

IN SEARCH OF THE ORIGINAL TEPARY BEAN, *PHASEOLUS ACUTIFOLIUS* (LEGUMINOSAE, PHASEOLEAE) IN THE TRANS-PECOS REGION OF TEXAS

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ABSTRACT

This note presents the search for the type locality of the tepary bean, *Phaseolus acutifolius*. Two specimens kept in the herbaria of Harvard (GH00064068) and Kew (K000900693) were considered as lectotype and isotype, respectively. The field notes left by the collector Charles Wright and the analysis of the exploration conditions in October 1849 pointed to original collecting in the North Mountain of Hueco Tanks in El Paso County, Texas. During this study, the location was revisited in September 2025 and seed for germplasm conservation was collected. The role of the Texas Parks and Wildlife Department in saving a unique cultural and biological heritage is highlighted.

RESUMEN

Esta nota presenta la búsqueda de la localidad donde fue encontrado el espécimen tipo del frijol tépari, *Phaseolus acutifolius*. Dos especímenes conservados en los herbarios de Harvard (GH00064068) y de Kew (K000900693) fueron considerados como lectotipo e isolectotipo, respectivamente. La libreta de campo que nos dejó su colector Charles Wright y el análisis de las condiciones de la exploración de octubre de 1849 apuntan a una colecta original en la montaña norte del sitio conocido como Hueco Tanks en el condado de El Paso en Texas. Se volvió a visitar el sitio en septiembre de 2025 y se colectó semilla para la conservación de este germoplasma. Se resalta el papel del 'Texas Parks and Wildlife Department' para salvaguardar este patrimonio cultural y biológico único.

RÉSUMÉ

Le propos de cette note est de présenter la recherche de la localité du type du haricot tépari, *Phaseolus acutifolius*. Deux spécimens conservés dans les herbiers d'Harvard (GH00064068) et de Kew (K000900693) ont été considérés comme lectotype et isotype, respectivement. Les notes prises sur le terrain par le collecteur Charles Wright et l'analyse des conditions de l'exploration en octobre 1849 identifient la

'North Mountain' du site 'Hueco Tanks' dans le comté de El Paso au Texas comme site de la collecte originale. Au cours de cette étude, ce site a été visité en septembre 2025 et des graines ont été récoltées pour leur conservation en banque de gènes. Le 'Texas Parks and Wildlife Department' a un rôle très important pour sauvegarder un patrimoine culturel et biologique unique.

INTRODUCTION

On October 13, 1849, Charles Wright (born in 1811 and deceased in 1885 in Connecticut, and educated at Yale College: Gray 1886) collected a wild legume as a gathering of five small flowering and fruiting plants. According to his field notes (Charles Wright Papers kept in the Gray Herbarium Library, at Harvard, Cambridge, Massachusetts, U.S.A.), he tentatively identified it as *Galactia*, and assigned it his collection number 1311. For the location, Wright reported "mt. valley 35 mi. E of El Paso" (Wright's Field List, 1849a, page 60 seq. 37) and left blank the line on page 61 (seq. 38.) where additional notes were usually reported.

In order to understand the significance of this original collection, the following questions will be successively considered: why was Charles Wright at that time in the Trans-Pecos region of Texas? Is it possible to work out the exact location where the collection was made? What is the identity of that plant? And finally, what is the outcome of the answers to these questions? Two scholars working at Harvard left information raising a doubt whether #1311 was collected in Texas or in New Mexico (Johnston 1940, p. 44, text in second paragraph of six lines, and Shaw 1987, p. 21, text in second paragraph of seven lines), thus warranting to dig further.

RESULTS

A word of context

In the period 1848–1860 several expeditions such as the Mexican Boundary Survey (1848–1855) were carried out in an area now included in western Texas and southern New Mexico (Winkler 1915; Bender 1933; Beck & Haase 1969). The purpose of these surveys, sponsored by the U.S. Federal Government, and with U.S. Army troops for security, was to open the Far West to new human settlements and trade, to prepare the lines of the Pacific railroads (Bender 1933, 1934) (the railroad started near Houston in 1852: Texas Department of Transportation 2014), and to learn about the geography, the animal and plant life, and the inhabitants (Winkler 1915). Around 1837, Asa Gray (1810–1888: Mabberley 2008) was invited by John Torrey (1796–1873: Mabberley 2008), then professor at the College of Physicians and Surgeons of New York, to work with him on the Flora of North America (Barnes 1886; Smith 1954), eventually representing the work of his lifetime objective (Stafleu & Cowan 1976). In contrast to New England, in the first half of the 19th century, the flora of the Southwest was poorly known by botanists (Smith 1954), and thus Gray purposely invited Wright to Cambridge, Massachusetts, during the winter 1848–1849, while the War Department was preparing a survey of the southern boundary. Gray successfully got permission for Wright to accompany the expedition but under many limitations (e.g., no horse, no covered cart) (Gray 1886; Geiser 1937). However, the Smithsonian Institution and John Amory Lowell of Boston were the patrons supporting Wright's participation (Gray 1852; Winkler 1915). Incidentally, the sum of \$150 contributed by the Smithsonian entitled this institution to obtain a full set of all plants he collected, as the first step towards the National Herbarium (Farlow 1897; Winkler 1915). It was the discovery of a new southern route between San Antonio de Bexar and El Paso del Norte, Texas (Smith 1850; Geiser 1935), that made the journey particularly attractive to document plant life, while the "Northern Route" was apparently a bit more familiar to the Corps of Topographical Engineers (Bryan 1850; French 1850), and thus with much less information in the accounts. The round trip of the expedition of 1849 was from San Antonio (departure on May 31) to El Paso (arrival on September 12, after one hundred and five days, and 673 miles [equivalent to 1,083.09 km] on foot, thus at an average covered distance of 6.41 miles/day [10.32 km/day]) and return (departure on October 12 (or 13, see below) and arrival on November 23, after forty-two days (forty-one according to French 1850), and 646 miles [1,039.63 km], thus at an average covered distance of 15.38 miles/day [24.75 km/day], see below) (Wright 1849b; French 1850; Geiser 1935, 1937). The date of 13 November on the map of page 44 (Shaw 1987) is likely a typographical error, because the date of 23rd of November is indicated twice on page 21 (Shaw 1987). The two journeys

were not equivalent: the expedition to El Paso was to bring many supplies to the settlements and military forts being built in the area, thus the supply wagon train had 263 military personnel under the command of Major Jefferson Van Horne, a crowd of gold diggers [gold was just found in California during that year (1849): Hobhouse 2005], Charles Wright being part of the crowd to his despair, and 275 wagons (Shaw 1987; Hartmann 1992). The return journey by use of the northerly route (“the Fredericksburg or upper route”: French 1850, p. 52) involved two small parties (Johnston 1850, p. 26: “... to organize two topographical parties. ... While recruiting the teams for the return march ...”): one under the command of Lieutenant Colonel Joseph E. Johnston with twenty-five men and a train of twenty-five wagons, departing from El Paso on October 11, 1849 (Johnston 1850, p. 27). The other party under the command of Captain Samuel Gibbs French, departing from El Paso on October 12 (deduction from Wright 1849b) or October 13, 1849 (deduction from French 1850, see below), was made by about forty military men (the thirty-five wagoners plus an estimate of five to ten escorts and scouts, since no figures are provided by French) and Charles Wright, with thirty-five wagons (French 1850; Geiser 1937). The difference in duration of the two journeys is noteworthy: while on the outward expedition the troops were still busy in eliminating road obstacles (Shaw 1987; Hartmann 1992), it seems that hurry prodded the return trip. The Corps of Engineers gave Wright little support, namely meager food rations, because of limited time in the final preparation of the trip (Gray 1886; Geiser 1937). In this context of strained relationships, Wright was likely collecting along the road most of the time (Johnston 1940).

According to Ivan Murray Johnston (1940), the plant collections made by Wright in 1849 were received in February 1850 by Dr. Gray, then permanently working as professor at Harvard College (Duchartre 1888; Smith 1954). Gray quickly realized the importance—in terms of numbers (1,404 collections in 1849: Johnston 1940; Shaw 1987) and quality—of the specimens gathered by Wright for the documentation of the flora of this lesser-known part of the Southwest, and with his indefatigable energy (Farlow 1888) he swiftly produced two important monographs titled *Plantae Wrightianae Texano-Neo-Mexicanae* and published as Smithsonian Contributions part I in 1852 and part II in 1853. For the legume plant involved in this note, reference will be made to part I only (Gray 1852). About part I, Gray (1852, p. 6) finished his preface in May 1850 by writing “A proper account of the topography and physical character of the region traversed by the United States troops ... will doubtless be officially published,” and this is what actually happened with the publication of the different Reports of the Secretary of War in July 1850 (Johnston et al. 1850).

