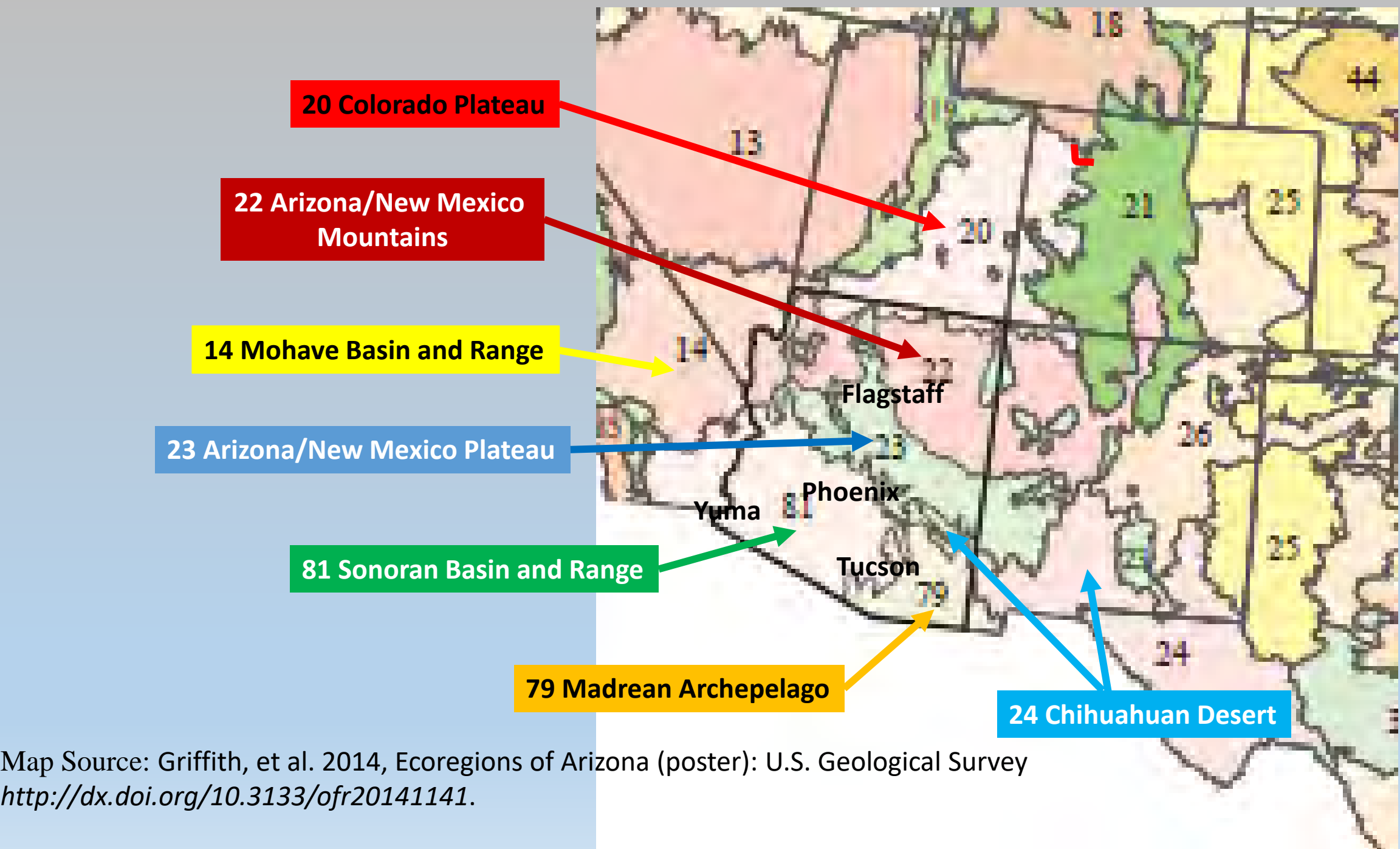




Ecoregions/Biotic Communities of Arizona with Examples of Plants Including Some of Wen's Favorites

**Arizona Native Plant Society 2020 Botany Symposium -
"Celebrating Arizona's Native Flora"
5 – 7 October 2020**



20 Colorado Plateau

22 Arizona/New Mexico Mountains

14 Mohave Basin and Range

23 Arizona/New Mexico Plateau

81 Sonoran Basin and Range

79 Madrean Archipelago

24 Chihuahuan Desert

Map Source: Griffith, et al. 2014, Ecoregions of Arizona (poster): U.S. Geological Survey
<http://dx.doi.org/10.3133/ofr20141141>.



Colorado Plateaus

- Great Basin Desert Scrub and Conifer Woodland (Brown et al.)
- N AZ, sc, se UT, e CO, ne NM
- Canyons, mesas, plateaus and mountains
- Tablelands and steep cliffs 1000-2000 ft high or more
- P-J and Gambel oak woodlands
- Low-lying areas with saltbush-blackbrush communities not found in higher elevations of Arizona/New Mexico Plateau



Yucca baileyi
Bailey yucca



Ericameria nauseosa
Rabbitbush
Max Licher



Scabrethia scabra
Mules Ears



Poliominthe incana
Rosemary mint



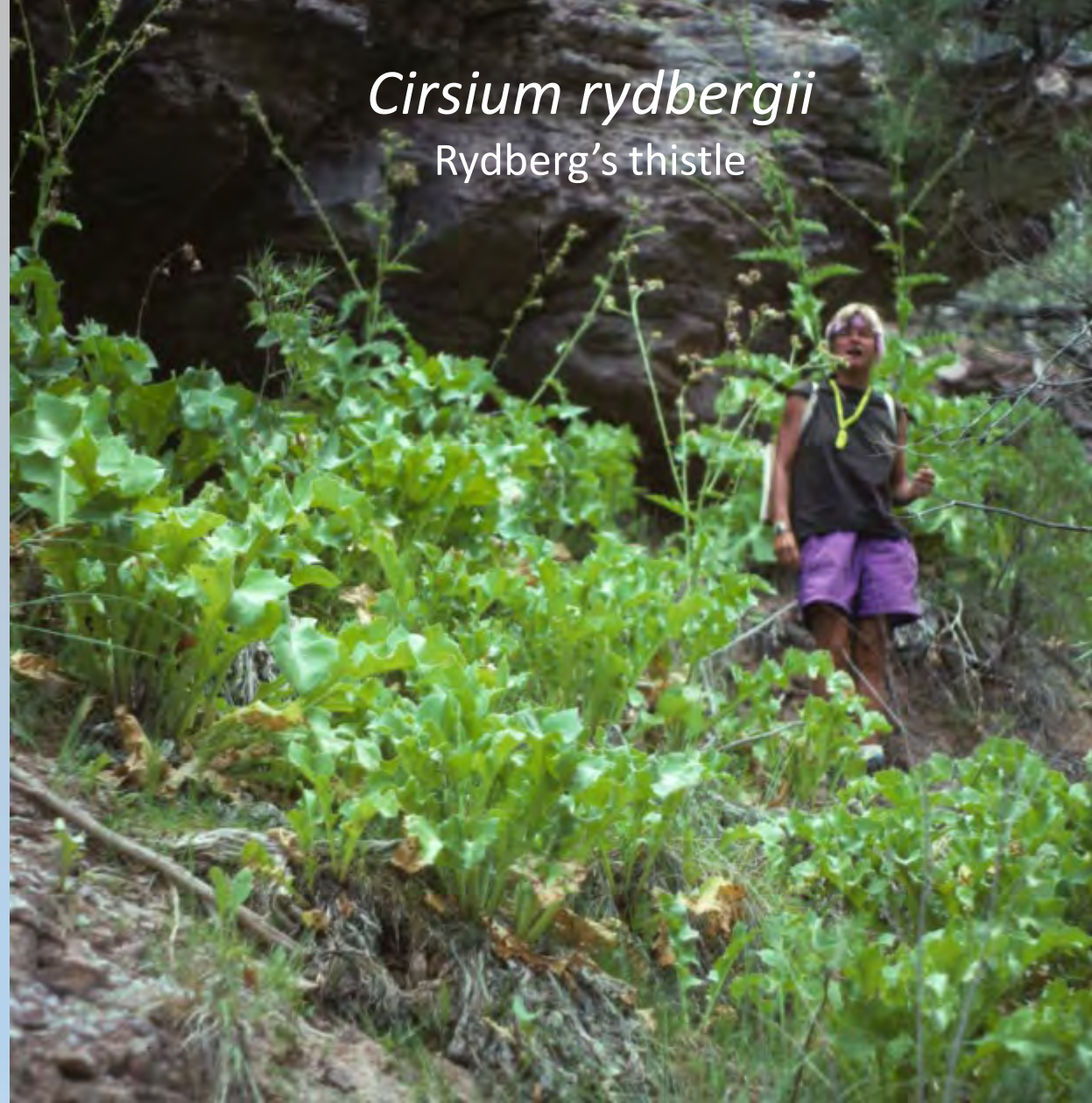
Cryptantha capitata
Capitate cryptantha



Asclepias cryptoceras
Humboldt Mountain Milkweed



Lathyrus eucosmus
Bush peavine



Cirsium rydbergii
Rydberg's thistle



Cladium californicum
California saw-grass



Sclerocactus sileri
House Rock Fishhook Cactus



Asclepias welshii
Welsh's milkweed

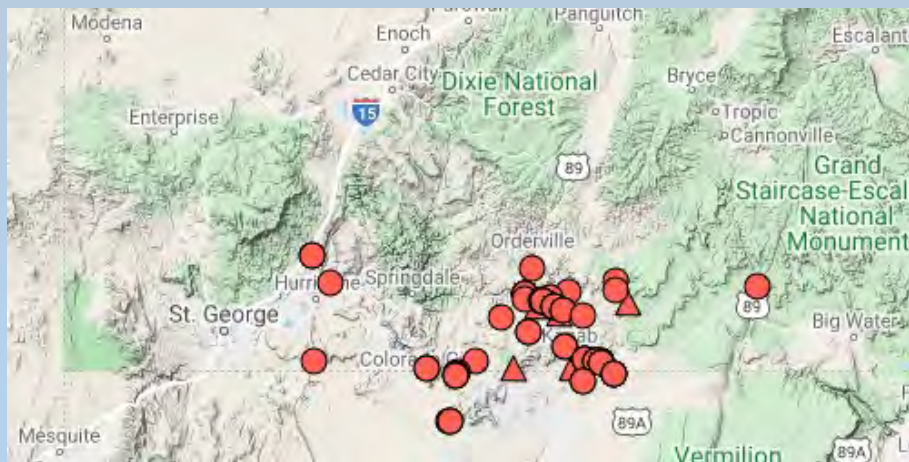




Euphorbia aaron-rossii
Marble Canyon Spurge

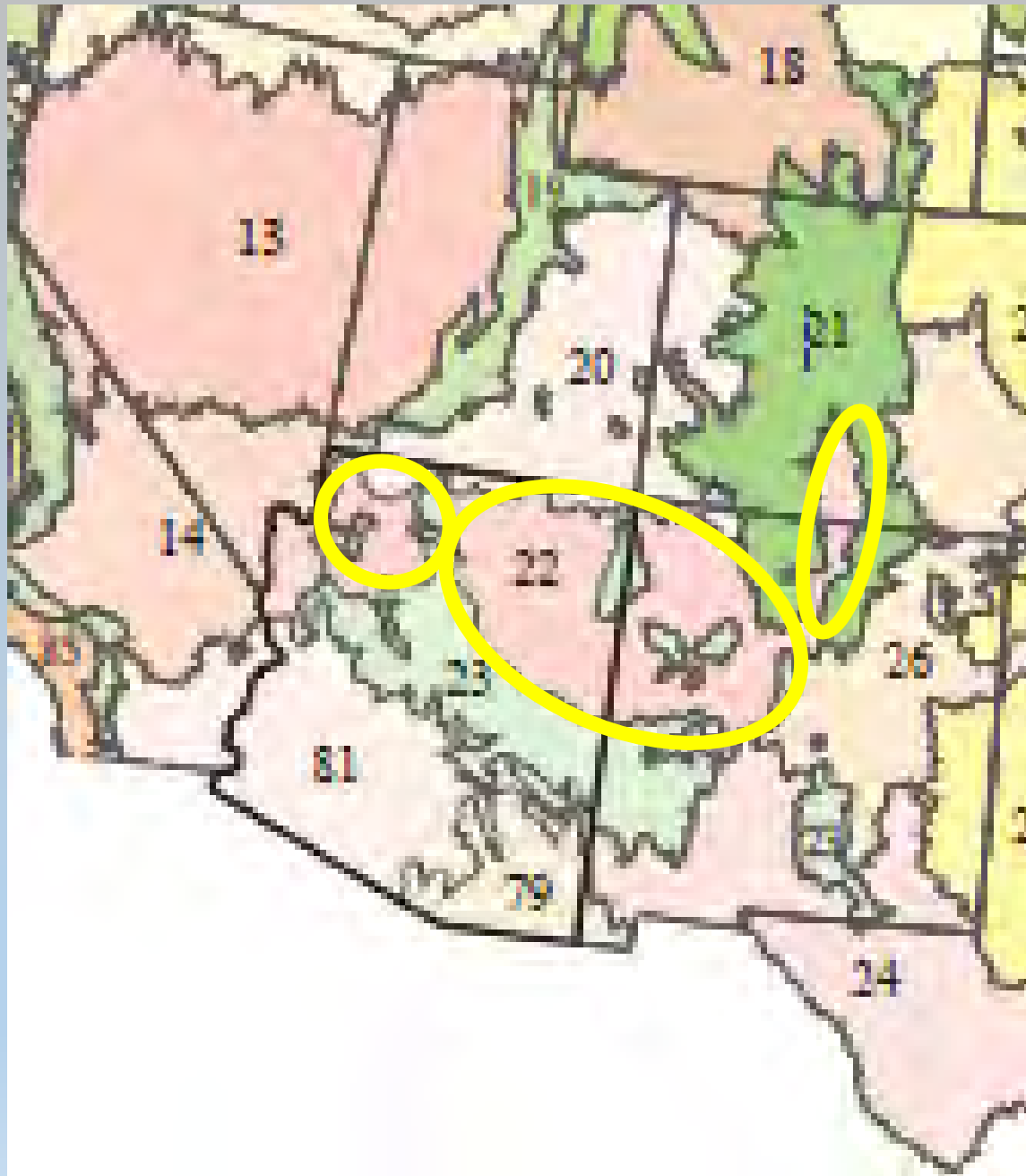


Susan Ashton



Yucca kanabensis
Kanab yucca

Arizona/New Mexico Plateaus



- Brown et al's Great Basin Conifer Woodland, Shrub-Steppe Grassland and Desert Scrub
- Transitional region between drier shrublands of Colorado Plateaus, lower, hotter, Mojave Basin and Range (14), semiarid grasslands (26), and forested mountain ecoregions (21, 23)
- N Arizona, nw New Mexico, into sc Colorado

