

# A Tale of Two Rare Wild Buckwheats (*Eriogonum* Subgenus *Eucycla* (Polygonaceae)) from Southeastern Arizona

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**ABSTRACT.** Unusual soils, compared to surrounding common soils, act as edaphic habitat islands and often harbor rare plants. These edaphic elements can be disjuncts or endemics. Two rare wild buckwheats from southeastern Arizona that grow on Tertiary lacustrine lakebed deposits have been found to be a disjunct, and an endemic. *Eriogonum apachense* from the Bylas area is determined to be a disjunct expression of *E. heermannii* var. *argense*, a Mojave Desert taxon from northern Arizona and adjacent California and Nevada, not a distinct endemic species. At a historical location of *E. apachense* near Vail, Arizona, a new species of *Eriogonum*, also in subgenus *Eucycla*, was discovered growing on mudstones of the Oligocene Pantano Formation. It was also recently found on outcrops of the Plio-Pleistocene Saint David Formation above the San Pedro River near Fairbank, Arizona.

The large North American genus of wild buckwheats, *Eriogonum*, has approximately 255 species. Only *Carex*, *Astragalus*, and *Penstemon* have more. This large number of species in *Eriogonum* is a consequence of extensive speciation (Shultz 1993) with "...about one third of the species uncommon to rare" (Reveal 2001). In the Intermountain West geographic isolation has been the stimulus to speciation, either through habitat or physiographic diversity. This situation is especially pertinent on the Colorado Plateau with its high levels of sedimentary geological diversity and topographic diversity of canyons and mesas. Fifty per cent of Utah endemics occur in the Colorado Plateau; and, thirty-six per cent of Utah endemics grow on clay, silt, mudstones, and shales and 18% on limestone (Shultz 1993). The creosote (*Larrea tridentata* (DC.) Coville) deserts of southern Arizona are in the Southern Basin and Range physiographic province which is

characterized by igneous mountains and alluvial basins; and, these unusual edaphic habitats are uncommon there. Though, in a small number of places (Fig. 1) they have been formed by late Tertiary lacustrine basin deposits (Nations et al 1982) where many endemics, disjuncts, and peripherals have been documented (Anderson 1996).

In Arizona there are 23 species in the subgenus *Eucycla* (Nutt.) Kuntze of *Eriogonum* (Reveal 2001). Many of these species are edaphic endemics. The two scientific epithets from subgenus *Eucycla* to be discussed in this paper are *Eriogonum apachense* Reveal (Fig. 2) and *E. terrenatum* Reveal (Fig. 3). The plants named as *Eriogonum apachense*, the Apache wild buckwheat, occur in the San Carlos Basin (Safford Basin) where they grow on late Tertiary white lacustrine limestone deposits above the Gila River (Fig. 4) approximately ten to twelve miles northwest of Bylas, Arizona. The species was described

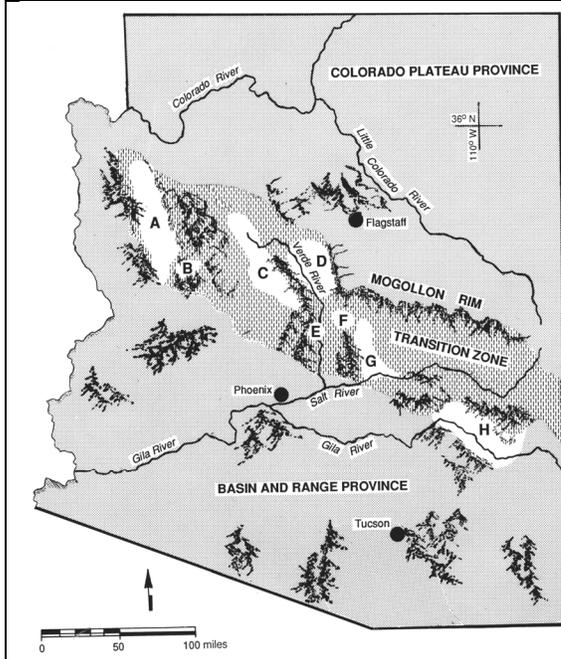


FIGURE 1. Arizona map showing late Tertiary lacustrine basins in central Arizona. A – Big Sandy Basin, B – Burro Creek, C – Chino Valley, D – Verde Valley, E – Lower Verde Valley (Horseshoe reservoir), F – Payson, G – Tonto Basin, and H – San Carlos Basin (from Anderson 1996)