Towards a precise location

To define the site of collection #1311, two primary sources are available: the Field List of Wright (1849a, and namely quadrangle F4 70 of microfiche 1 of 3 in Shaw 1987) and the report by Captain French (1850). About the former, Elizabeth Anne Shaw (1987, p. 31) aptly noted that the List is too neatly written throughout to be the real daily notes of Wright in the field, thus a transcription done by him possibly in San Antonio in late November–early December 1849, before such Field List reaches Gray on December 30 (Shaw 1987). And Wright was in the party commanded by Capt. French, on the way to El Paso and back to San Antonio, as indicated in the letters by Wright to Gray, namely the one written on November 25 (Wright 1849b). In addition, the travel conditions are worth studying, namely about distances that can be realistically covered. This inquiry seems appropriate because of the handwritten notes added in Johnston’s unpublished manuscript (1940, p. 44 seq. 116) about a possible entry by the party of French with Wright on October 14 and 15, 1849, into a territory now belonging to the county of Otero, New Mexico—an entry endorsed by Shaw (1987, p. 21, but curiously not reflected on the map p. 44).

In this regard, Elmer Ottis Wooton had the opportunity to study Wright’s Field Lists in the early 1900s, that is before the work and interpretations by Ivan M. Johnston (1940). And in his work on “Southwestern localities visited by Charles Wright” of 1906, Wooton confirmed that the dates of October 12–14, 1849, correspond to times of collections in “mountains 30 to 40 miles east of El Paso” and that the plants collected in 1849 were all gathered in what is presently the state of Texas. Wooton added (1906, p. 562): “Wright *may* have entered what is now New Mexico on the return journey between October 12 and October 20, but this is quite doubtful, since the party apparently went down the river to San Elezario [sic!] and then turned eastward.”

Wooton (1906) also noted that “El Paso” was actually El Paso del Norte by then and today the city of Ciudad Juárez in Mexico, and this might be relevant when calculating distances (see below). In this regard, Captain French (French 1850, p. 49) wrote: “The town of El Paso is wholly situated in Mexico, ... but three houses on the American side.”

The wagon train could have left El Paso on October 12, 1849, not October 11 according to Johnston (1940, p. 44) and Shaw (1987, p. 20), because from Wright (1849b) we know they were traveling for forty-two days (20 in October 1849 and 22 in November 1849). But if we trust the counting by French (“forty-one days”: 1850, p. 53) and the immediate memory of Wright about arrival in San Antonio—23rd of November (which is also the date of arrival of the other party: Johnston 1850, p. 27), then the departure date was October 13 (19 days in October 1849 and 22 days in November 1849). The party went eastwards to the valley of the Pecos River, with intention to use the valley of the Delaware Creek just after passing south of El Capitan in the Guadalupe Mountains (Fig. 1) (Geiser 1937; Johnston 1940; Hinckley 1950). It is unlikely that on the journey back the party had any cattle (critical with regard to daily mileage and speed); there is no mention of it in the report by French (he mentioned deer and antelope however, if needed for any meat source), because the return was not a supply journey but a traveling to respective headquarters, as not many forts were established by 1849 in far west Texas. And not being a supply journey, the wagons were likely not up to their hauling capacity of 3,000-pound loads (Gardner 1997)—and it is still unclear to us what the military men could carry back to their headquarters as full loads, and thus were able to go fast. Thirty miles [48.28 km] east of El Paso, the Topographical Engineers stopped at the “Waco tanks” in Sierra Hueca (French 1850, p. 52) [in Spanish spoken and written in the New World, “hueco” means a hole (Galimberti-Jarman & Russell 2008), and “waco” might be interpreted as the writing of the verbal pronunciation]. Captain French noted: “The supply of water in these tanks depends on the rains. We did not find sufficient in them for a large train—scarcely enough for three hundred animals” (French 1850, p. 52). With 35 wagons hauled by six mules each (the usual practice for Conestoga-type wagons: Herrick 1968, p. 157; Gardner 1997, p. 10), this would give 210 mules plus ten horses for the escorts and scouts, thus enough water for all. George Burr Richardson (1904, p. 93) wrote “About 1000 cattle are watered here.” Leon Carl Hinckley (1950, p. 494) who retraced the steps of Wright, noted “water was plentiful at Hueco Tanks.” Hueco Tanks because of its geological and topographic characteristics has provided fresh water to humans, wildlife and introduced animals (horses, mules, oxen) for centuries (Richardson 1904; Van Devender & Riskind 1979; Sutherland 2006). The next obligatory stop of water supply for people and beasts was near “Ojo de los Alamos” (= Alamo Spring, at about 32°01'30"N, today in Otero Co., NM) in Sierra de los Alamos just west of the Cornudas Mountains (Pope 1854; DeLorme 2022). So, there was an entry into New Mexico, because of today's state border limits along the parallel 32nd (Fig. 1).

According to French (1850, p. 52–53), the next stops for watering were: Thorn's Springs, Ojo del Cuerpo (in some cases spelled Ojo del Cuerbo; = Crow Spring), then at the head of the ravine (ascent of Guadalupe Mountains through Old Butterfield Trail with the Patterson Hills to the left; assumed as Guadalupe Spring), and forest of pines six miles beyond (after passing Guadalupe Pass; assumed as Pine Spring) (Table 1). Our assumptions were tested against the work by George Burr Richardson given his special focus on water resources in western Texas (1904, p. 71–111). We know from the letter by Wright (1849b) that the party experienced a snow storm in the Guadalupe Mountains, likely around the Guadalupe Canyon and Guadalupe Pass (just east of Guadalupe Spring on the road to Independence Spring) on October 17, because there were no plant collections on that day (Wright 1849a; Wooton 1906). Understandably, Wright was not to repeat the herborizing experience in the rain of the first days of June (Geiser 1935; Hartmann 1992). And Lt. Col. Johnston (1850, p. 27) commanding the other party wrote: “in the middle of October, the winter set in such severity, that I thought the lives of our mules depended on turning southward.” On October 18 the collections by Wright were already on the eastern base of the Guadalupe Mountains (Wooton 1906).

For a better understanding of travel conditions of the party of which Wright was part of, three additional expeditions were analyzed (Table 1). Instead of considering the entire journey back to San Antonio, we focused our attention on the track from El Paso to the Guadalupe Mountains; the number of days to complete

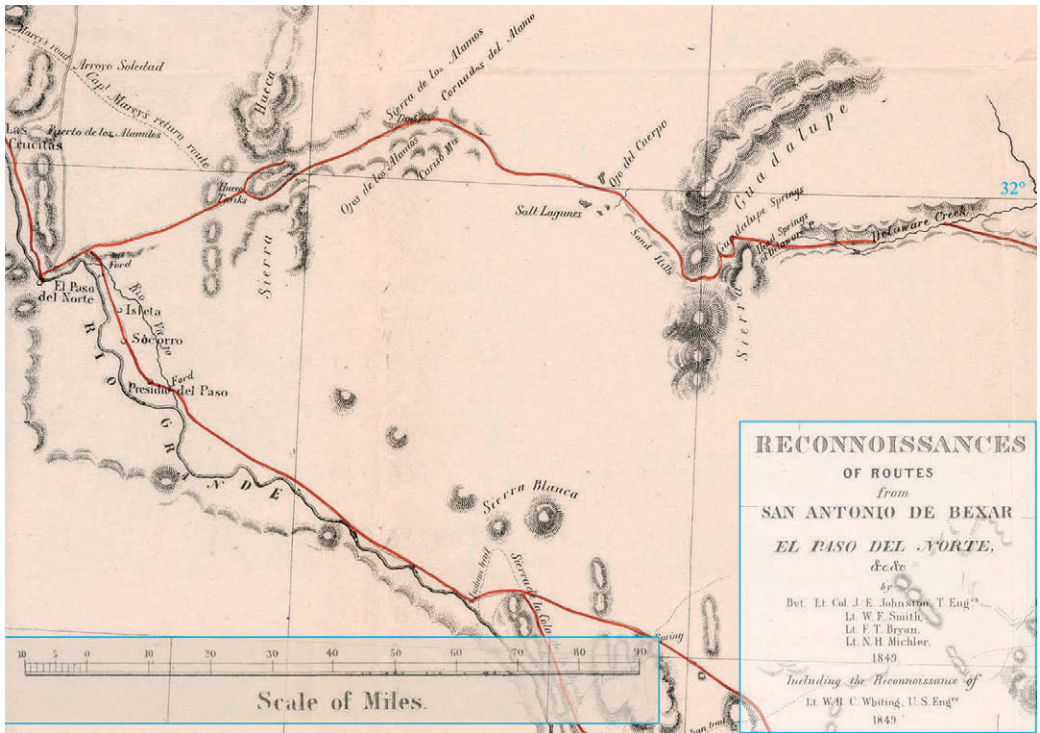


FIG. 1. Reconnoissances of routes from San Antonio de Bexar to El Paso del Norte, & cc., & cc., by Bvt. Lt. Col. J.E. Johnston, T. Eng'rs., Lt. W.F. Smith, Lt. F.T. Bryan, Lt. N.H. Michler, including the reconnaissance of Lt. W.H.C. Whiting, U.S. Eng'n. 1849. P.S. Duval's Lith. Steam Press. (to accompany) Reports of the Secretary of War, with reconnoissances of routes from San Antonio to El Paso ... 1850. Credit David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries. Map edited from original p. 244 by authors for space and clarity, including cropping, "32°" latitude label added, scale and title moved.