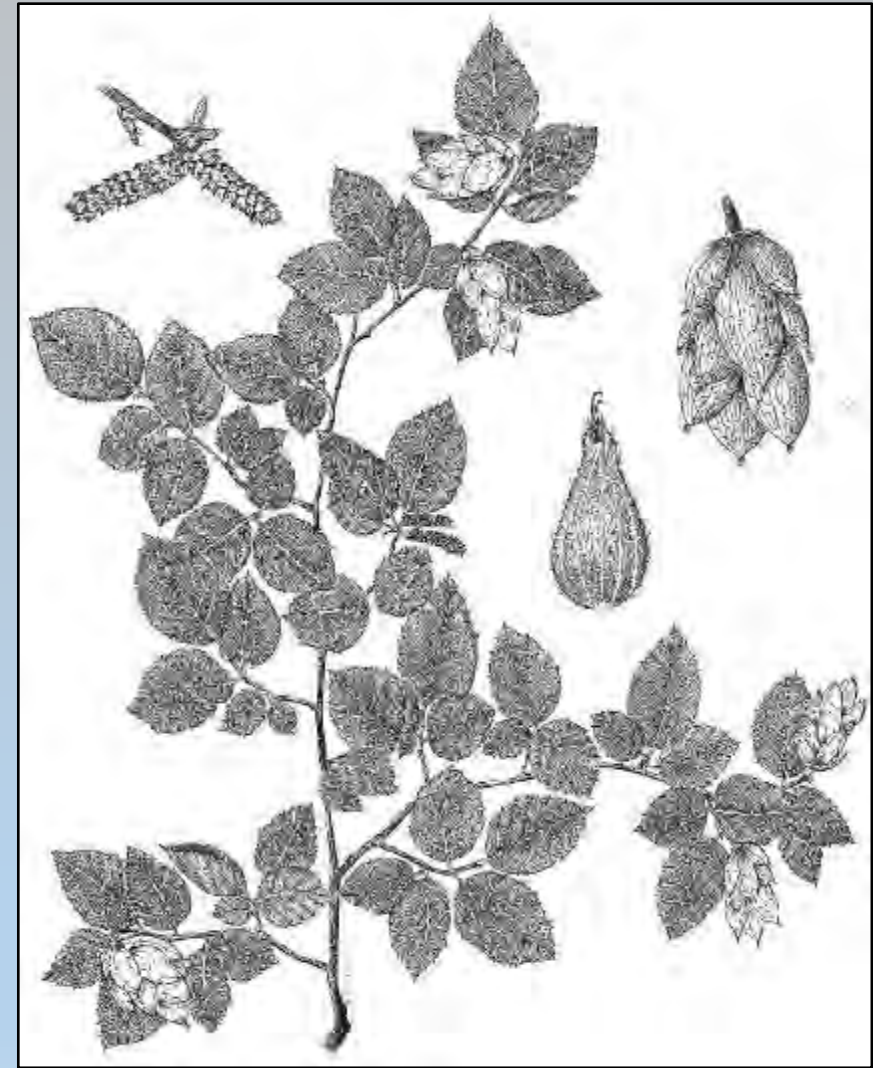




Psoralethamnus fremontii
Fremont dalea



Ostrya knowltonii
Knowlton's hophorn-bean
Max Licher



Sandra Turico



Encelia resinifera ssp. *resinifera*
Sticky brittlebush
Curtis Clark



Stanleya pinnata
Prince's plume

Frasera paniculata
Tufted elkweed



Oenothera caespitosa var. *crinita*
Tufted evening-primrose

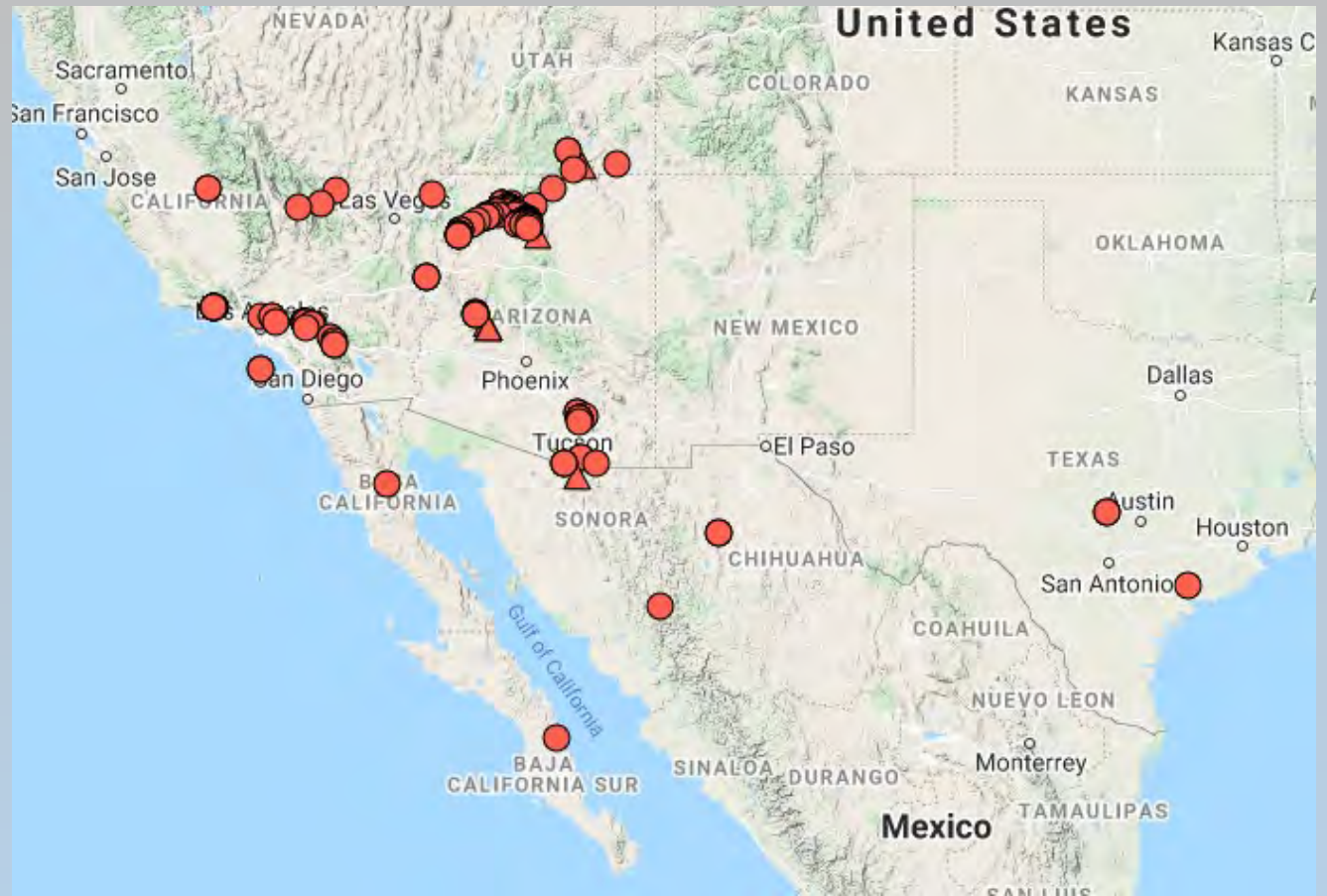




Epipactis giganteus
Giant hellebore orchid



Sandra Turico

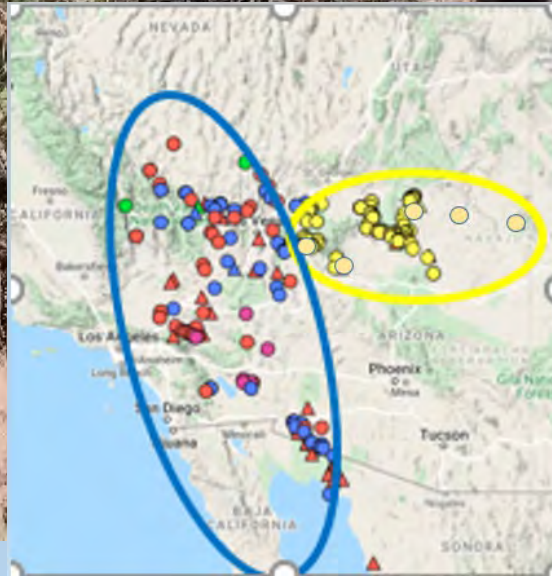


Imperata brevifolia

Satin-tail



Opuntia polyacantha
Plains prickly-pear



Homalocephala polycephala
var. *xeranthemoides*
Cotton-top cactus



Sclerocactus parviflorus
Small-flowered fishhook cactus

Nolina cf. microcarpa
Beargrass



Agave utahensis ssp. kaibabensis
Kaibab agave





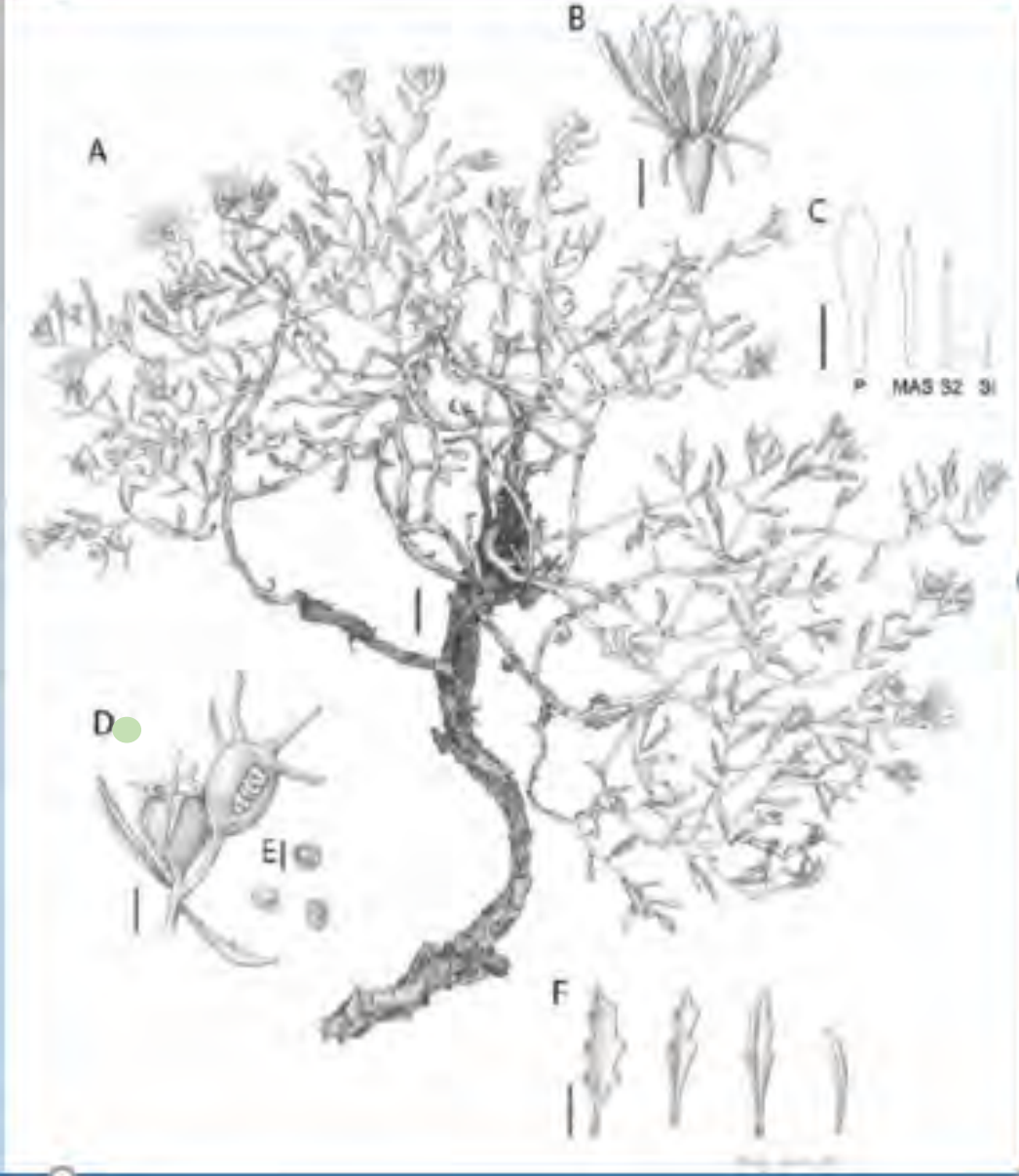
Yucca baccata
Banana yucca

Yucca hybrid

Yucca sp.?



Mentzelia hualapaiensis
Hualapai stickleleaf



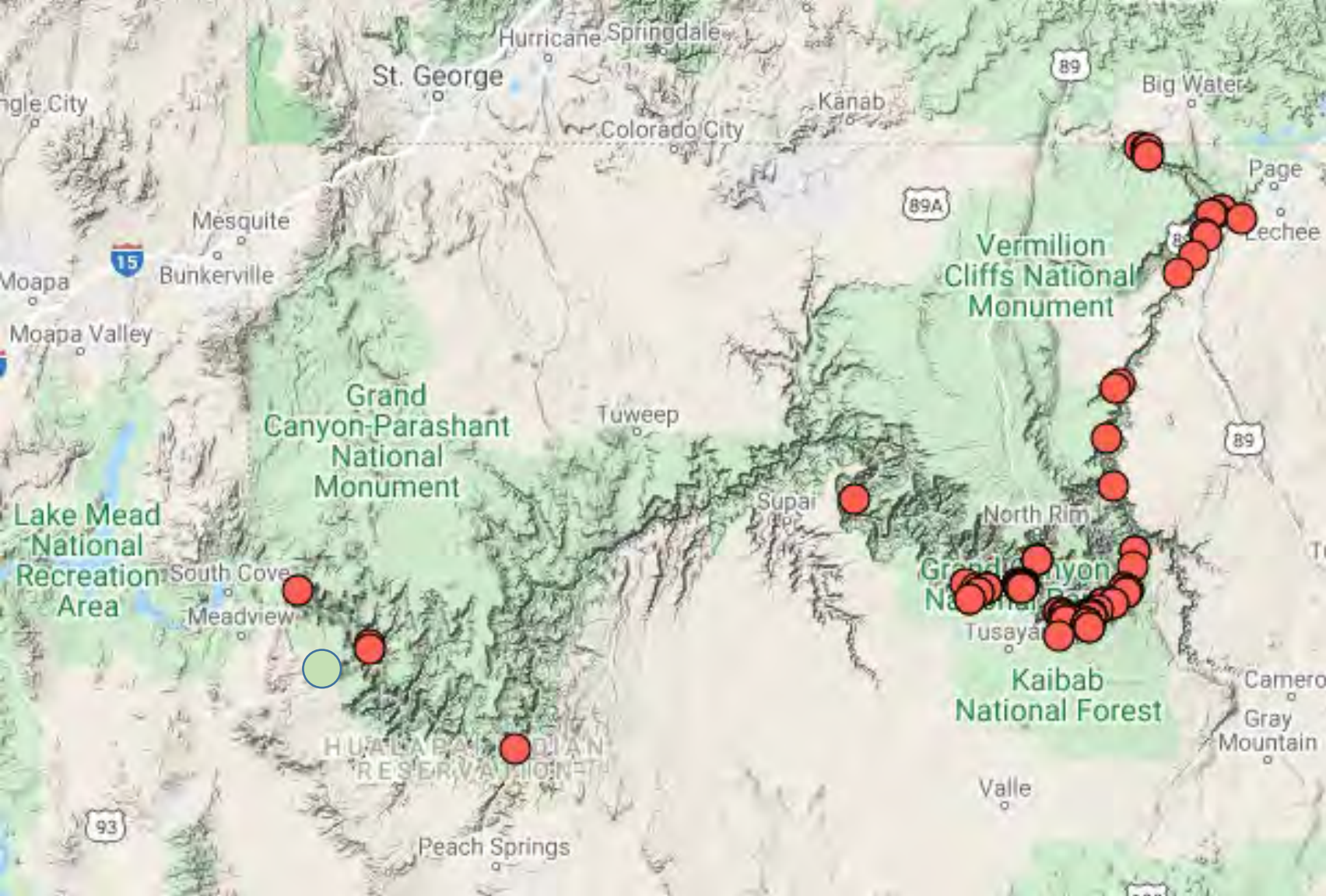
Mentzelia canyonensis
Grand Canyon stickleleaf