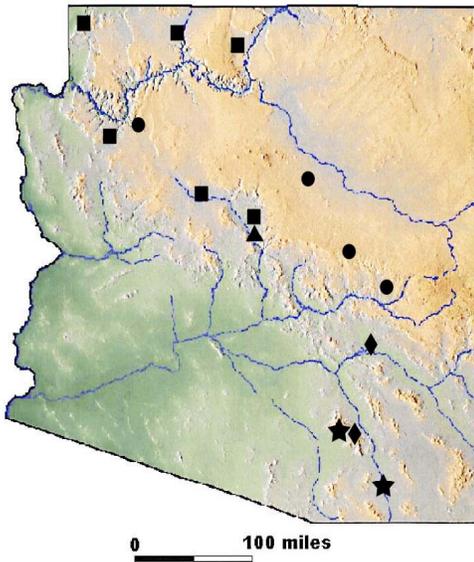


FIGURE 5. Arizona map showing distribution of subject wild buckwheats (*Eriogonum*). *E. apachense* (diamonds), *E. heermannii* var. *argense* (squares), *E. terrenatum* (stars), *E. ericifolium* (triangle), *E. pulchrum* (circles).



FIGURE 2. *Eriogonum apachense* type locality near Bylas, Graham County, Arizona.



FIGURE 3. *Eriogonum terrenatum* at type locality near Fairbank, Cochise County, Arizona.



FIGURE 4. *Eriogonum apachense* on late Tertiary lacustrine habitat in the San Carlos Basin.



FIGURE 6. *Eriogonum heermannii* var. *argense* habitat on Verde Formation in White Hills, Verde Valley, Yavapai County, Arizona.



FIGURE 7. *Eriogonum terrenatum* habitat on Pantano Formation near Vail, Pima County, Arizona.



FIGURE 8. *Eriogonum terrenatum* habitat on middle member of St. David Formation near Fairbank, along the San Pedro River Valley, Cochise County, Arizona. Person on the left is Jack Whetstone, BLM, Sierra Vista, AZ, and person on the right is the author.

as closely related to *Eriogonum heermannii* Dur. & Hilg. and distinguished by "...the narrowly turbinate involucre, truncated outer perianth segments, generally smaller and more slender stature and habit, and the distinct geographical distribution." (Reveal 1969). At that time the nearest known populations of *Eriogonum heermannii* were from approximately 200 miles to the northwest in Mohave and Coconino Counties (Fig. 5).

The subsequent discovery by Bob Denham of plants similar to *Eriogonum apachense* on the Verde Formation in the Verde Valley (Fig. 6), another Late Tertiary lacustrine basin, and by Marc Baker of plants similar to *E. heermannii* var. *argense* Munz along the upper Verde River in the Chino Valley on both sedimentary and igneous habitats brought the two taxa into close geographic proximity of about 25 miles apart. This new information led to a reevaluation of their taxonomic relationship. In October 2003, Marc Baker, James Reveal, and the author visited these wild buckwheat sites in the Chino and Verde Valleys; and, the latter two also visited the type locality of *Eriogonum apachense* near Bylas. (See Appendix One for exact location information on plant sites and collections). Morphological evaluation of live material from these populations (documented by collections: *Reveal 8412*, and *8413* from the Verde Valley and *Reveal 8418* and *8419* from the San Carlos Basin) showed variation among plants in each population in the taxonomic characters (involucre shape, inflorescence branch width, and plant stature) previously used to distinguish the two species. There were no consistent patterns of morphological differences