that track is computed against the number of days of their whole journeys (first column where our estimates are in brackets). For the comparisons to be meaningful, it is important that the transportation technology is the same (same kind of wagons hauled by mules or horses), thus within a time span close to 1849. Note in Table 1, all journeys use the northern route, the second one in the same direction as French's party, while the other two came from San Antonio. Francis T. Bryan in his report of December 1849 but published in 1850 indicated the use of wagons hauled by horses and mules but without figures. John H. Byrne made a diary of the expedition (in Pope 1854, page 51 and following); it comprised eight wagons with six mules each. John Russell Bartlett (1854, page 48 and following) indicated that his train had six wagons hauled each by five mules, his rockaway by four. While the first two authors of reports did not refer to each other, Bartlett (1854, page 136) used several measurements made by Bryan.

These four expeditions draw attention on the following, bearing in mind that in French's report only a few mileages and no dates are indicated (estimates of miles in brackets from Richardson's map of 1904). First, the comparisons are not necessarily equivalent, because the departure or arrival point "El Paso" is ill defined at that time. For example, Captain Pope's exploration started on February 12, 1854, from Doña Ana before reaching the 32nd parallel and had cattle; it ended at Preston on Red River, not in San Antonio. Bryan's journey ended at Ysleta (also spelled Isleta) 9.28 miles southeast of El Paso (estimate from U.S. Geological Survey map of 1896, Fig. 2). Yet, the distance between "El Paso" and Independence Spring seems within the same order of magnitude (our estimate for a direct way was 102.16 miles). Second, independently from the duration, the four expeditions made the same stops, most likely for watering men and draft animals, between El Paso del Norte

and the headwaters of the Delaware Creek (or reverse way). Third, independently from the direction, in the difficult terrain of the passes south of Cerro Alto and south of the Guadalupe Mountains, and also around Ojo del Alamo and southeast Cornudas Mountains, the daily mileage covered was reduced. Finally, the distance between El Paso and Hueco Tanks was 24.3, 21.54 (to Ysleta), 28.0 miles (Table 1), and 27.43 miles (our reading of U.S. Geological Survey map of 1896, Fig. 2), that is likely less than thirty miles. From the detailed information provided by John H. Byrne (in Pope 1854, Appendix A, p. 51 and following), daily mileages up to 36.5 mi [58.74 km] were done, and French reported “the road runs over a level plain” (1850, p. 52) (meaning also that in this flat land major obstacles are few, and thus landmarks absent!). As the authors experienced on September 23, 2025, by driving Montana Avenue (and after Route 62/180) eastwards, the land between El Paso and Hueco Tanks is completely flat, where the Chihuahuan creosote-bush desert scrub (as defined by Powell et al. 2018) is quickly being replaced by the expanding city of El Paso (Fig. 3 top and bottom).

On the other hand, given the technological conditions of transportation in that year, the daylight conditions have to be considered. For the site on October 13, 1849, by use of equation (4) by Brock (1981) we calculate a daylength of 11 hours and 26 minutes (for a latitude of 31°55'N), thus a sunrise at 7:09 am and a sunset at 6:35 pm. This daylength would suggest appropriate light conditions to search for plants for about nine hours. So, if the wagon train left Paso del Norte at sunrise, it would have arrived at the North Mountain of Hueco Tanks at about 4:30 pm on the same day (if not earlier, on the assumption of covering six miles [9.66 km] per hour), allowing two hours of decreasing light for Charles Wright to collect plants, while the troops were busy with the watering tasks for the 220 mules and horses. The animals were then hobbled and allowed to graze during the night (a common practice along the detailed information provided by Byrne [in Pope 1854]).

One should note that before leaving El Paso, Wright was collecting a bit south in the Rio Grande valley; for example, on October 1, he was herborizing at San Elizario (22.2 miles to the southeast, along the Rio Grande) (Wright 1849a). It is thus possible that, and because there were no lodging possibilities yet in El Paso (the three houses mentioned by French in 1850 on page 49), the starting point for Wright was not exactly at Paso del Norte, the landmark precisely considered by the Topographical Engineers, explaining thus the difference of five miles. But one should mention—and to the credit of Wright—that he asked Gray for a revision of his notes about place names by the Corps of Engineers (Wright 1849b, top of page 3). On the other hand, it seems not certain that Wright did the entire return journey on foot: he was alone with a small party traveling fast with thirty-five wagons. Wright started his letter of November 25 making reference to his external look and his financial situation rather than his health condition. If doing the 646 miles on foot, one would expect a wording such as “tired” instead of “ragged.” If doing it on foot, then the daily mileage would have been close to the one of the onward journey (i.e., 6.41 mi, see above), and thus at least the double duration. If Wright did the first day (October 12) of the journey on foot, one could assume that the 30 miles to Hueco Tanks according to French (and endorsed by Gray 1852, p. 44) was a too big distance to be traveled in one day. The party would have camped on the open prairie on October 12 half way from Hueco Tanks, where they arrived on October 13. But the report by Captain French does not provide any indication that the return trip was equal to the onward trip in such conditions, starting with a camp on the prairie. Further, the snow storm on October 17 around Guadalupe Pass put an unmovable milestone in both space and time. With a practical consequence: the collection of #1311 was done in the late afternoon of October 13, and the continuation of the journey was as set in Table 1. And this does not lessen the prowess of the collecting effort by Wright up to the very last days: the fewer collecting days in November 1849 simply indicate fewer plants blooming and fruiting because of the fall conditions in that part of Texas.

The claim (by Johnston 1940, see note by W[alter]. T[obey]. Kittredge 2008, on specimen GH00064068, Fig. 4 left) that the locality of #1311 would be near Cerro Alto Mountain (6,787 ft or 2,068 m) with latitude 31°56'45"N and longitude 105°58'15"W (DeLorme 2025) in Hudspeth County in Texas seems untenable because: i) it is too far to the north-east and beyond the location where people would stop first for water, that is, the North Mountain at Hueco Tanks (Fig. 3 top), ii) given the hour of arrival at Hueco Tanks it would mean

TABLE 1. Travel conditions of and mileage done by four expeditions in 1849–1854 (some names along the original spelling but updated in main text).