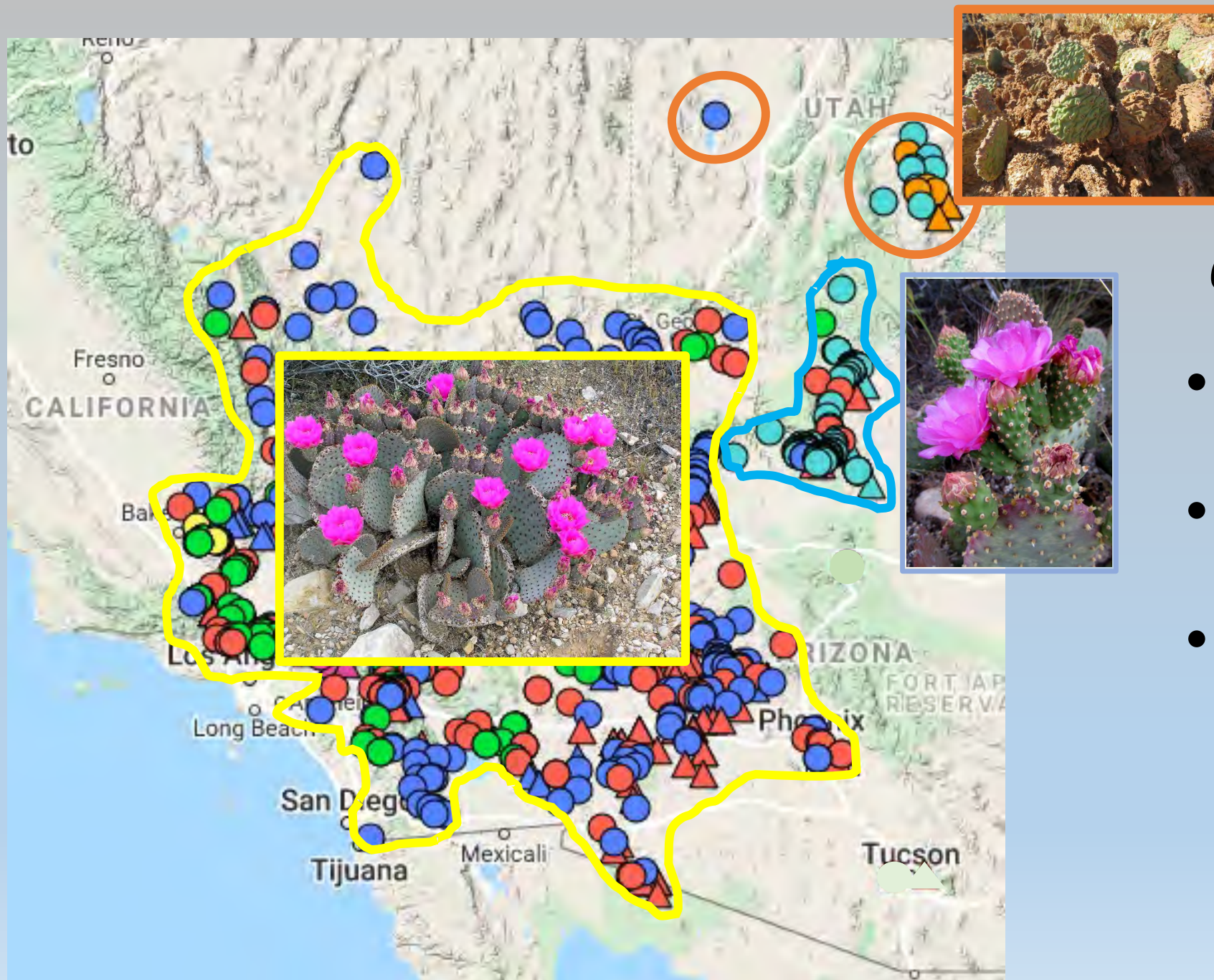
Cirsium sp. nov.



Cirsium sp. nov.



Opuntia basilaris var. *longiareolata*
Grand Canyon beavertail cactus

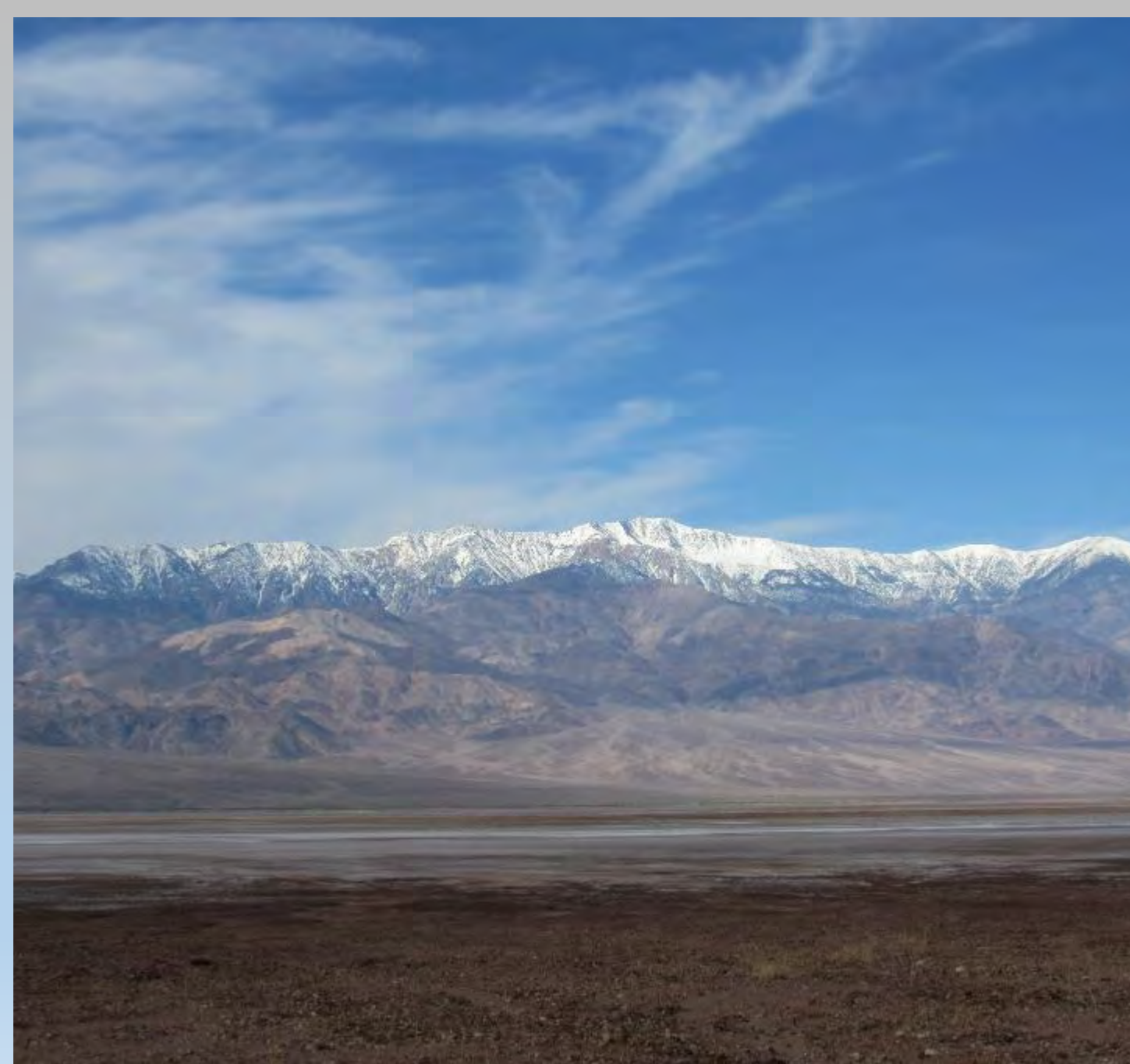


Opuntia basilaris

- Glen Canyon – *O. heilii* center of origin
- North to south migration for species
- Grand Canyon – a refuge for var. *longiareolata* (Lucas Majure, pers. comm.)

Mohave Desert

- Brown et al's' Mohave Desert Scrub
- SE California, s Nevada, sw Utah, and nw Arizona
- Broad basins and scattered mountains
- 50-125 mm ppt, late winter
- Sea level – 1200 m





- Creosotebush dominated; white bursage, Joshua tree and other yuccas, and blackbrush, barrel cacti
- Alkali flats: saltbush, saltgrass, alkali sacaton, and iodinebush
- Higher elevations sagebrush, juniper, and singleleaf pinyon
- At higher elevations ponderosa pine, white fir, limber pine, and bristlecone pine



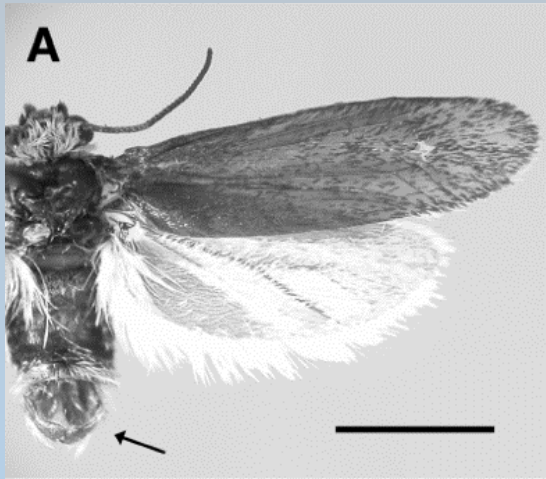
Yucca brevifolia
Western Joshua-tree

Lenz, L. 2007. *Aliso* 24(1): 97-104.

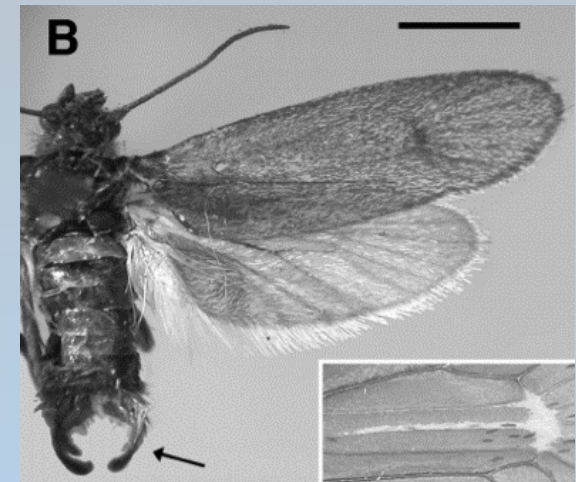
Yucca jaegeriana
Eastern Joshua-tree



*Yucca
brevifolia*



Tegeticula synthetica



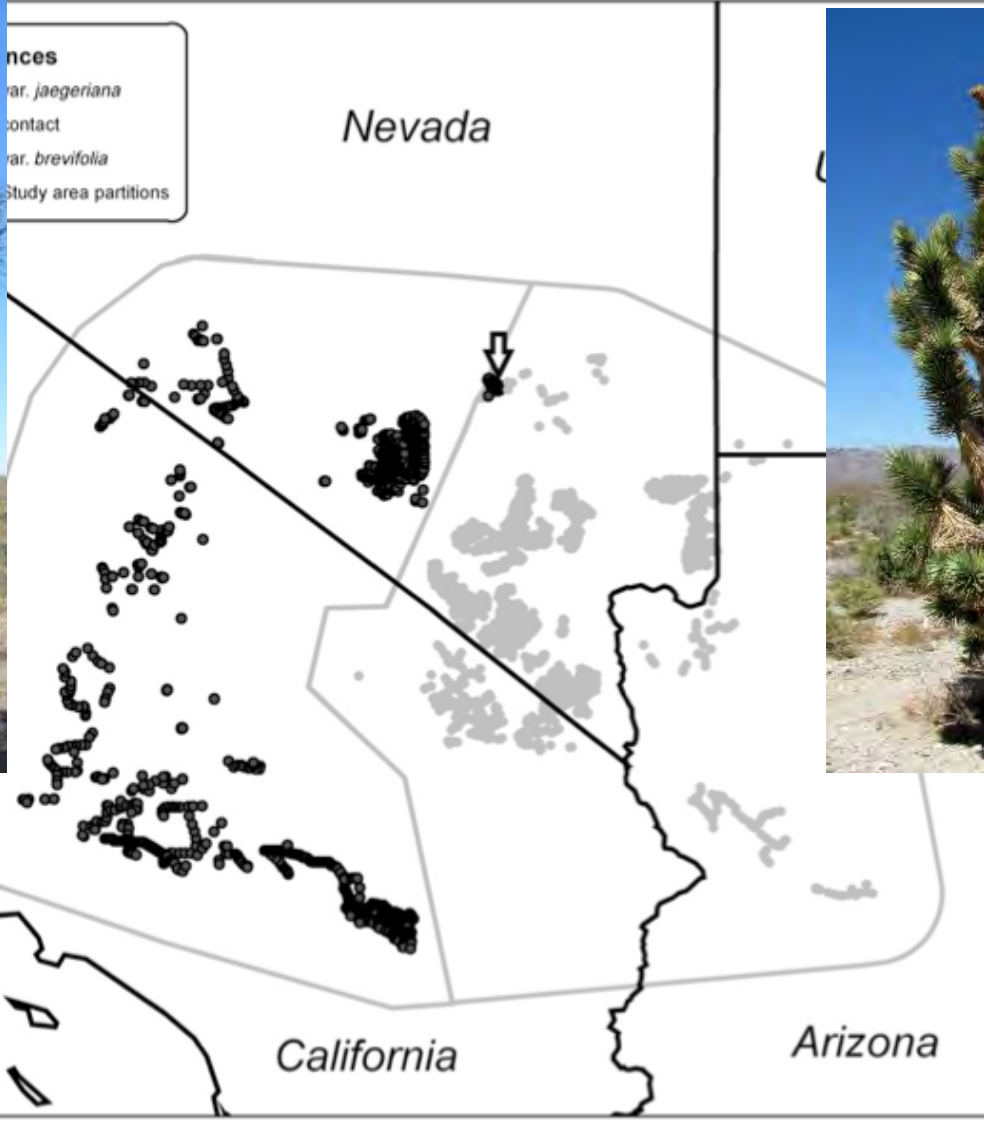
Tegeticula antithetica



Pellmyr, & Segraves.
2003. Annals of the
Entomological Society of
America. 96. 716-722.



ances
ar. *jaegeriana*
contact
ar. *brevifolia*
Study area partitions



Yucca brevifolia and *Y. jaegeriana*
range (Godsoe et al., 2009, p. 590)