that distinguished between populations as separate species. *Eriogonum apachense* is thus determined to be a disjunct expression of *E. heermannii* var. *argense*. This disjunct distribution pattern is repeated in several other northern taxa from the Colorado Plateau that are disjunct on late Tertiary lacustrine deposits in the Sonoran Desert (Fig. 5); they include *Arenaria eastwoodiae* Rydb., *Astragalus calycosus* Torr. var. *scaposus* (Gray) Jones, *Penstemon thompsonae* (Gray) Rydb., *Physaria newberryi* Gray, and *Streptanthus cordatus* Nutt. ex. T. & G. These disjunctions are floristic remnants of the southern expansion of Colorado Plateau pinyon-juniper woodlands into southern Arizona during the last Wisconsin glaciation (Anderson 1996).

Because an historical collection from eight miles south of Vail, Pima County, (*Marcus Jones s.n.* RSA) had also been identified as *Eriogonum apachense* (Reveal 1976), the author searched for it in this area. Outcrops of another sedimentary formation, the Oligocene Pantano Formation, provided potential edaphic habitat for rare plants approximately eight miles southeast of Vail. This population was not relocated; but, conversely, during these searches another *Eriogonum* previously unknown to science was discovered (*Anderson 84-70* ASU, *Anderson 84-71* ASU; *R. Duncan s.n.*, Nov 7 2002, ARIZ, NY, US). These wild buckwheats grow on plum colored sediments of the Upper Pantano Formation (Spence 2002) in the Chihuahuan Desert (Fig. 7). On a field visit with the author in October 2003, Reveal confirmed this *Eriogonum* as a new species (*Reveal 8415* and *Reveal 8416*). (See Appendix One for exact location information on plant sites and collections). Coincidentally, Liz

Makings, a graduate student at ASU working on a master's thesis on a "Flora of the San Pedro Riparian National Conservation Area" (Makings 2003), discovered another population of this same undescribed wild buckwheat (*Makings 1467* ASU) in her study area in 2003. These plants also grow in the Chihuahuan Desert, but on white lacustrine limestones and green claystones (Fig. 8) of the Pleistocene Middle Member of the Saint David Formation (Gray 1967) between the ghost town of Fairbank and the old railroad station of Boquillas in Cochise County. There are two subpopulations here within one square mile with 800-1000 plants total, growing on bluffs above the west side of the San Pedro River. No other populations were found during additional inventories by Jack Whetstone, BLM Sierra Vista, and the author along the San Pedro Riparian National Conservation Area between Sierra Vista and Fairbank. This new species, the San Pedro River Valley wild buckwheat, was named *Eriogonum terrenatum* Reveal (2004) after the type locality near the ruins of the eighteenth century Spanish fort, Presidio de Santa Cruz de Terrenate.

*Eriogonum terrenatum* is closely related to *E. pulchellum* J. T. Howell which occurs north of the Mogollon Rim in northern Arizona and to *E. ericifolia* Torrey & Gray which is endemic to the lacustrine limestone of the Verde Formation in the Verde Valley near Camp Verde, Yavapai County. It differs from these two species in its larger stature, flowers, and achenes; its involucre campanulate versus turbinate; leaf margins enrolled versus revolute; and consistently white flowers. Other characters of leaf shape and pubescence and flowering stem length are

TABLE 1—Comparison of morphological characters in *Eriogonum terrenatum* and its closest relatives.

Characteristic	<i>E. terrenatum</i>	<i>E. pulchrum</i>	<i>E. ericifolium</i>
Plant height	1-4 cm	0.8-1.2 cm	0.5-1.5 cm
Leaf			
shape	linear-oblongate to linear-elliptic	oblongate to elliptic	linear
length	0.3-0.8 cm	0.5-0.8 cm	0.6-1.5 cm
adaxial surface	thinly floccose to glabrous	floccose	glabrous
edge	enrolled	slightly revolute	revolute
involucre shape	campanulate	narrowly turbinate	turbinate
flowers			
color	white	white to rose	white to pink or rose
size	3.5-4.5 mm	1.5-2 mm	2-3 mm
flowering stem length	0.5-3 cm	1-5 cm	0.3-1 cm
achene	4.0-4.5 mm	1-5 cm	0.3-1.0 cm

intermediate between these two species (Table 1). Previous to this recent fieldwork and the discovery of additional material for comparison, the Vail population of *Eriogonum terrenatum* was treated as *E. ericifolium* by Duncan (2003).