1. Journey from El Paso to San Antonio in 1849; source: French 1850, p. 52 and following			
Travel dates	Travel notes	mi to	Place of arrival
Oct. 13, 1849	the trip started from around El Paso	30	camp at Waco Tanks, TX
(2) Oct. 14)	difficult passage in Waco mountain	25	water at Ojo de los Alamos, NM
	south end of Cornudas Mts.	9	camp at Thorn's Springs, NM
((3) Oct. 15)	good grazing, no wood, abundant water	(30)	camp at Ojo del Cuerpo, TX
((4) Oct. 16)	road enters a large ravine	(12)	camp at Guadalupe Spring
((5) Oct. 17)	no collecting because of snow storm	(6)	camp at Pine Spring
((6) Oct. 18)	collecting on east. base of Guadalupe Mts.	(6)	camp at Independence Spring
6 days/ 41	distance from El Paso to Independ. Spr.	118	average: 19.7 mi/day
2. Journey from El Paso to Preston in 1854; source: Pope/ Byrne 1854, p. 54 and following, and p. 98			
Travel dates	Travel notes	mi to	Place of arrival
Feb. 21, 1854	departure from El Paso	24.3	Hueco Tanks
2: Feb. 22	rough road S Cerro Alto Mt	5.4	camp in pass of Cerro Alto
3: Feb. 23	cactus for wood	23.2	Sierra de los Alamos
4: Feb. 24	water in tanks, grass good, wood plenty	8.2	Los Cornudos
5: Feb. 25	no water, fine grass, no wood	11.0	in open prairie
6: Feb. 26	water not too salty, grass salty, no wood	13.1	Ojo del Cuerbo
7: Feb. 27	no water, fine grass, cactus for wood	11.6	in pass of Guadalupe Mts
8: Feb. 28	spring water, grass scanty, wood plenty	10.7	canyon in Guadalupe Pass
9: March 1	difficult terrain S Guadalupe Mts	4.7	E slope of Guadalupe Mts
10: March 2	difficult terrain S Guadalupe Mts	5.9	near Independence Spring
10 days	distance from El Paso to Independ. Spr.	118.1	average: 11.8 mi/day
3. Journey from San Antonio to Isleta in 1849; source: Bryan 1850, p. 21 and following, and p. 25			
Travel dates	Travel notes	mi to	Place of arrival
July 21, 1849	coming from Delaware Creek		Independence Spring
1: July 22	difficult terrain S Guadalupe Mts	5.54	Guadalupe Spring
2: July 23	brackish water, grass poor, no wood	28.21	Ojo del Cuerpo
3: July 24	no water, good grass, no wood	14.85	on prairie
4: July 25	water very salty, good grass, no wood	16.0	on prairie
5: July 26	good water and grass, plenty of wood	13.30	tanks of Connedos del Alamo
6: July 27	water difficult to access, scarce wood	9.14	Ojo del Alamo
7: July 28	good water and grazing but no wood	19.05	Waco mountains
	rough road S Cerro Alto Mt	6.42	Waco tanks
8: July 29	departure from Waco Tanks	21.54	Rio Grande at Isleta
8 days/ 46	distance from Independ. Spr. to Isleta	134.0	average: 16.8 mi/day
4. Journey from San Antonio to El Paso in 1850; source: Bartlett 1854, p. 117 and following, and p. 137			
Travel dates	Travel notes	mi to	Place of arrival
Nov. 9, 1850	coming from Delaware Creek		Independence Spring
1: Nov. 10	difficult terrain S Guadalupe Mts	5.54	Spring at foot of Guadalupe Mts
	stop could be in north of Salt Basin	28.21	Spring Ojo del Cuerpo
2: Nov. 11	little water, plenty of wood	28.15	Cornudos del Alamo
	good water, good grass	9.14	Ojos del Alamo
3: Nov. 12	good water, little grass, brushwood	19.05	Waco Mountains
	rough road S Cerro Alto Mt	6.42	Waco Tanks
4: Nov. 13	sandy and desert plain	28.0	Rio Grande at El Paso
4 days/ 27	distance from Independ. Spr. to El Paso	124.5	average: 31.1 mi/day

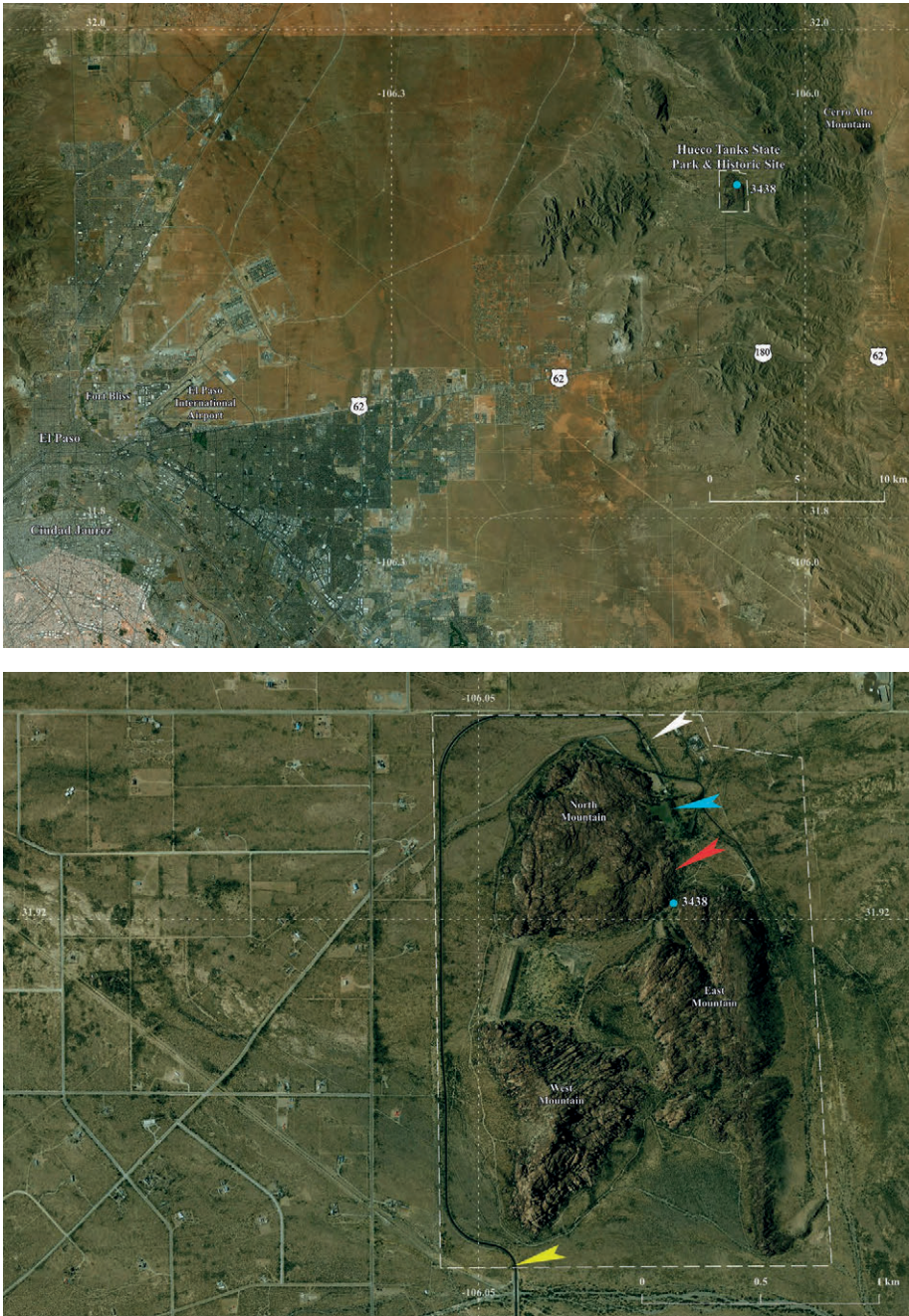


FIG. 3. Satellite images of the location (**top**) and immediate surroundings (**bottom**) of the Hueco Tanks State Park and Historic Site. The study area map was created in QGIS 3.32.3-Lima using the *MapTiler Satellite V4* basemap (© MapTiler; © OpenStreetMap contributors). The earliest possible date for this satellite mosaic is February 2025, but most, if not all, the tiles on the map are likely more recent, possibly from as late as early January 2026. The upper picture shows the peri-urban area expanding to the north-east and along Route 62/180 up to the foothills of the Hueco Mountains. In the lower picture the borders of the Park are indicated by a white dashed line, the main entrance by a white arrow, a large reservoir by a blue arrow, the cave shown in Figure 6 by a red arrow, and the access road from current Route 62/180 by a yellow arrow. Note the residential developments entering just on the west side of the Park.