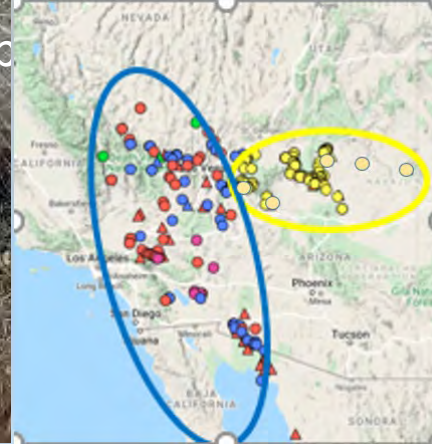
Yucca schidigera
Mohave yucca



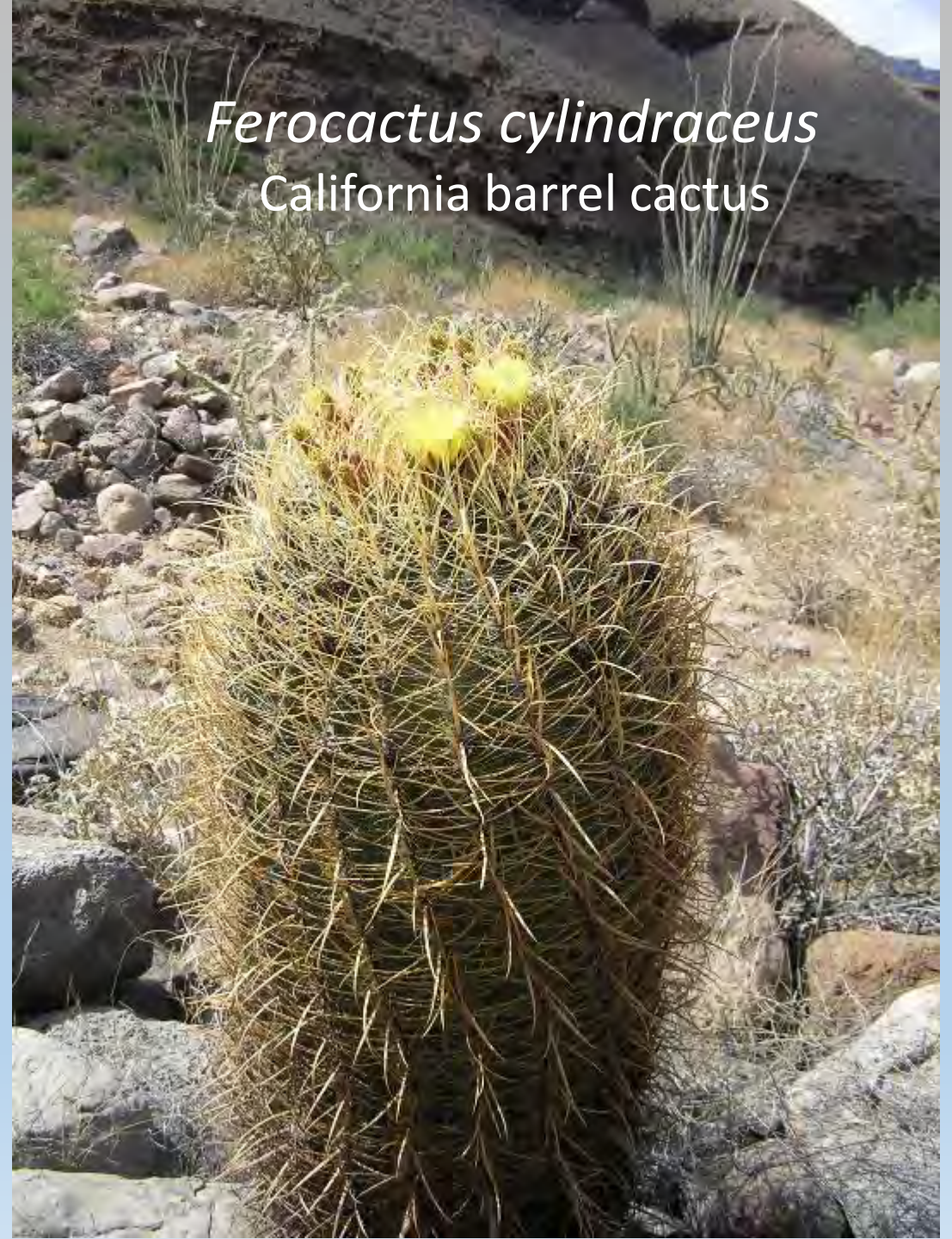
Yucca utahensis
Utah yucca

Homalocephala polycephala
var. *polycephala*

Many-headed b



Ferocactus cylindraceus
California barrel cactus



Opuntia curvispina



Opuntia diplourisina
Lake Mead prickly-pear

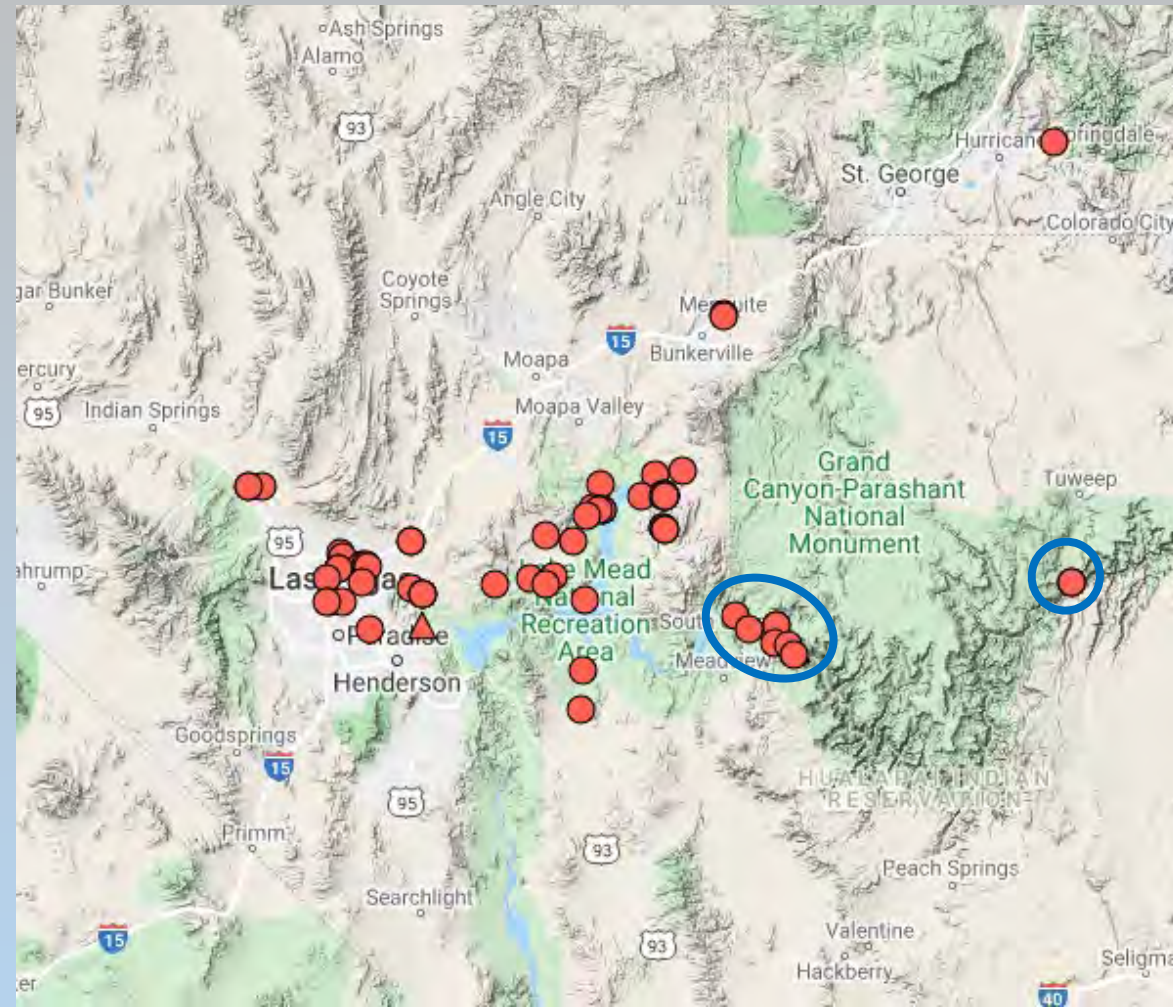
Cylindropuntia abyssii
Peach Springs Canyon cholla

Illustration by Elaine Hultgren

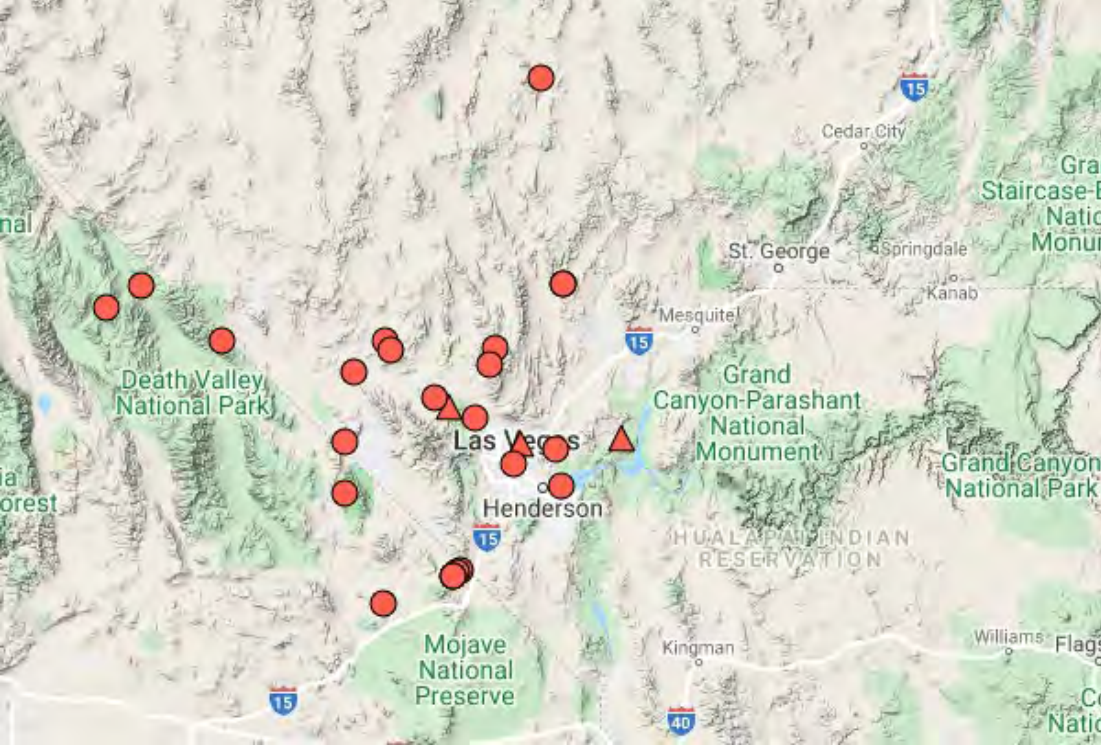




Teague Embrey



Arctomecon californica
California bear-poppy



Gregory Gust



Arctomecon merriamii
White bear-poppy





Cirsium mohavense,
C. virginensis?

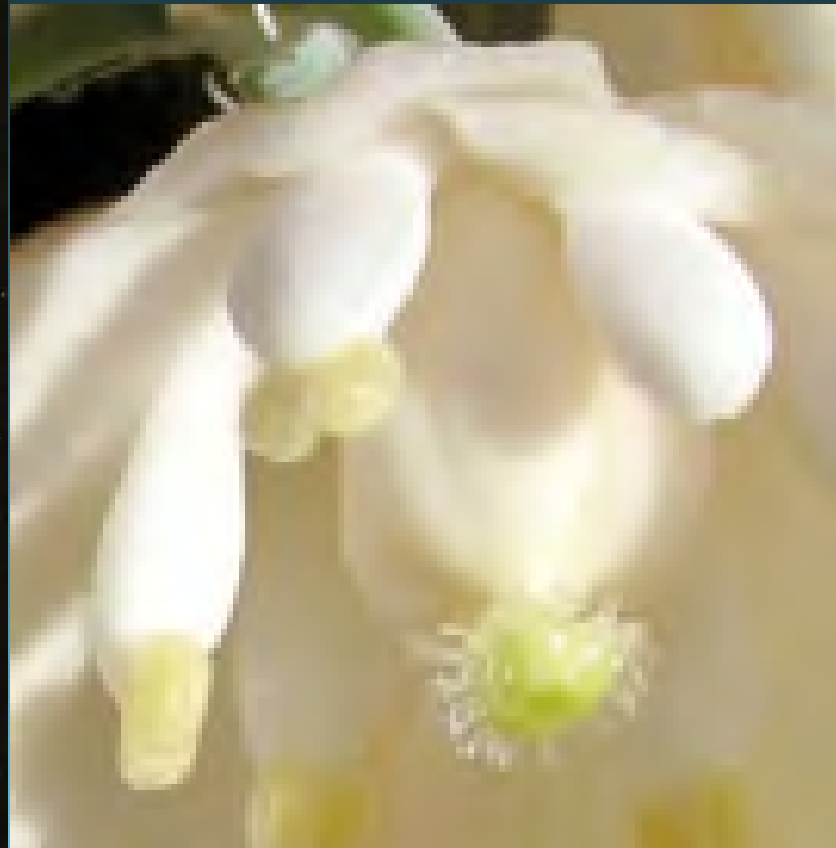


Cirsium mohavense?





Hesperoyucca
newberryi
Newberry's mock-yucca



Carrie Cannon

Carrie Cannon



Our Lord's Candle,
Hesperoyucca

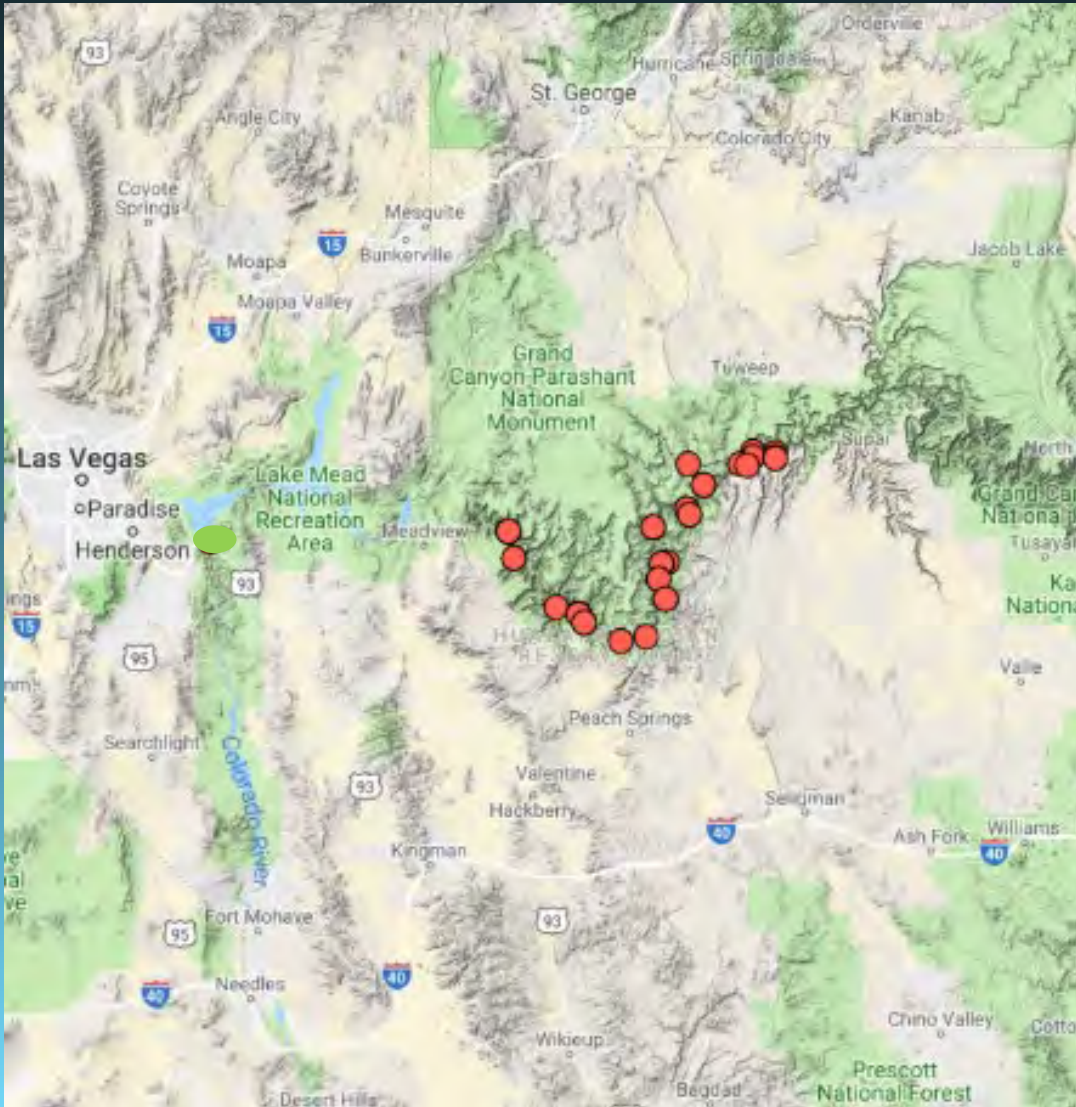
- Not related to Yucca
- Three species recognized

Clary, K. 2001. Sida 19(4): 839-847

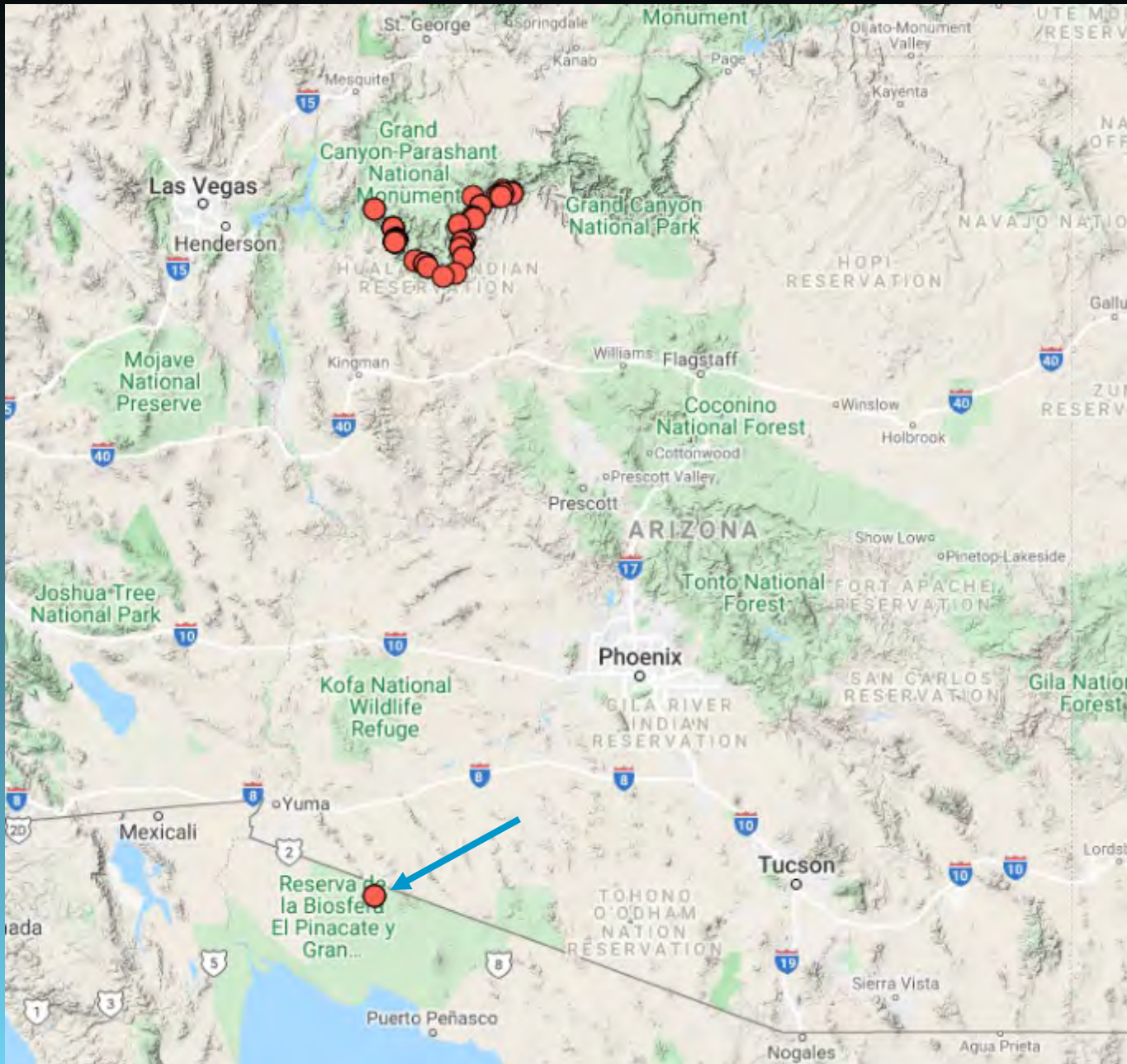


©2015 Barry Rice,
Calphoto

Hesperoyucca newberryi



Carrie Cannon, photo



Hesperoyucca sp.