The distributional pattern of the San Pedro River Valley wild buckwheat is similar to that of other rare plants on Late Tertiary lacustrine outcrops in southern Arizona mentioned above (Anderson 1996). Though, *Eriogonum terrenatum* signifies the first such taxon from the Chihuahuan Desert, and not the Sonoran Desert. A list of associated Chihuahuan Desert species for the two *Eriogonum terrenatum* sites appears in Appendix Two.

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gave information on the St. David Formation.

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## APPENDIX ONE

### Collections

#### *Eriogonum heermannii* Durand & Hilg. var. *argense* (M. E. Jones) Munz

##### U.S.A. Arizona.

Yavapai Co.: White Hills, along U.S. Forest Service Road 119A, 1 mile north of Middle Verde Road, this junction 3.5 miles northwest of exit 289 on Interstate Highway 17, 2.45 air miles north-northwest of Middle Verde and 6.85 air miles north-northwest of Camp Verde, on calcareous soil of the Verde Formation associated with *Larrea* and *Juniperus*, 3400 ft elev., 34° 39' 14" N, 111° 54' 16" W – T15N, R4E, sec. 35 SW ¼ of the NW¼. *J. Reveal 8412 with J. Anderson and M. Baker*, October 17, 2003

Yavapai Co.: White Hills, along U.S. Forest Service Road 119A, 1.6 miles north of Middle Verde Road, this junction 3.5 miles northwest of exit 289 on Interstate Highway 17, 2.45 air miles north-northwest of Middle Verde and 6.8 air miles north-northwest of Camp Verde, on calcareous soil of the Verde Formation associated with *Larrea* and *Juniperus*, 3550 ft elev., 34° 39' 19" N, 111° 53' 48" W – T15N, R4E, sec. 35 NE ¼ of the NW¼. *J. Reveal 8413 with J. Anderson and M. Baker*, October 17, 2003

Graham Co.: Along U.S. Highway 70 near Cottonwood Wash, 11.5 miles northwest of Bylas and 8.3 miles east-southeast of junction of Indian Road 8, San Carlos Indian Reservation, on white lacustrine outcrops associated with *Canotia holocantha* and *Purshia subintegra*, 2840 ft elev., about 33° 14' 45" N, 110° 16' 03" W - T2S, R20E, sec. 3. (General area of type locality of *Eriogonum apachense* Reveal, now a synonym of var. *argense*.) *J. Reveal 8418 with J. Anderson*, October 21, 2003

Graham Co.: Along U.S. Highway 70 near Salt Creek, 13.3 miles northwest of Bylas and 6.5 miles east-southeast of junction of Indian Road 8, San Carlos Indian Reservation, on white lacustrine outcrops associated with *Canotia holocantha* and *Purshia subintegra*, 2935 ft elev., about 33° 15' 30" N, 110° 17' 40" W - T2S, R20E, sec. 16. (General area of type locality *Eriogonum apachense* Reveal, now a synonym of var. *argense*.) *J. Reveal 8419 with J. Anderson*, October 21, 2003

#### *Eriogonum terrenatum* Reveal

##### U.S.A. Arizona.

Pima Co.: 8.3 miles southeast of Vail exit of I-10 on old highway (frontage Road); T16S R17E S 27 NW ¼; on shaley brown outcrops of the Pantano Formation (Oligocene lacustrine) in eroded area of hillsides and washes, 3520 ft. elev. With *Juniperus*, *Acacia*, *Krameria parviflora*, *Psilostrophe cooperi*, *Menodora scabra*, and *Dyssodia*. *John Anderson 84-70, 84-71*, Nov 30, 1984