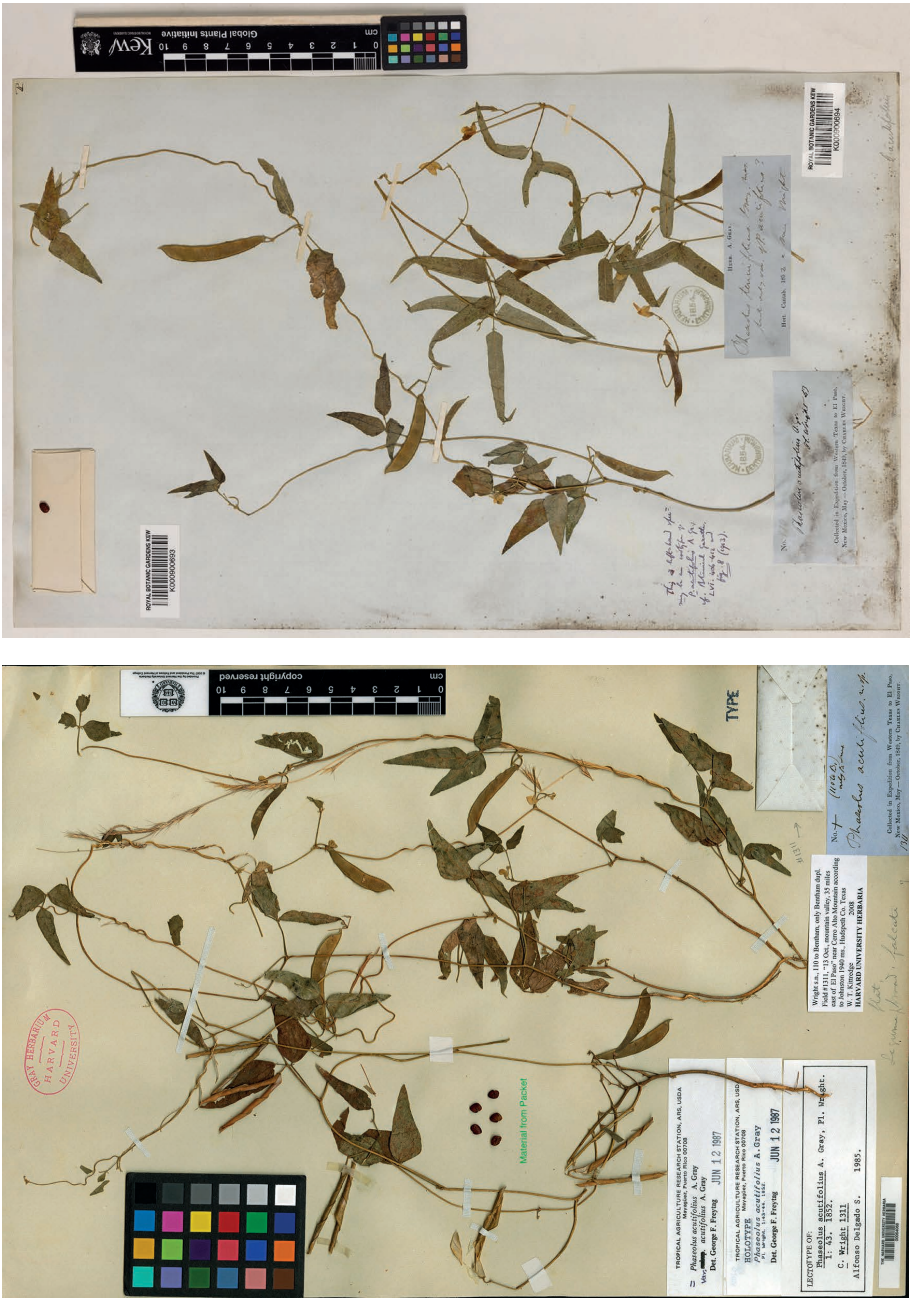


FIG. 4. The collection #1311 by Charles Wright reunited. **Left:** the lectotype kept in the Gray Herbarium at Harvard University (copyright Harvard University Herbaria). **Right:** the isotype kept in the Herbarium Benthamianum at the Royal Botanic Gardens, Kew (the plant to the left) (© The Board of Trustees of the RBG, Kew). Reproduced with the kind permission of the Gray Herbarium of Harvard University and the Trustees of the Royal Botanic Gardens, Kew, respectively.

a collection in total darkness below Cerro Alto Mt. if on the same day. In this regard, it is relevant that Captain John Pope (1854) wrote about a survey done in February 1854 indicating on p. 98 “Camp No. 1, Hueco Tanks, total distance from El Paso 24.3 miles, water in natural tanks; wood and grass. Camp No. 2, in pass of the Cerro Alto, 29.7 miles [from El Paso], no water; brush for wood; good grass. Camp No. 3, Sierra de los Alamos, 52.9 miles [same], spring water; grass good; cactus for wood, not very abundant.” Interestingly, fifty years later, Richardson (1904, p. 94) wrote: “In wet weather water collects in a surface depression known as Cerro Alto Lake, which lies at the east base of Cerro Alto about 5 miles east of Hueco tanks, but this is only a temporary source of supply.” According to the Field List by Wright, on October 15, 1849, the party was on the sides of the Guadalupe Mountains, which means that the day after collecting #1311 or October 14, 1849, was spent in crossing the pass south of Cerro Alto Mountain (“The passage of the Waco mountain is steep and difficult by the road that we made the descent” wrote Captain French 1850, p. 52; see illustration in Bartlett 1854, p. 132) and in joining the Sierra de los Alamos, where there was water. A look at the topographical map published by the U.S. Geological Survey in 1903 indicates that the pass south of Cerro Alto Mountain is in a deeply embanked narrow valley. Given the relationships between Wright and the army officers as noted by Samuel Wood Geiser (1937, p. 240; see also Powell et al. 2018, p. 28), the Corps of Engineers would not embark on a night plant exploration in difficult terrain and knowing there was no water in the area; and it is reasonable to trust Charles Wright that his plant #1311 was collected on October 13, that is, in the Hueco Tanks area.

Finally, the observations by Lieutenant Bryan (1850, p. 23) making the northern route to El Paso [thus westward] confirmed: i) the “very rough road ... for six miles” passing through the Waco mountain before arrival at Waco tanks, ii) “several of these tanks containing immense quantities of pure cold water;” and iii) “the tank at which we stopped is on the right of the road [thus northward]. There are others on the western side of the mountains.” Within the Corps of Topographical Engineers, it was already known that it was not necessary to make a stop below Cerro Alto Mountain but to center on passing the Hueco Mountains to arrive at a sure water source at the North Mountain of Hueco Tanks. As it can be seen, Lieutenant Bryan and his party arrived first at the largest tank located to the east at Hueco Tanks (Fig. 3 bottom blue arrow).

The plant in the books and herbaria

In the monograph *Plantae Wrightianae Texano-Neo-Mexicanae*, Asa Gray (1852, p. 43–67) did an ample treatment of the Leguminosae, starting with *Phaseolus retusus* Benth. (today *P. maculatus* Scheele: Powell et al. 2018; Debouck 2021) numbered 107 (it is one of his distribution numbers instead of the collecting numbers given by Wright: Wooton 1906; Johnston 1940). On p. 43–44 he described a new species, *Phaseolus acutifolius*, with a description in Latin and a diagnosis in English. Instead of reporting one of his numbers, Gray wrote a dagger symbol, explaining that the plant material was too scarce for distribution (Gray 1852, p. 6). One could thus logically conclude that the specimen was kept in the personal herbarium of Asa Gray in Cambridge, Mass. (Fig. 4 left). One of us (DGD) had the opportunity to study that specimen on July 24, 2006, at Harvard where it is registered as GH00064068. The familiar blue label (Johnston 1940), the writing by Gray on the margin in the center of the words “Legume flat broad falcate” (as estimated from the penmanship presented by Smith 1954 and Burdet 1975), the number 1311 (written by Gray) in the left lower corner point to the collection made by Wright, although there is no reference to a specimen in the protologue provided by Gray. Therefore, along Articles 9.3. and 9.12. of the Madrid Code (Turland et al. 2025), it has to be considered as a lectotype (following also some best practices as indicated by Nicholas Turland 2013, p. 55 to 65), a conclusion also reached by Alfonso Delgado-Salinas in 1985 (the label in the lower left corner) and one of us (Debouck 2021). It should be stressed that the link between the protologue and this specimen is a thin one, and mainly around the collecting number “1311,” because in the protologue there is no reference to Wright’s work, it is indicated “thirty miles east of El Paso; Sept.” (Gray 1852, p. 44), thus conflicting with Wright’s Field List, and the label let the reader understand that El Paso is in New Mexico, which it is not (and some authors were misled: e.g., Baudet 1977). However, there is a stamp “TYPE” in fading black ink to the right just above the envelope; this stamp is undated and the author of that key stamping is unknown (see below).

But in the upper left corner of the grey blue label of that specimen, after the “No.” there is a dash crossed, and then in black ink “(110 to B.) only B. and [then an illegible word, in spite of the help provided by Hervé Burdet 1975, p. 223–224].” If we interpret “B.” as George Bentham with whom Asa Gray had a long correspondence between 1839 and 1883 (Archives, Library of the Gray Herbarium, Harvard University; see also Shaw 1987, p. 31), then it might be appropriate to look into the Herbarium of Bentham, currently kept in Kew, England (Holmgren et al. 1981). During the first visit to Kew by one of us (DGD) on August 5, 1985, a peculiar “double”—because mounting paper was then expensive—specimen caught our attention (Fig. 4 right) (<http://specimens.kew.org/herbarium/K000900693>). On that mounting paper, there are two plant specimens. To the left side, one can see a whole plant with its fibrous root (just as the one to the left on specimen GH00064068) and a climbing vine, and to the right (precisely lower right) a wound stem of a plant. The lower left label reads: “No. 110 *Phaseolus acutifolius* A. Gr[ay] Pl. Wright. 43 [written in black ink] Collected in Expedition from Western Texas to El Paso, New Mexico, May–October, 1849, by Charles Wright [printed].” Just above the lower part of the stem there is a stamp with fading black ink “Herbarium Benthamianum 1854.” To the left in the lower part of the mounting paper, written in black ink directly on the paper, there is the following indication: “This left-hand spec. may be an isotype of *P. acutifolius* A. Gr.; cfr Botanical Gazette LVI. 406–412 and fig. 8 (1913).” It is possible that this indication—seen during our visit of August 1985 (Debouck 2019)—has been written by Noel Yvri Sandwith (1901–1965) at Kew when working on neotropical plants, namely the Bignoniaceae (Gwilym Lewis, pers. comm., 27 November 2025). To the upper left part of the mounting paper the curator has placed the bar code label “Royal Botanic Gardens Kew K000900693.” Because of the plant material itself and the correspondence between the labels of the specimen GH00064068 and the specimen K000900693, one can conclude that the latter is the isoelectotype of *Phaseolus acutifolius* Asa Gray (isoelectotype here designated!). Incidentally, once again the link is a weak one, and this time through the distribution number “110” by Gray. It is important to note that in making this link between three small fruiting legumes with the upper part of root system kept in the Gray Herbarium and the one kept in the Herbarium of Kew, no credit is given to another number 110 given by Gray on page 44 to a *Galactia marginalis* Benth. from “Western Texas.” As aptly noted by Wootton (1906), Johnston (1940) and Smith (1954), these distribution numbers were rather confusing!