Cool

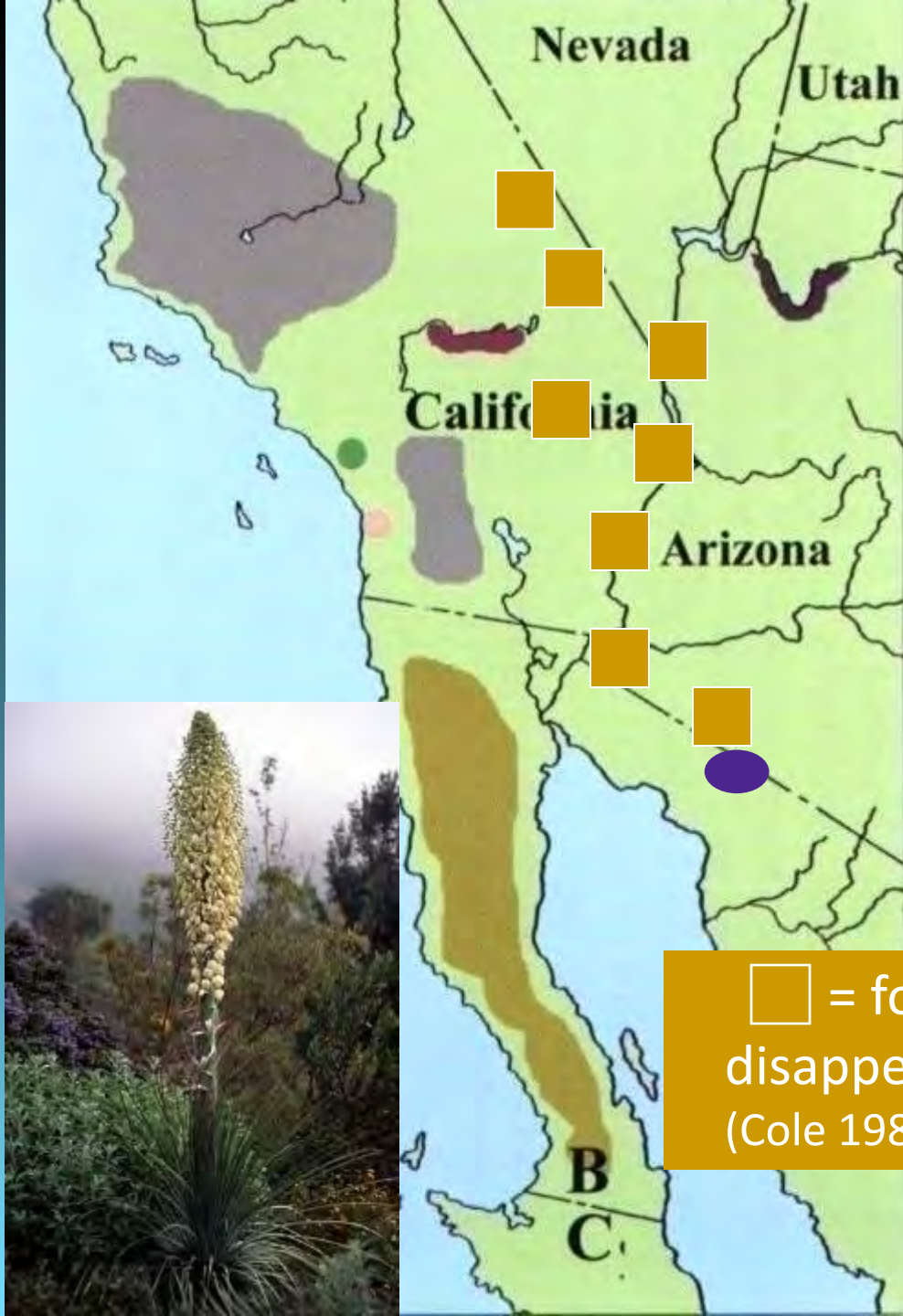


Segraves &
Pellmyr 2001.
Molecular
Ecology 10:
1247-1253.



Hesperoyucca sp.





□ = fossil *Hesperoyucca*,
disappearing 11 -12,000 ya
(Cole 1986; Van Devender 1987)



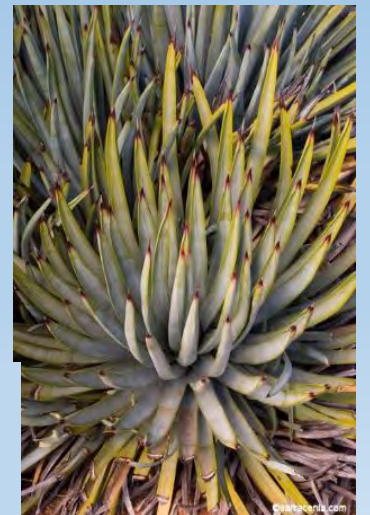
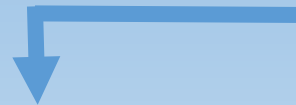
Hesperoyucca pollinating moths *Tegeticula maculata*



ssp. *maculata*



ssp. *extranea*

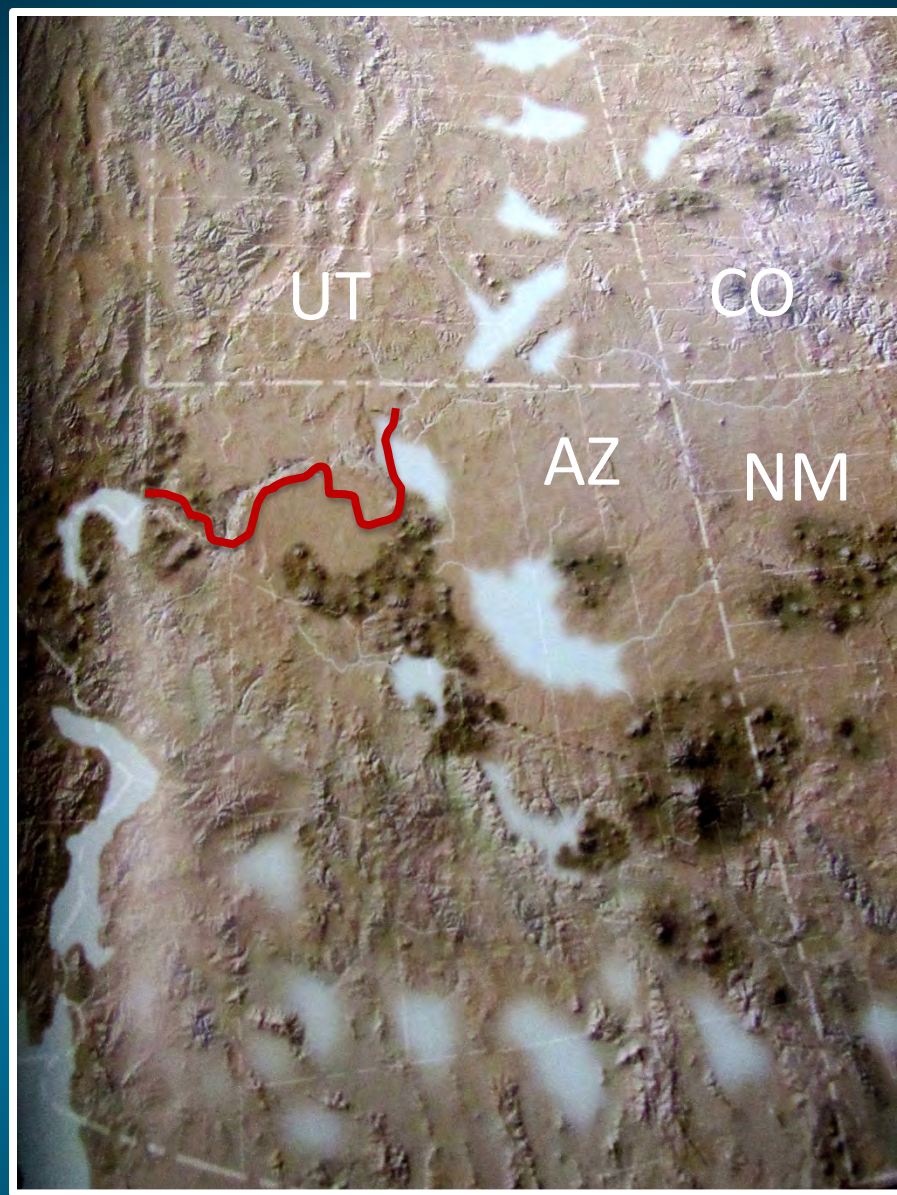


Moth's and plants' development and distribution related to glacial/interglacial activities



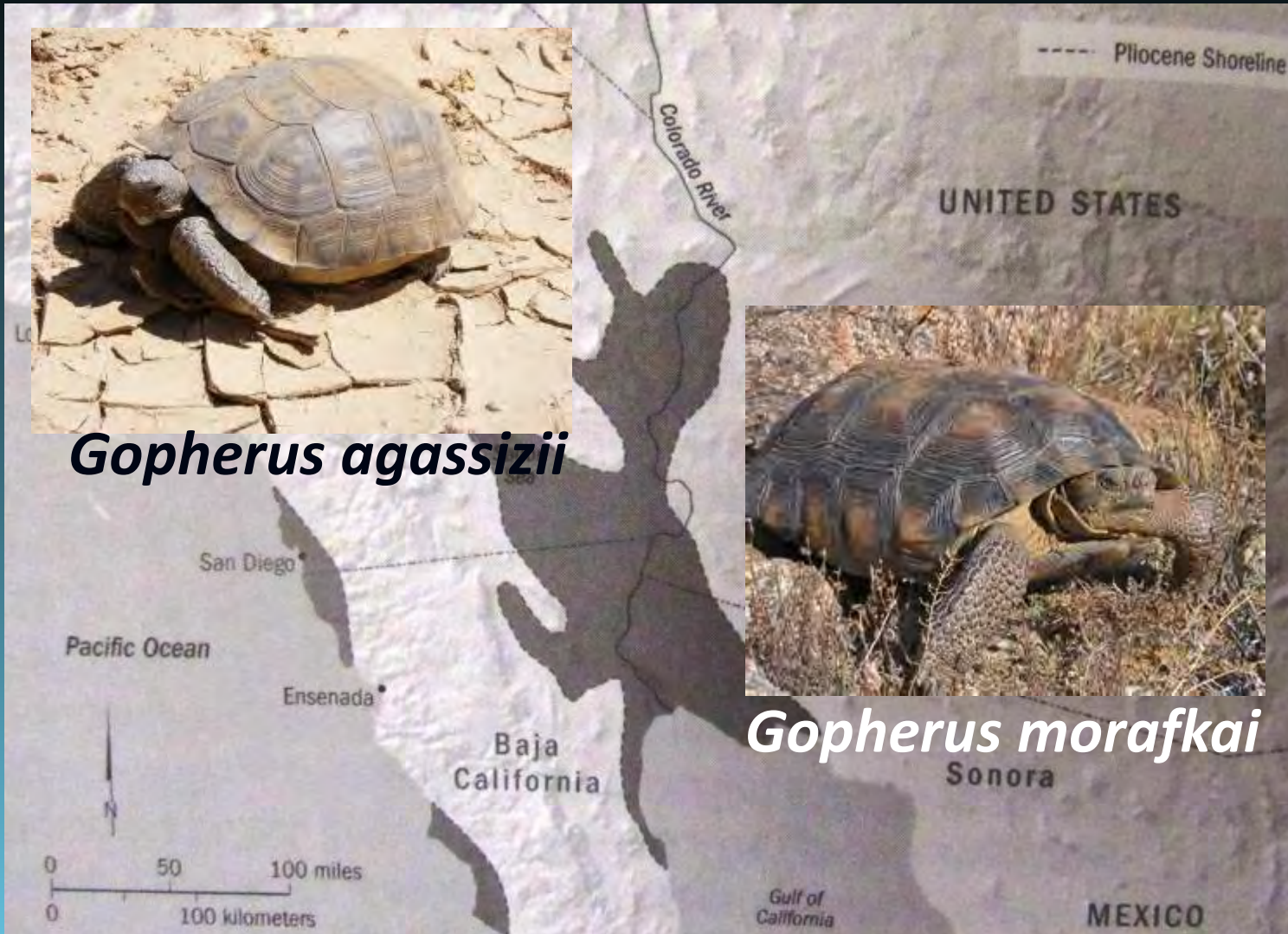
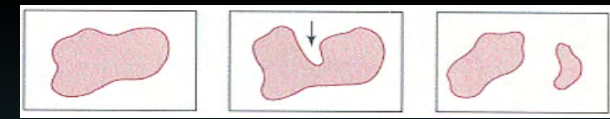
How and When did *Hesperoyucca* species diverge?

- Were Colorado River, lakes and embayments isolating barriers to seed or pollinators?