Pima Co.: North of East Marsh Station (or Pantano) Road north of Cienega Creek, 8.3 miles east-northeast of the Mountain View Exit (Exit 279) along Highway 10, 1.4 air mile northwest of Cross Hill and 6.85 air miles east-southeast of Vail, growing on mudstone and siltstone of the Oligocene Pantano Formation associated with with *Larrea*, *Juniperus*, *Tiquilia canescens*, *Parthenium incanum*, and *Acacia constricta*, 3520 ft elev., 32° 01' 00" N, 110° 36' 01" W - T16S, R17E, sec. 27 NW¼ of the NW¼. *J. Reveal 8415 with J. Anderson*, October 20, 2003

Pima Co.: South of East Marsh Station (or Pantano) Road north of Cienega Creek, 8.3 miles east-northeast of the Mountain View Exit (Exit 281) at Interstate Highway 10, 1.1 air mile west-northwest of Cross Hill and 7.1 air miles east-southeast of Vail, growing on plum-colored mudstone and siltstone of the Oligocene Pantano Formation, associated with *Larrea*, *Juniperus*, *Tiquilia canescens*, *Parthenium incanum*, and *Acacia constricta*, 3560 ft elev., 32° 00' 35" N, 110° 35' 58" W - T16S, R17E, sec. 27 NE¼ of the SW¼. *J. Reveal 8416 with J. Anderson*, October 20, 2003

Cochise Co.: Contention Uplands, calcareous soils, subshrub 40 cm tall, associated with *Koberlinia spinosa*, *Ephedra trifurca*, *Acacia constricta*, *Yucca elata*, *Prosopis velutina*, *Tiquilia canescens*, *Thymophylla acerosa*, *Zinnia acerosa*, *Pleuraphis mutica*, 3856 ft elev., 31° N 46.482, 110° W 13.299. *E. Makings 1467*, April 10, 2003

Cochise Co.: San Pedro Riparian National Conservation Area, on low eroded bluffs of Pleistocene deposits west of the San Pedro River, southeast of Boquillas (ruins) and southwest of Contention (ruins), about 4.5 air mi NNW of Fairbank and Arizona Highway 82, north of the site of Presidio de Santa Cruz de Terrenate, associated with *Larrea*,

*Juniperus*, *Tiquilia canescens*, *Parthenium incanum*,  
and *Acacia neovernicosa* and other desert shrubs,  
3840 ft elev., N31°46'37", W110°13'33", T19S,  
R21E, sec. 20 SE¼ of the SE¼. J. Reveal 8417 with  
J. Anderson, E. Makings, & J. Whetstone, October  
20, 2003

## APPENDIX TWO

### **Associated Species with *Eriogonum terrenatum***

At the Pantano Formation, near Vail, Pima  
County, Arizona

*Acacia neovernicosa*, *Krameria erecta*,  
*Thymphylla acerosa*, *Tiquilia canescens*, *Larrea  
tridentata*, *Psilostrophe cooperi*, *Parthenium incanum*,  
*Tridens mutica*, *Allionia incarnata*, *Ziziphus  
obtusifolia*, *Dasyilirion wheerlii*, *Juniperus  
coahuilensis*, *Foquieria splendens*, *Pleuraphis mutica*,  
*Ephedra trifurca*, *Zinnia pumila*, *Rhamnus  
microphylla*, *Polygala macradenia*, *Bouteloua  
eriopoda*, *Isocoma tenuisecta*, *Echinocactus  
erectocentra*, *Bahia absinthifolia*, *Agave* sp.

At the St David Formation, near Fairbank,  
Cochise County, Arizona

*Acacia neovernicosa*, *Tiquilia canescens*,  
*Sporobolus airoides*, *Aristida purpurea*, *Ephedra  
trifurca*, *Pleuraphis mutica*, *Parthenium incanum*,  
*Thymophylla acerosa*, *Dalea formosa*, *Koberlinia  
spinosa*, *Yucca elata*, *Zinnia pumila*, *Larrea  
tridentata*, *Flourensia cernua*, *Koberlinia spinosa*,  
*Ziziphus obtusifolia*, *Hymenopappus filifolius* var.  
*pauciflorus*