On the other hand, for the plant specimen (Fig. 4 right) to the lower right, the label reads: “Herb. A. Gray. *Phaseolus tenuifolius* Gray n.sp. but only var. of *P. acutifolius*? Hort. Cantab. 1852 e sem. Wright.” According to William Stearn (1993, p. 212), Hort. Cantab. would be the abbreviation for *Hortus cantabrigiensis*. This last part of the label text would allow us to infer that this plant was obtained in the garden of Cambridge, England, from seeds collected by Charles Wright (in this regard, in 1852, William Jackson Hooker wrote p. 288: “The seeds were divided between the Botanic Garden of Harvard University, U.S.A., and the Royal Gardens of Kew”). Just above the label, there is also the same stamp with fading black ink “Herbarium Benthamianum 1854.” In the lower right corner, the curator has placed the bar code label “Royal Botanic Gardens Kew K000900694,” thus providing a clear understanding that there are two different specimens mounted on the same mounting paper, while belonging to the same herbarium of George Bentham. In contrast with the specimen to the left, this one has an external lobing in the lower part of the lateral leaflets, a distinctive trait of var. *tenuifolius* (Gray 1853; Wootton & Standley 1913, p. 140); it comes from a different gathering “near the copper mines, New Mexico, and in Guadalupe Pass” (Gray 1853, p. 33; Standley 1910). Finally, from our own study of over 100 herbaria in the New World and Europe (Debouck 2021; Debouck et al. 2025), it seems that there are no more specimens of the collection #1311 by Wright but the two now put together in Figure 4.

Two points in the diagnosis by Gray may deserve attention. First, Gray includes his new species into the section *Drepanospron* (Bentham 1837) which together with section *Euphaseolus* (De Candolle 1825) has long regrouped several *Phaseolus sensu stricto* species (Maréchal et al. 1978; Lackey 1983). And both specimens, the lectotype in the Gray Herbarium and the isoelectotype in the Herbarium at Kew, present several of the most distinctive traits of *Phaseolus sensu stricto* (Maréchal et al. 1978; Lackey 1983): trifoliate leaves with basifix stipules and stipels, uncinat trichomes, inflorescence as raceme of racemes, primary bracts persistent till

anthesis, absence of nectaries on the peduncle, pedicels longer than the calyx and pods without internal septa. Bract persistence is important to differentiate *P. acutifolius* from *P. helvolus* (today *Strophostyles helvola* (L.) Elliott), one of the two species mentioned in the diagnosis. Second, Gray does not refer to the original identification of plant #1311 by Wright as *Galactia*, while on the same page (Gray 1852, p. 44), he named a new species for that genus, *Galactia wrightii*! In the vegetative stage, this species could be confused with variants of *P. acutifolius* or *P. angustissimus* A. Gray with narrow leaflets, but the uncinata hairs if present allow for the conclusion that it is a *Phaseolus* (Baudet & Maréchal 1976; Lackey 1978).

The relationship between the wild bean plant found by Wright and described by Gray and a “new” cultivated species grown by the Amerindians of the Southwest possibly for millennia (Kaplan & Lynch 1999) was understood later on by George Fouché Freeman (1876–1930: Mabberley 2008) in two sister publications (1913, 1918), apart from describing its unique attributes in adaptation and yield under arid conditions. This understanding was endorsed by Charles Vancouver Piper (1926), Liberty Hyde Bailey (1935), George Francis Carter (1945) and authors of other works afterwards. That relationship has since been further established with help of molecular markers (Muñoz-Florez et al. 2006; Blair et al. 2012).

Before going back to the field with clear idea about target place and plant, it seems pertinent to reconsider the note written by Noel Yvri Sandwith on the specimen kept in Kew (K000900693) (Fig. 4 right), as it invites to investigate further the search by Freeman (1913, p. 405–412) about the botanical name of his cultivated tepary. Thanks to Joseph Nelson Rose (1862–1928: Mabberley 2008) then working on the useful plants of Mexico for the Department of Agriculture (Rose 1899), Freeman was brought into contact with the botanists of Harvard, namely Benjamin Lincoln Robinson (1864–1935: Smith 1954), then curator of the Gray Herbarium in the years 1892–1934 after Sereno Watson (Fernald 1937; Smith 1954). In his work (1913, p. 409, Fig. 8) Freeman reproduced the tracing of the type specimen made under the supervision of Benjamin Lincoln Robinson at Harvard. This accurate black ink tracing represents exactly the specimen now identified as GH00064068, with its original label in the lower right corner, the envelope just above it, and on the margin in the center the words “Legume flat broad falcate,” and no other indication. Importantly, the number and the bar code in the lower left corner are recent, as are the labels added by Alfonso Delgado-Salinas in 1985, by George Freytag in 1987, and by Walter Kittredge in 2008 (Fig. 4 left), thus logically not reproduced in the tracing of Figure 8 in Freeman’s work (1913, p. 409, Fig. 8). It called our attention that the person making the tracing took the time to include the envelope—a non-significant taxonomic information—but did not report the stamp “TYPE” possibly because that stamping had not been made yet. It is plausible that after the search done for Freeman among the dozens of specimens left by Wright a person at the Gray Herbarium (Benjamin Lincoln Robinson?) wanted to single out this specimen and stamped “TYPE” above the envelope, thus providing an invaluable help to future botanists.

Back to the field

The area of Hueco Tanks has been visited over time by several botanists. Using our own study of over 100 herbaria in the New World and Europe (Debouck 2021; Debouck et al. 2025), here follow the descriptions (as per original labels) of the specimens that these botanists have left and institutions where these have been studied (acronyms of herbaria according to Thiers 2025 and numbers of the specimens therein if present). The study of sixteen herbaria through the Southwestern Environmental Information Network (SEINet) portal (<https://swbiodiversity.org/seinet/collections/list.php/>) in April 2023 did not yield additional specimens of *Phaseolus* collected at Hueco Tanks. Specimens studied:

- El Paso County, in rock crevices at Hueco Tanks, 17 Sep 1948, LC Hinckley 4589 (NY).
- El Paso, Hueco Tanks State Park, Commanche [sic] Cave, upper canyon, 27 Sep 1972, SW Oefinger s.n. (BRIT, ISC).
- El Paso County, Hueco Tanks State Historical Park, northeast of East Mountain, 24 Sep 1977, TR Van Devender, NF McCarten s.n. (ARIZ-207374).

- El Paso County, Hueco Mountains, Hueco Tanks State Park, eastern edge of the county north of Hwy 180, rock outcrop near the campground, (Near 106°02'W, 31°55'N), alt. 4600 ft., 5 Oct. 1982, AC Sanders, R Manshardt & K Neisses 3127 (UCR-31251).
- El Paso County, Hueco Tanks State Historical Park, Texas, North Mtn, 11 Sep 1988, RD Worthington 17306 (L-501280, UCR-56400).

Clearly the Hueco Tanks State Park and Historic Site managed by the Texas Parks and Wildlife Department since 1969 has allowed the conservation of 1–2 populations of wild tepary, but it is important to note that none of the populations sampled before the years 1990s has GPS coordinates. In this regard, one should keep in mind that the Global Positioning System has been available to, and implemented by, botanists after the year 2000.