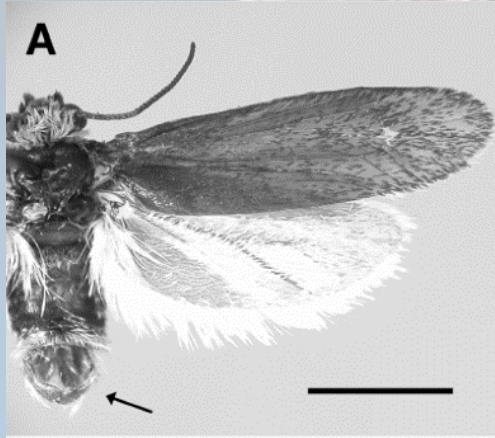


6-2 ma, beginning of an integrated Lower Colorado River (from Hoover Dam to Yuma)

Allopatric Speciation - Vicariance



Bouse Embayment (4-9 mya)/Colorado River



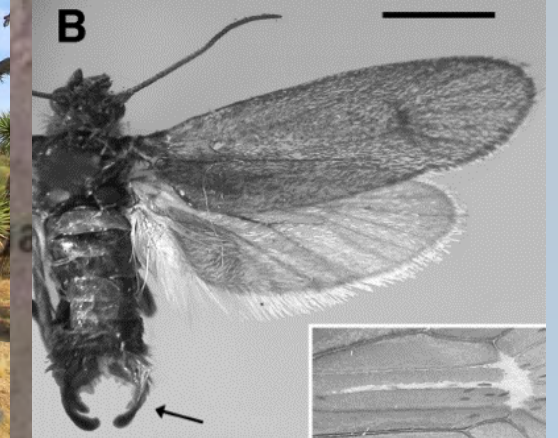
Tegeticula synthetica



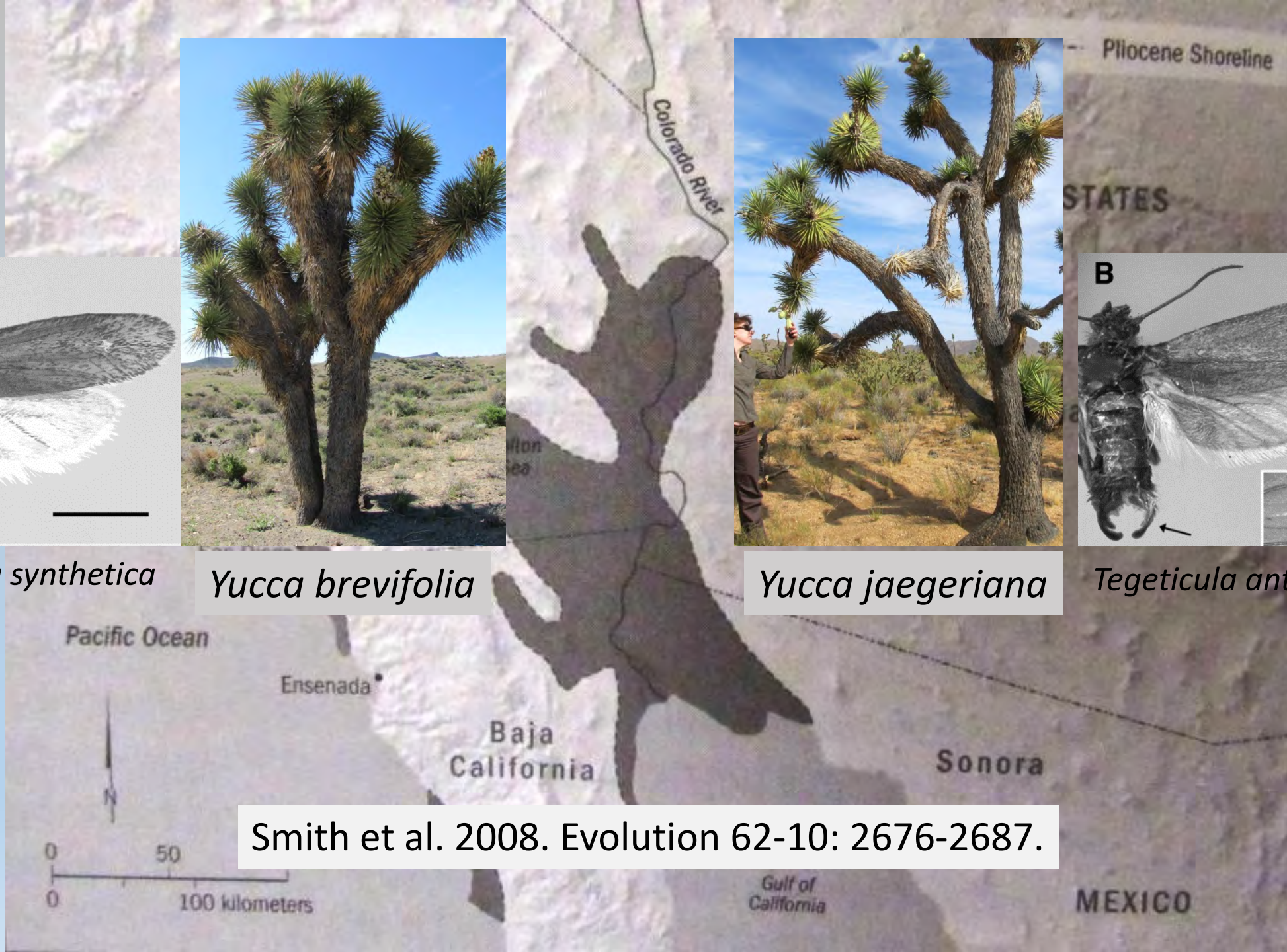
Yucca brevifolia



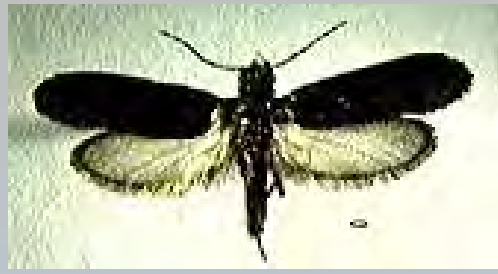
Yucca jaegeriana



Tegeticula antithetica



Smith et al. 2008. Evolution 62-10: 2676-2687.

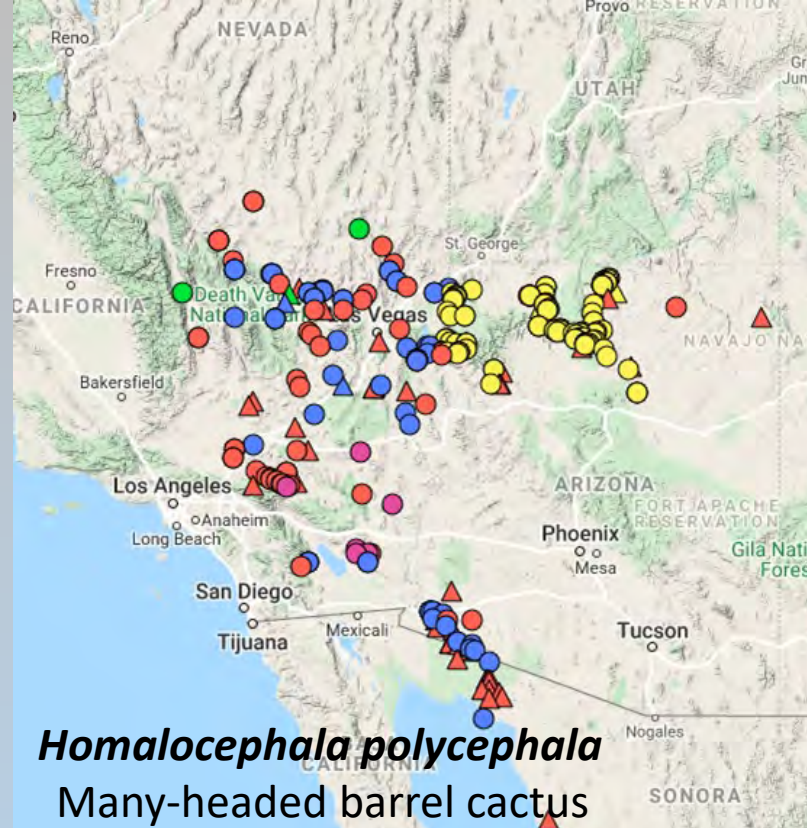
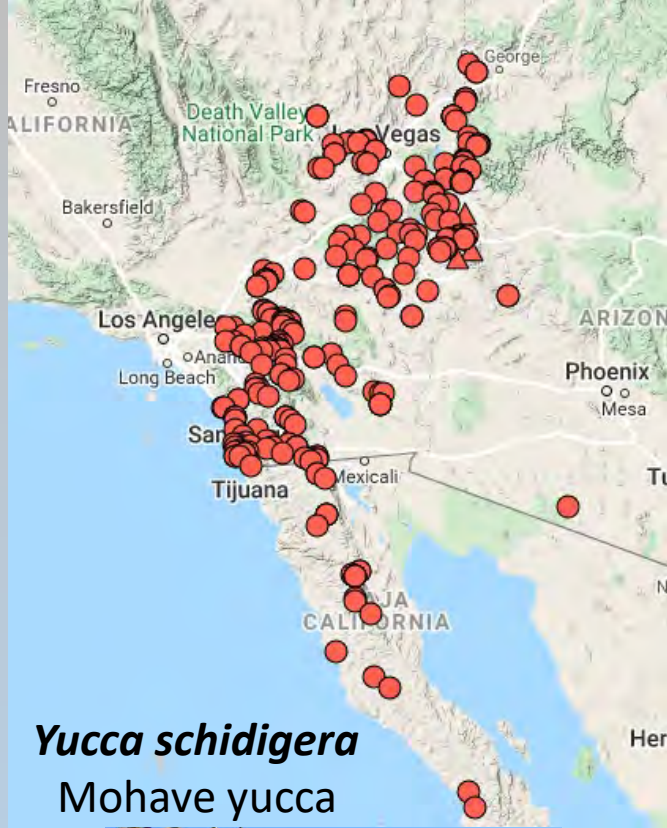


- *Hesperoyucca* diverged ca 16 mya (*Yucca* diverged ca 20 mya)*
- Active pollination by *Tegeticula* ancestor ca 36-40 mya*
- *T. maculata* subspecies diverged ca 9-10 mya**

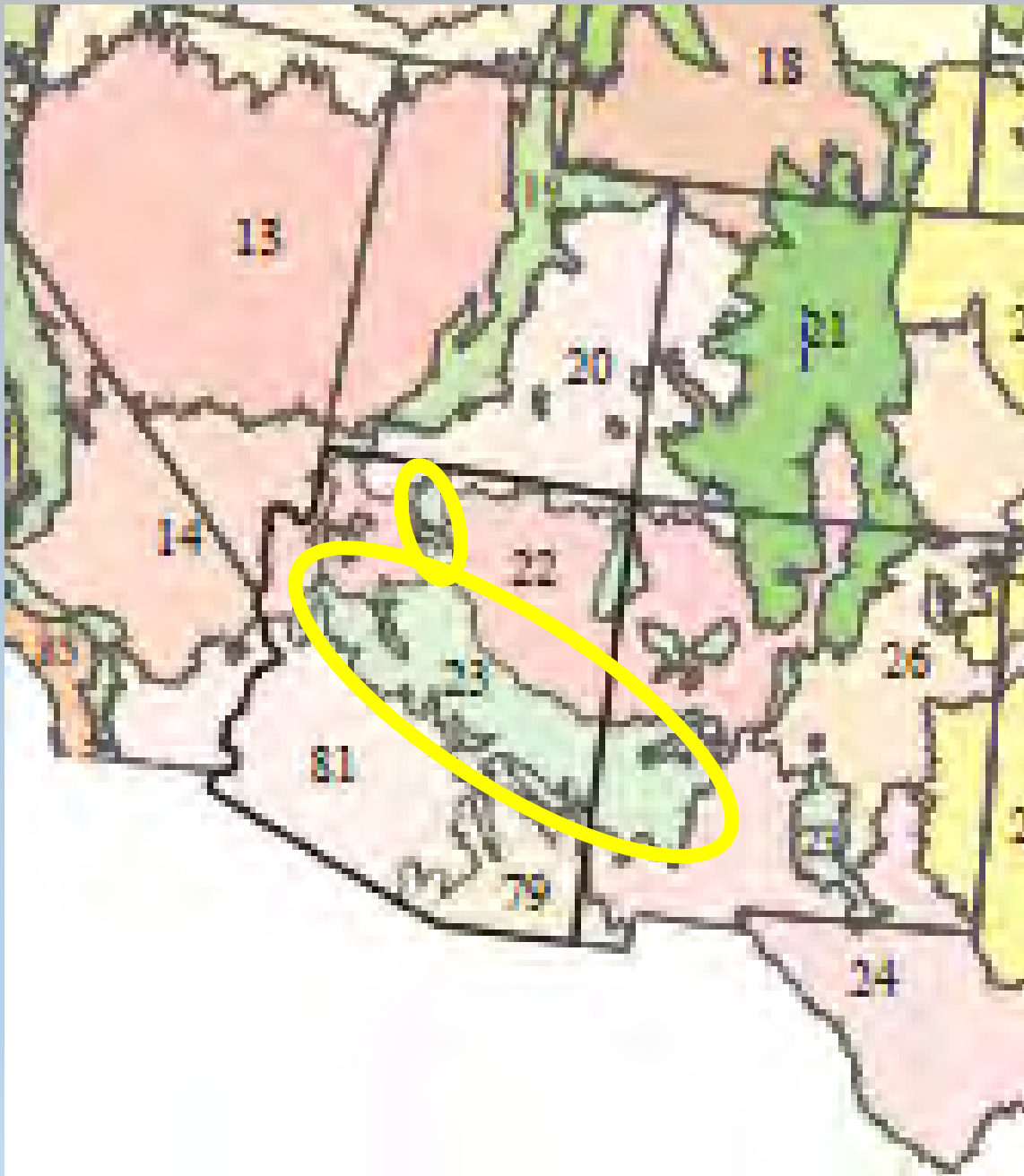
*McCain et al. 2016, AJB 103: 1717-1729;

**Segraves & Pellmyr 2001. Molecular Ecology 10: 1247-1253





Arizona/New Mexico Mountains “Mogollon Highlands”



- Brown et al's Rocky Mtn and Madrean Montane Conifer Forest, Intermountain Grassland & Rocky Mtn, Great Basin Subalpine Conifer Forest



Arizona/New Mexico Mountains “Mogollon Highlands”

- 11 of the 26 biotic communities
- Chaparral to P-J and oak woodlands to spruce, fir, Douglas-fir at highest elevations
- Riparian and old-growth Ponderosa Pine forests – both endangered ecosystems



Arizona/New Mexico Mountains “Mogollon Highlands”

- Great geologic and topographic diversity
- High faunal and flora diversity – a biodiversity hotspot
- A region “neglected by scientists”



The Arizona
Native Plant
Society

The Plant Press

THE ARIZONA NATIVE PLANT SOCIETY

Volume 40, Number 2

Fall 2017

In this Issue

Mogollon Highlands

- 3 A Preliminary Description of the Mogollon Highlands Ecoregion
- 7 Edaphic Endemism and the Mogollon Highlands
- 10 Fossil Creek Watershed PAPAZ Flora Project



Courthouse Butte, south of Sedona. *Photo courtesy Ries Lindley.*



Arctostaphylos spp.

Manzanita



Eriodictyon angustifolium

Yerba santa
Les Landrum



Purshia stansburyana

Cliffrose
Max Licher

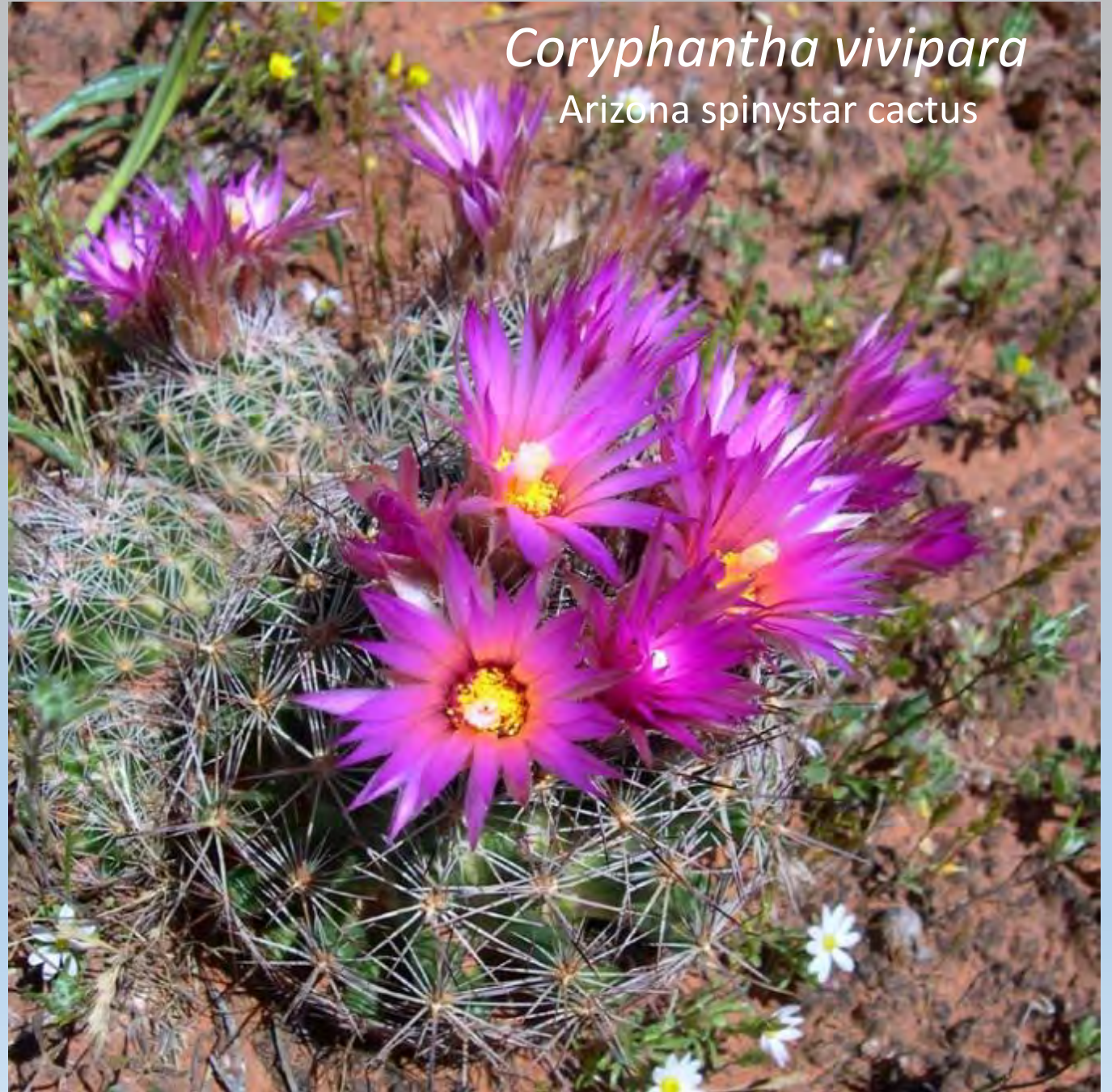


Fremontodendron californicum
Flannelbush

Yucca angustissima
Narrow-leaf yucca



Coryphantha vivipara
Arizona spiny star cactus





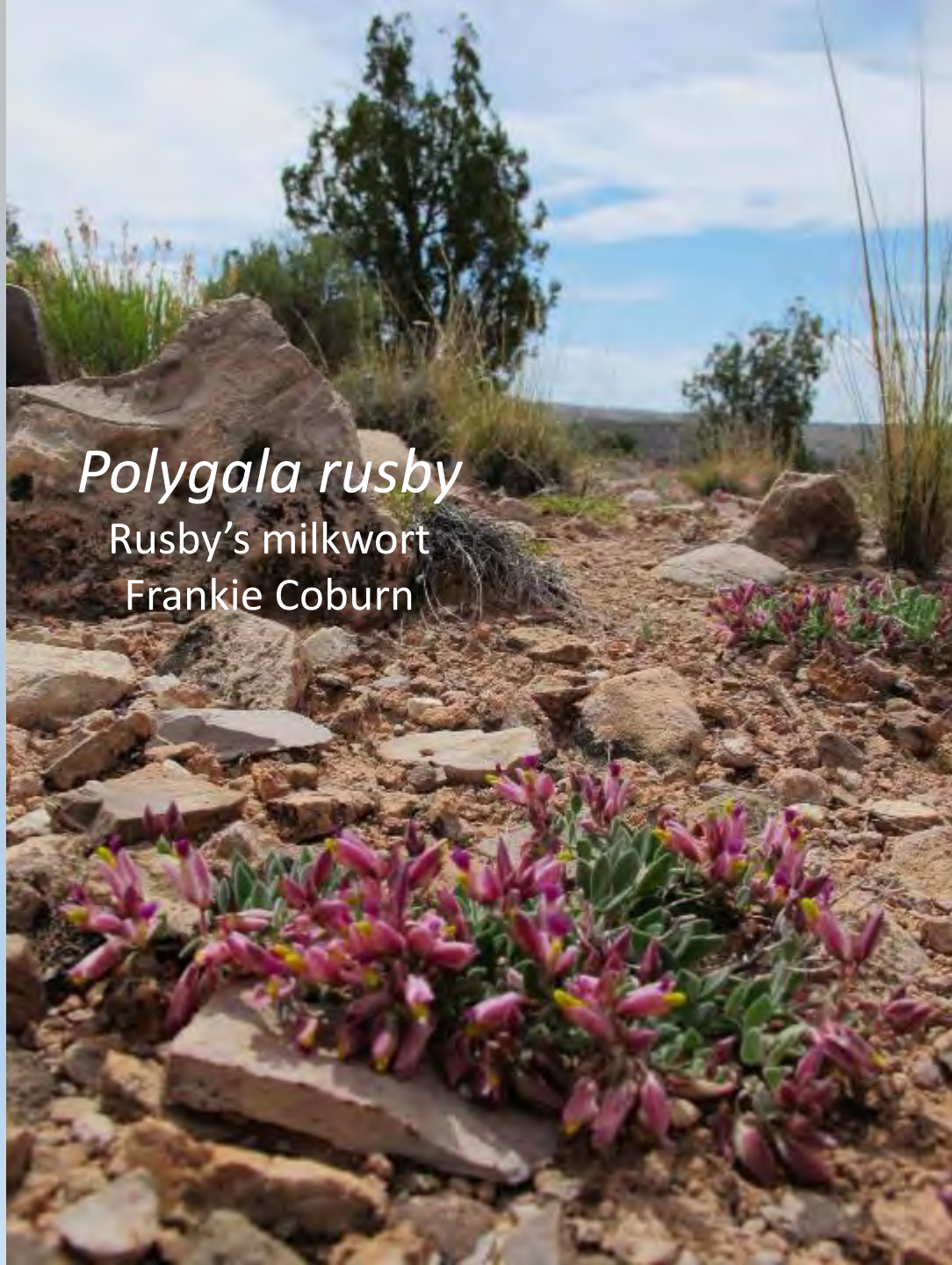
Hymenopappus radiatus
 White-rayed woollywhite



Triteleia lemmoniae
 Oak Creek triplet-lily



Dudleya saxosa var. *collomiaae*
 Gila County live-forever



Polygala rusby

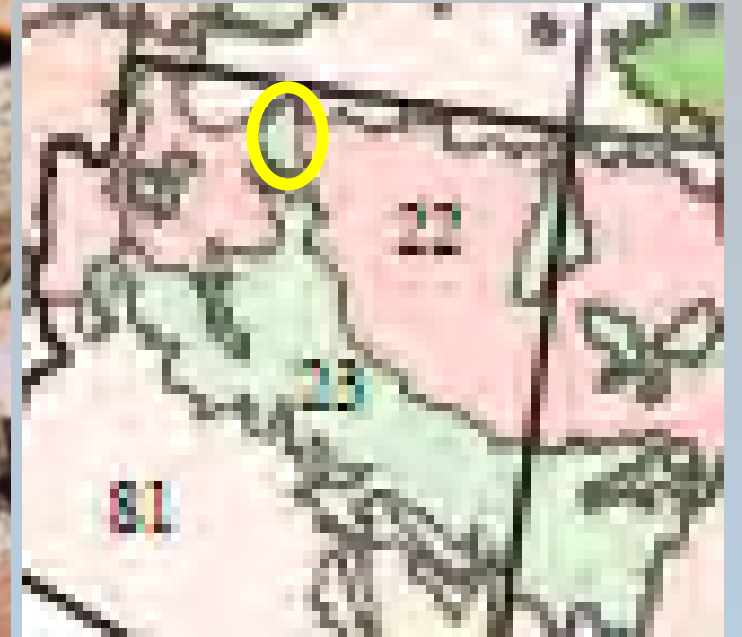
Rusby's milkwort

Frankie Coburn



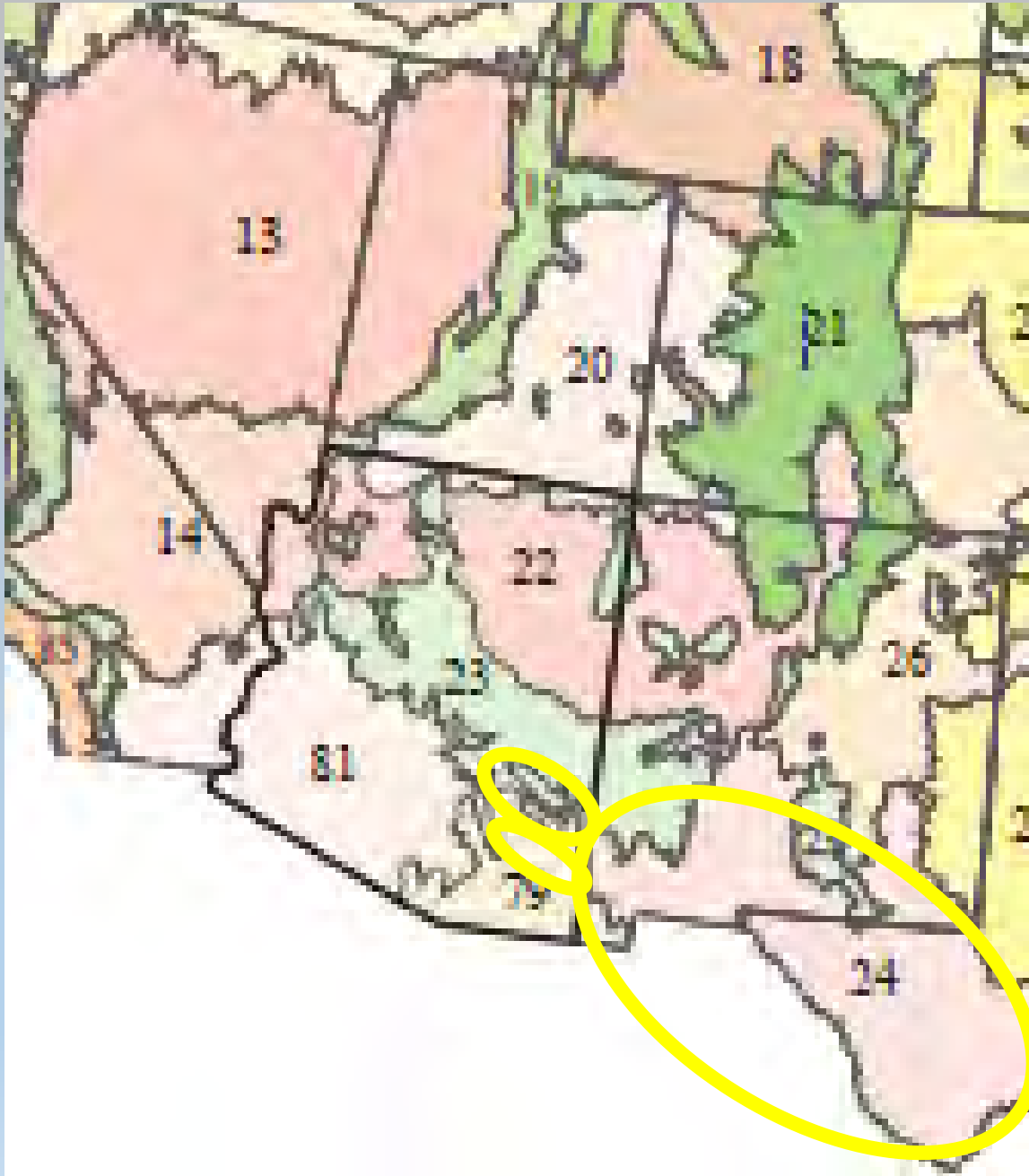
Echinocereus yavapaiensis

Yavapai claretcup hedgehog



Pediocactus paradinei
Kaibab pincushion cactus

Chihuahuan Desert



- Brown et als' Chihuahuan Desert Scrub
- Extends from the Madrean Archipelago (79) to the Edwards Plateau in sc Texas.
- Is the n portion of the southernmost desert in North America, extending > 500 miles s into Mexico



Tripterocalyx macranthus

Small-flowered sandpuff



Flourensia cernua

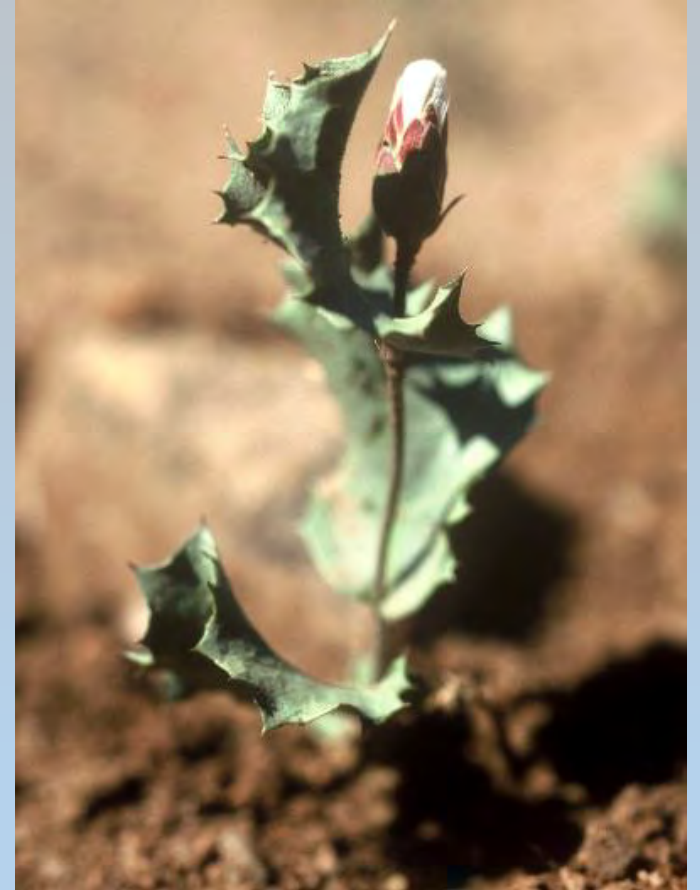
American tarwort, blackbrush

Liz Makings





Berlandiera lyrata
Chocolate flower, Greeneyes
Liz Makings



Acourtia nana
Dwarf desert-holly



Acacia neomexicana
Vinorama
Liz Makings



Opuntia macrocentra
Duraznilla, nopal



Echinocereus fendleri
Fendler hedgehog

Grusonia emoryi
Devil club-cholla



Madrean Archipelago – the Sky Islands

- Brown et als' Madrean Evergreen Forest & Woodland and Semi-desert Grassland, Chihuahuah Desert Scrub
- Basins and ranges with elevations 3000 to 5000 feet
- Basins of grama-tobosa steppes, ranges of oak-juniper woodlands



- Ponderosa pine, mixed conifer at higher elevations (to over 10,000 ft)
- 15 sky islands in Coronado N.F.
- Bridge between Rocky Mountains and Sierra Madre Occidental = high diversity and endemism

https://www.fs.fed.us/wildflowers/beauty/Sky_Islands/communities/bristlecone-limber.shtml



Arbutus arizonica
Arizona madrone



Rhus microphylla
Lima de la sierra



Agave parryi var. *huachucensis*

Huachuca agave



Agave schottii var. *schottii*

Amole



Agave palmeri
Lechuguilla, Palmer's agave

Amoreuxia palmatifida & *A. gonzalezii*, "Saiya"



Tom VanDevender



Tom VanDevender



All Parts are Edible!