On the basis of the historical record and the aforementioned herbarium records, we went to the Hueco Tanks State Park and Historic Site, namely the east side of North Mountain (Fig. 3 bottom), in the afternoon of September 23, 2025, and we found a population; its label reads (corresponding to the site where the first plants of this population were seen (Fig. 5 top), and within a 200 m perimeter from the cave (Fig. 3 bottom red arrow) the wall of which is presented in Fig. 6):

U.S.A. TEXAS. El Paso Co.: Hueco Tanks, near entrance of the cave with 19th-century handwritings, 0.2 miles SSE of main entrance, GPS: 31°55'14.2"N, 106°02'28.5"W, elev. 1372 m (1360 m barometric), 23 Sep 2025, Dupl.: 7 (BRIT, F, GH, NA, SRSC, UC, US); a population of 30 plants spread on sunny open gentle slopes and at base of porphyritic rocks, at green pod filling stage entering maturity, a few pink lilac flowers still present, stems up to 2 m long, climbing, soil light brown, sandy, derived from alluvium; in desert chaparral with *Acacia*, *Quercus*, *Solanum*, *Ipomoea*, *Sicyos*, *Desmodium*, Compositae and grasses (*Bouteloua*). DG Debouck, S Dohle, G Guerrero-F, T Porch, R Pratt & LG Santos-M. 3438.

Some observations on wild teparies at Hueco Tanks

The plants were found at maturing pod stage, while some still had pale lilac flowers (Fig. 7 top). There was morphological variation in leaflet shape, from ovate-lanceolate like those of the type (Fig. 7 top) to narrowly lanceolate (Fig. 7 lower part and Fig. 8 left). Likewise, there was variation in color of seed testa (Fig. 9); that heterogeneity is important for genebanks as it may indicate that the collected seeds were not the progeny of a single plant (Debouck et al. 2025). Incidentally, in Fig. 8 left—the photographer had still the internal clock of his camera adjusted on U.S. eastern time or two hours later as compared to the hour at Hueco Tanks, 4:09 pm, we see that the shadows start making difficult the search for the target plants—light conditions possibly experienced by Charles Wright on October 13, 1849.

The population of wild tepary at Hueco Tanks is not evenly distributed across the North Mountain of the State Park. It has not been seen in the flat areas where a dense thicket of small microphyllous trees (catclaw, honey mesquite) and creosote bush dominate, confirming early observations (Van Devender & Riskind 1979; Powell 2004). Rather, it seems concentrated near the bases of several igneous outcrops and in crevices and narrow spaces between boulders (Figs. 5 bottom, 8 right, 10 left). That topography may be doubly positive in restricting access to deer and in concentrating running waters during the monsoon (Fig. 10) and later in limiting evaporation due to drying winds. The current distribution may also indicate a recovery of the population after intense grazing in the past (e.g., Byrne in Pope 1854, p. 53). As Hueco Tanks is an important water source in the entire region east of El Paso, one could anticipate that numerous herds have gathered there in the period 1800–1970 with a significant grazing pressure on the native flora. Just as an indication of such pressure, Clinton Hartmann (1992, p. 60) indicated that on the way to El Paso the supply wagon train under the command of Major Van Horne in 1849 had 2,500 beasts between horses, mules and oxen!

The distribution of the moisture at Hueco Tanks shows that plants of wild *P. acutifolius* can reach a height of 2–3 m (Fig. 8 right) for a total growing season averaging three months, leaving positive indicators in terms of seed yield (one seed giving one plant with ten pods and six to eight seeds per pod, as most ovules developed into seeds).

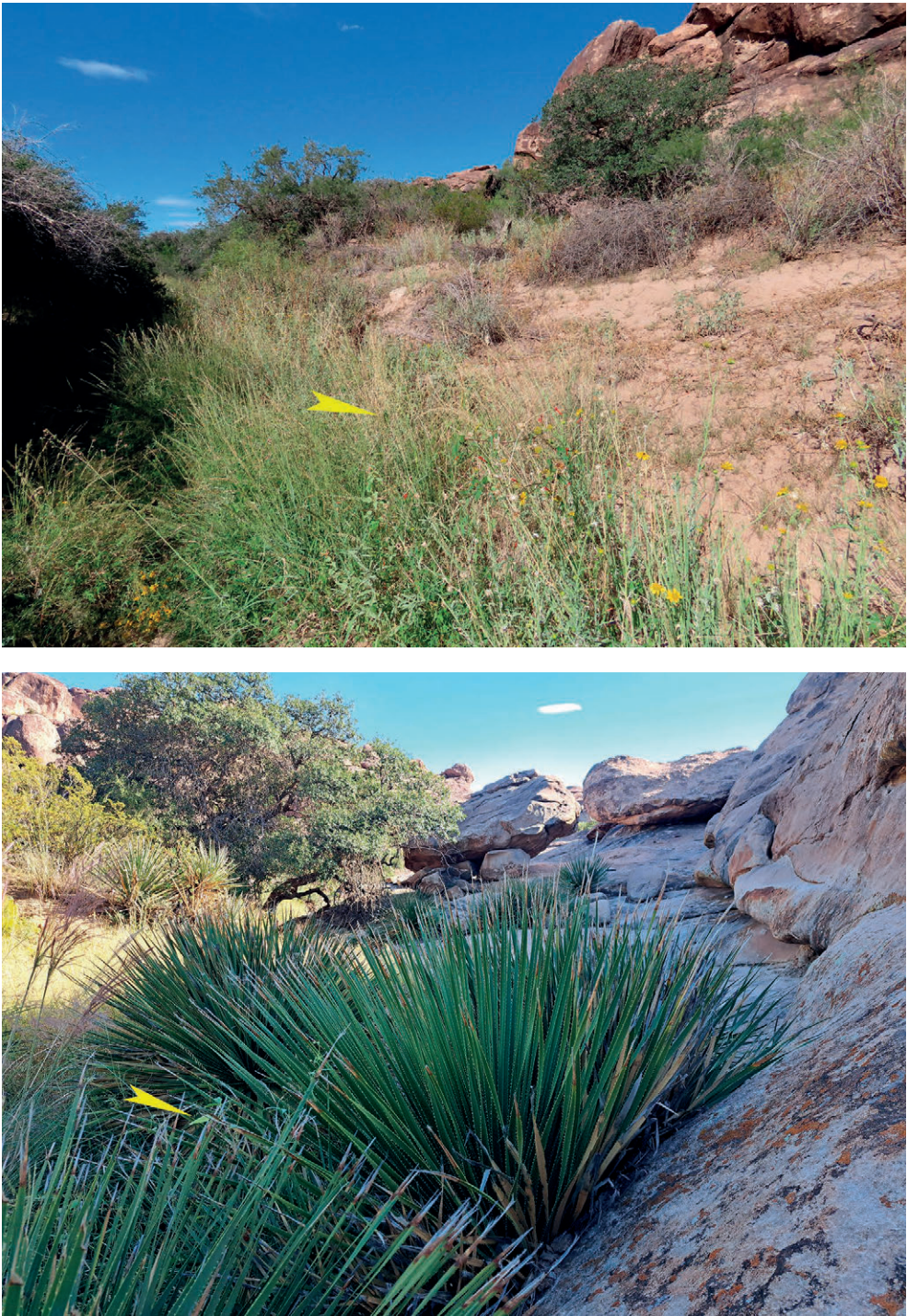


FIG. 5. Habitat of population #3438 of wild *P. acutifolius* at Hueco Tanks, North Mountain, eastern side, El Paso Co., TX. **Top:** plants growing on grasses in a little wash (photo DGD). **Bottom:** plants climbing on leaves of sotol *Dasylirion leiophyllum*, at the base of a porphyritic outcrop; note the tall oak in the background (photo SD) (yellow arrows point to leaflets of wild tepary).



FIG. 6. View of a cave wall with (probable) Mescalero Apache pictographs (upper part and to the left) and historic graffiti (to the right and in lower part) in the eastern sector of North Mountain at Hueco Tanks, El Paso, TX; note some of the dates extend well back into the 19th century (photo SD).

DISCUSSION

First, why bother? As aptly noted by Samuel Wood Geiser (1935), the reason for the search of type localities is in the number of new species and thus types found among the plants gathered by Charles Wright during this 1849 expedition. And in this particular case, it is the ancestor of a cultivated plant. But it is worth noting that the journey to El Paso was studied in great detail by Geiser (1935, pages 23–32), with lists of plant species and type-localities, while alas there was no publication by the same author for the return journey, as if the basic elements (i.e., a detailed report by the U.S. Corps of Topographical Engineers and the Field Notes by Charles Wright) for a similar work were not providing the necessary data.