Amoreuxia gonzalezii



Armando Corral-Rochín, Sonora, Mexico



Tom VanDevender, photos



Manihot angustiloba

Pata de gallo, Narrow-leaved-cassava

Liz Makings



Cnidoscolus angustidens

Mala mujer, stinging-spurge

Sue Carnahan



Mammillaria wrightii
Wright's pincushion



Opuntia santa-rita
Santa Rita prickly-pear



Nolina microcarpa(?)
Beargrass



Coryphantha recurvata
Santa Cruz beehive cactus



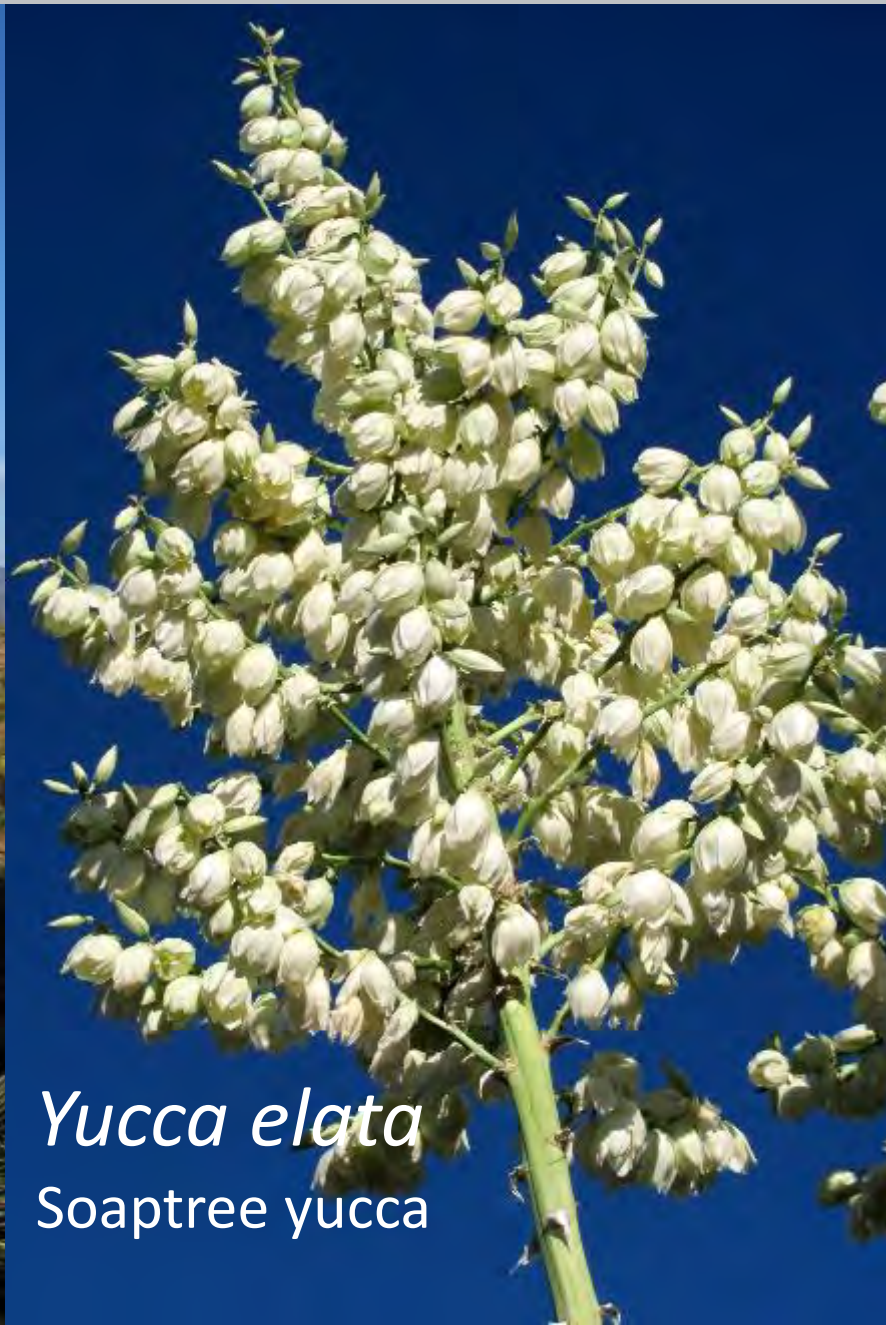
Echinocereus rigidissimus
Rainbow hedgehog

Mammillaria macdougalii
Cabeza de Viejo, MacDougal's pincushion



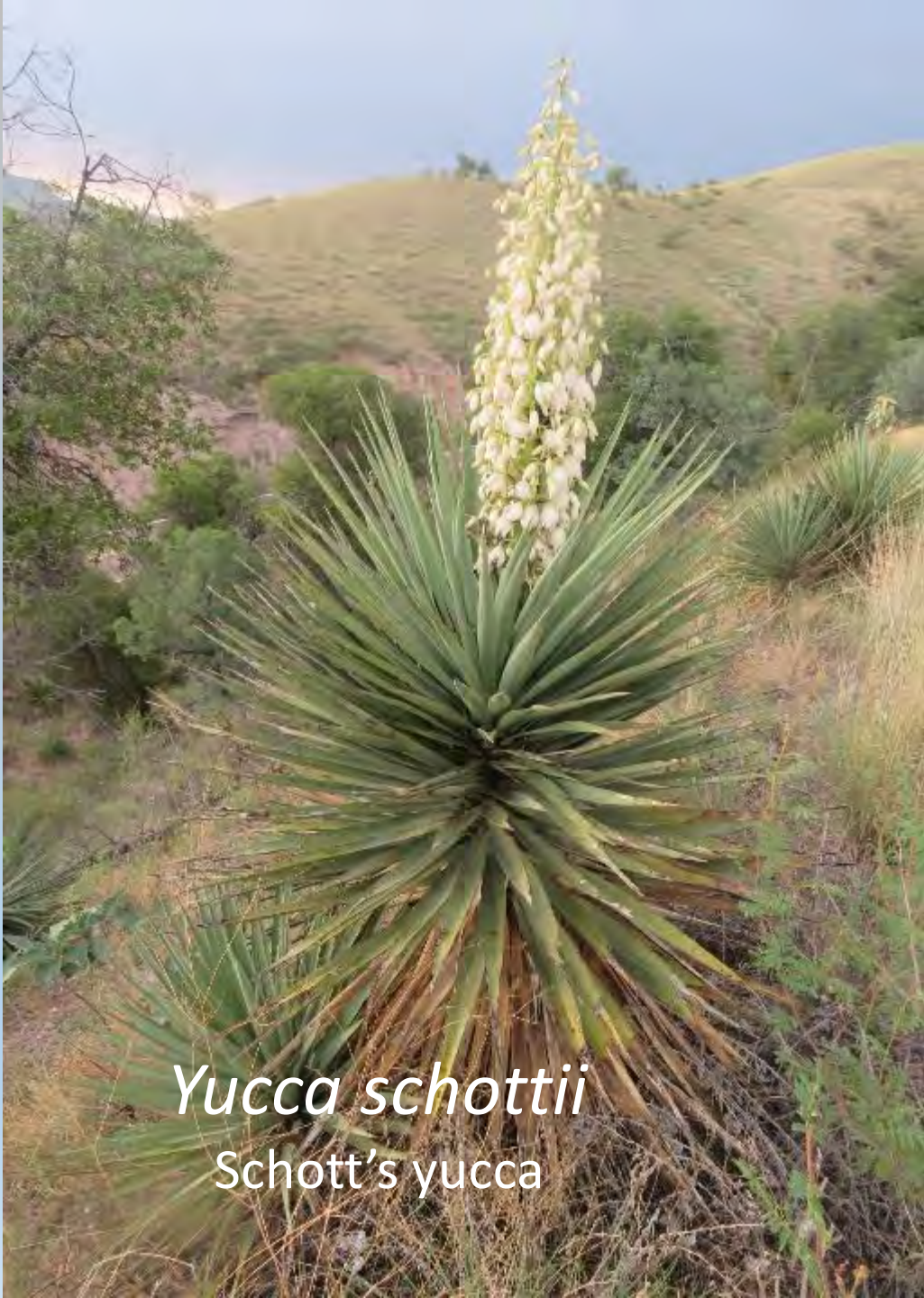
Cylindropuntia spinosior
Cane cholla



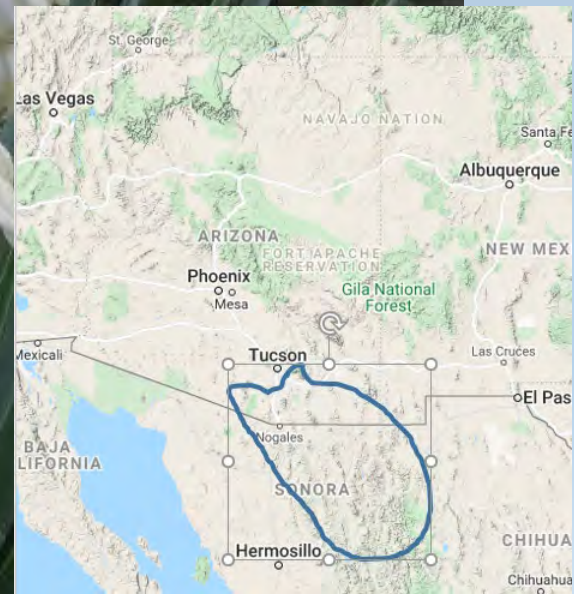


Yucca elata
Soaptree yucca



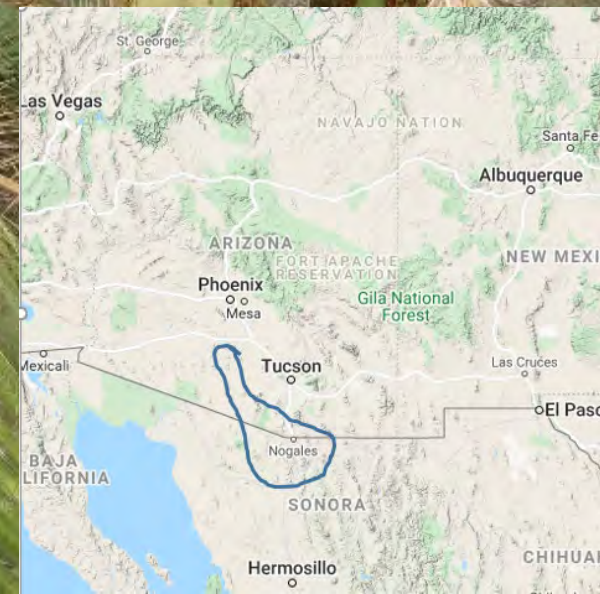


Yucca schottii
Schott's yucca



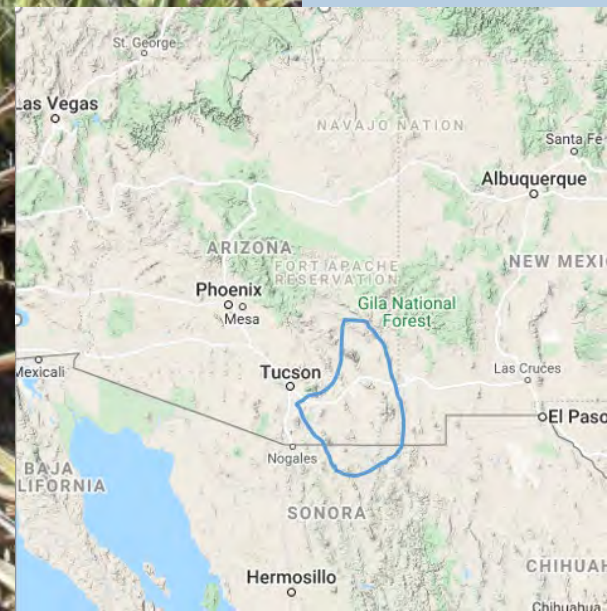


Yucca arizonica
Arizona yucca





Yucca thornberi
Thornber's yucca





Sonoran Basin and Range

- Brown et als' Lower Colorado Valley & Arizona Upland
- Similar in topography to Mojave Basin and Range
- Slightly hotter than the Mojave
- 0-330 mm ppt, winter to winter-summer
- Great number of types of life forms and diversity of plant communities



- Dominated by paloverde-cactus shrub and giant saguaro cactus (vs. largely creosote)
- White and triangle-leaf bursage, ocotillo, brittlebush, creosotebush, catclaw acacia, cholla, desert saltbush, pricklypear, ironwood, and velvet mesquite
- Shreve, F. 1964. Vol. 1. Vegetation of the Sonoran Desert, Stanford U Press



Ambrosia ilicifolia
Hollyleaf bursage



Rhus kearneyi
ssp. kearneyi
Kearney's sumac

Phacelia neglecta

Alkali phacelia



Hesperocallis undulata

Ajo-lily





Dudleya arizonica
Arizona liveforever



Mammillaria tetrancistra
Corkseed pincushion



Cylindropuntia echinocarpa
Silver cholla



Cylindropuntia ramosissima
Diamond cholla



Cylindropuntia bigelovii
Teddybear cholla



Cylindropuntia acanthocarpa
Buckhorn cholla

Sandfood - *Pholisma sonorae*



A photograph showing four spherical objects, possibly stones or seeds, resting on a sandy surface. The objects are arranged in a loose pattern: one on the left, two in the upper center, and one on the right. The sand is a light brown color with some darker specks. The lighting is bright, casting soft shadows to the right of each object.

Eirini Pajek

Eirini Pajek



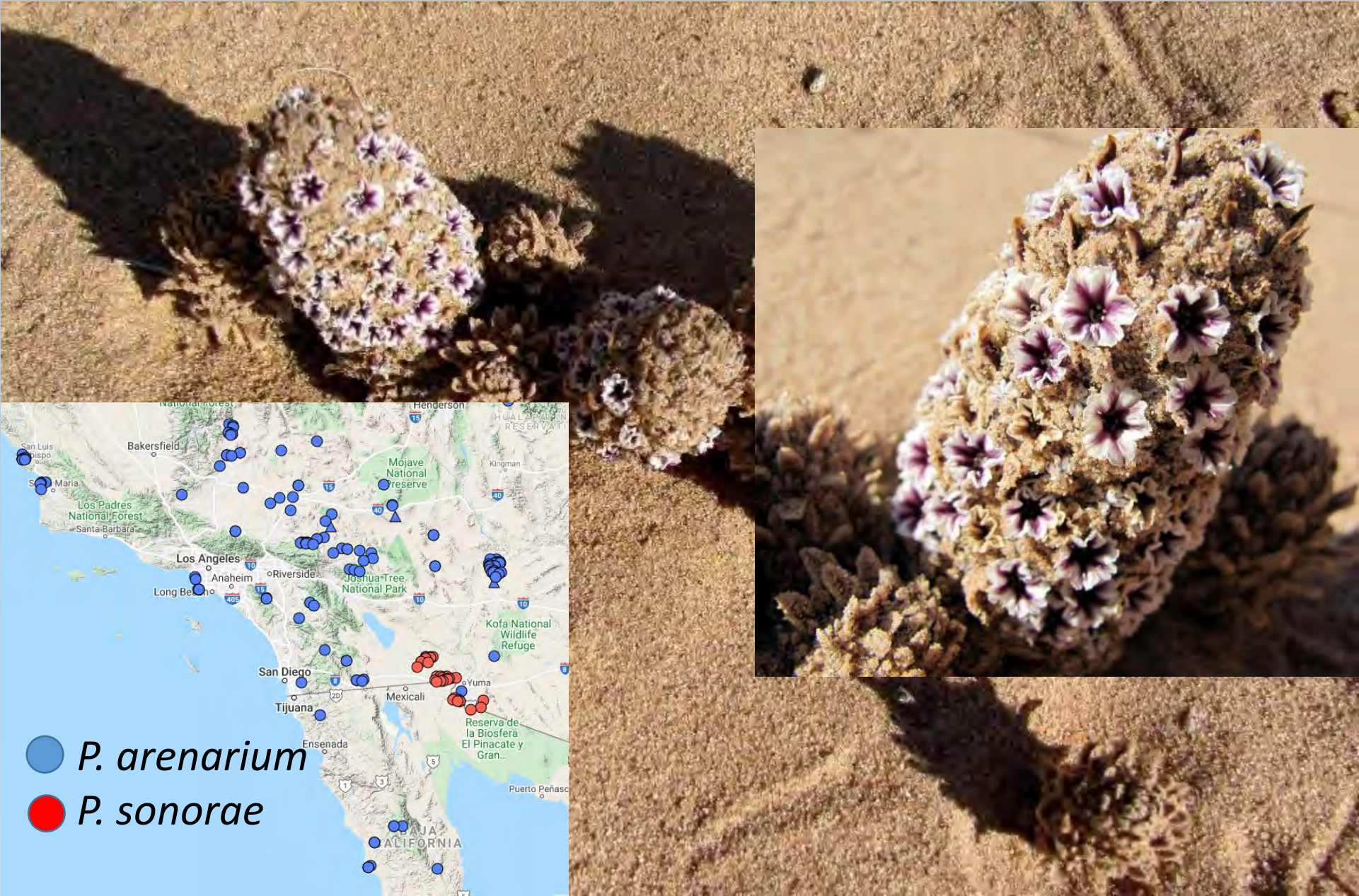


Eirini Pajek

Sandfood - *Pholisma sonora*



Pholisma arenarium



Pholisma arenarium





Carrie Cannon, photo

Thank You!
whodgson@dbg.org



Carrie Cannon, photo