Second, there is a high probability that the type locality of *P. acutifolius* has been found, and seed of that wild tepary bean has been secured. Once the lectotype had been identified in the Gray Herbarium, using Wright's Field List and the interpretative notes by Wootton (1906) and Johnston (1940), it was possible to determine the exact date of the original collection (not "Sept." as reported by Gray 1852, p. 44), and from there the location on the round trip of 1849 from San Antonio to El Paso and return (Geiser 1937). The data and the map produced by the U.S. Army Corps of Topographical Engineers (1850) (Fig. 1) and the working conditions during the return journey leave little doubt that the east side of North Mountain at Hueco Tanks was the place of the collection of specimen Wright 1311, now kept as GH00064068 (lectotype) at Harvard and as K000900693 (isolectotype) at Kew. There was variation in estimates of distances, even in dates of departure, in the flat arid land between Paso del Norte and the Guadalupe Mountains around the thirty-second parallel of north latitude. Apart from the confusion arisen from including Wright in the wrong returning party, there might be two reasons explaining that variation, while the transportation technology remained the same: i) the lack of a



FIG. 7. Variation of leaflet shape in population #3438 of wild tepary at Hueco Tanks, El Paso, TX. The lower photograph anticipates foliar traits expressed in var. *tenuifolius*: narrow leaflets and basal asymmetry (arrows) (photos SD).



FIG. 8. Two views of plants of population #3438 showing **(left)** another variation in leaflet shape (arrow) (photo LG5) and **(right)** that stems of wild teparies if protected and with some moisture (the rocky outcrops contribute to water concentration at their base) can be longer than two meters, while they climb on dead branches of an oak (photo 5D). In the left picture note the shadow on eastern slope of North Mountain because of a declining sun to the right (west).



FIG. 9. Three sets of original seeds of population #3438 collected at Hueco Tanks, showing the variation of seed color within the population (scale bar in cm) (photo SD).

definite milestone (e.g., a church, a railway station) at El Paso (just being established in those years on the American bank of Rio Grande), and ii) the roads not yet being definitely established in 1849–1854. However, the Corps of Engineers knew about the location of the Sierra Hueca (today, Hueco Mountains: DeLorme 2025), the Sierra de los Alamos (today, Alamo Mountain: DeLorme 2022) and the Cornudos (sic!) Mountains (today, Cornudas Mountains: DeLorme 2022) (as shown by the synthesis map of several explorations on p. 132 by Averam Bender, 1933, the map 34 p. 82 in Beck and Haase 1969, and the data of Table 1), where they could surely find three elements critical for survival in the desert: water, grass and wood (or equivalent). In a later but similar journey in 1854 from El Paso to the Pecos with eight wagons with six mules each, John H. Byrne, the Assistant Computer (in Pope 1854, p. 51–56) indicated that the wagon train had water casks, stocks of corn, and wood, but these supplies are all heavy, likely to slow down the pace of the train under the climate of the Chihuahuan Desert, and thus the Topographical Engineers were more often than not eager to find local sources. Wood was key as fuel wood for cooking and heating, for tools, but also for the uses ahead (beams for forts, sleepers for railroads, poles for telegraph), and thus the surgeon often acting as naturalist on these expeditions always had a keen eye for timber (oaks, pines) after a tradition inherited from Great Britain (Hobhouse 2005).

It is noteworthy that Wright found the wild tepary on the return journey, because there was almost equal probability to find it on the journey to El Paso, namely in the Limpia Canyon (where we found population #3442: Debouck et al. 2026), because the party of soldiers and road-builders went through that area August 22–26, 1849 (Geiser 1935; Powell et al. 2018). Year 1849 was a rainy year in that part of Texas (Geiser 1937)—“The hills were here in August, clothed in verdure as green as if it were early spring” wrote Captain French (1850, p. 47)—and by these dates, and in that area, wild tepary would normally be blooming and starting to form pods (as inferred from the specimen *Barton H Warnock* 22777 studied at TEX). Further, at that time, the populations of wild teparies did not suffer yet from the grazing pressure by the Barbary sheep (*Ammotragus lervia*) introduced in the wild in the 1950s (Texas Invasive Species Institute 2014); we saw four of them climbing a slope near Indian Lodge Trail in Davis Mountains State Park on Sept. 26, 2025, mid-morning! Or is it because Wright was collecting on foot and somehow was obliged to stay close to the troops and the Topographical Engineers? But once at Hueco Tanks Wright could have had more time to herborize during the watering tasks of the party. In this regard, Wright’s Field List (p. 60–61, seq. 37–38) mentioned seven

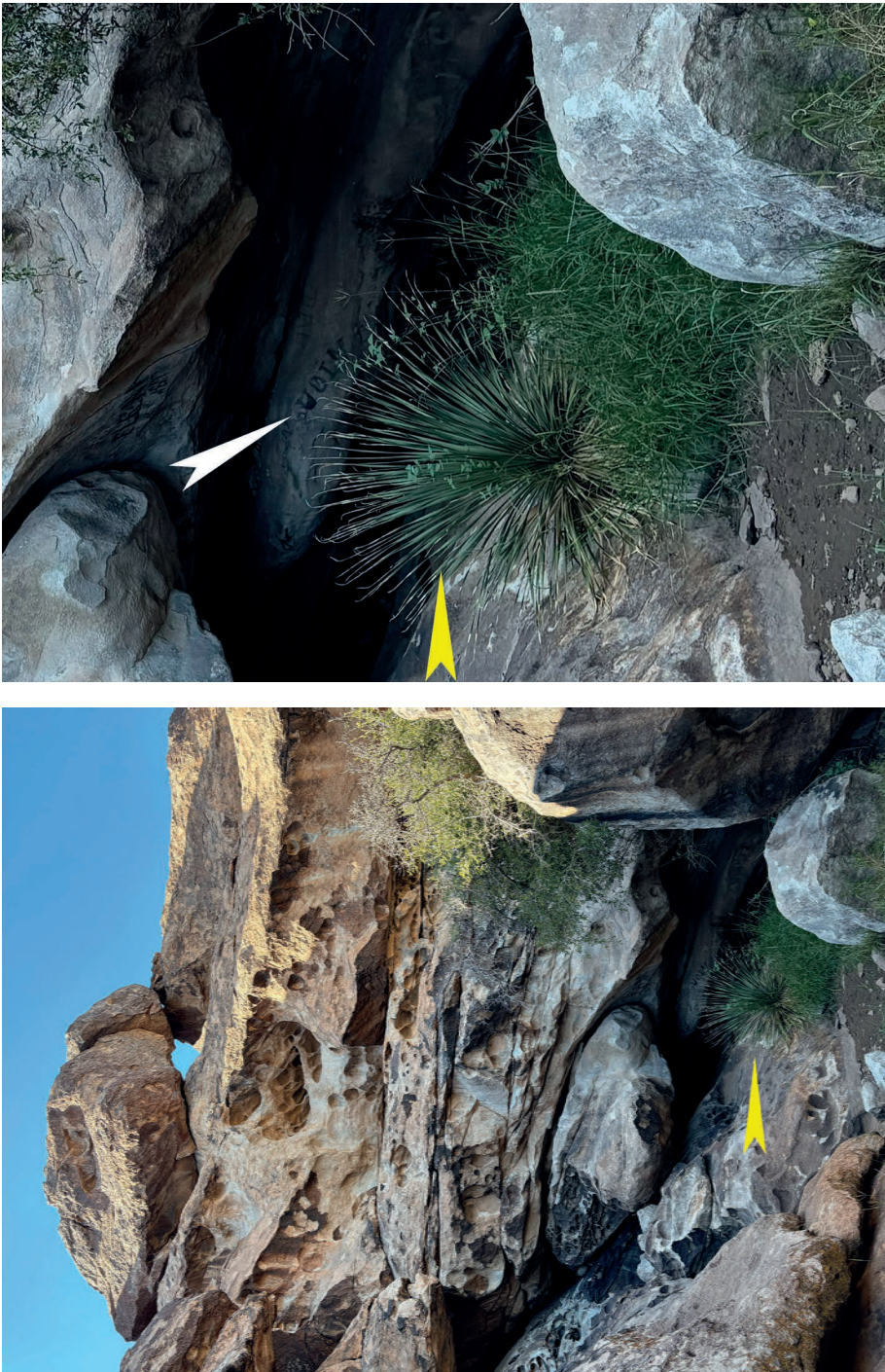


FIG. 10. Two views of the same tepary plant in population #3438. **Left:** a sotal (yellow arrow) with a tepary climbing on it. **Right:** the same sotal. Note the soil moisture before it. A historical graffiti can be seen on the rock wall behind the sotal (white arrow) in close proximity to the cave of Figure 6 (photos TP).

collections (nos. 1309–1315) dated October 13, 1849, including as no. 1310 a *Quercus* “a considerable tree 12-20 ft. high spreading.” An oak of that size (see also Fig. 5 bottom) in desert conditions is only possible under almost constant moisture, and it is relevant that it is the collection number just preceding that of *P. acutifolius*. In other words, that oak was seen at Hueco Tanks, not in the creosote-bush desert scrub! Finally, our sampling close to the cave (Fig. 6) came from the intuition that in the whole area of Hueco Tanks this spot was famed to at least a few officers or soldiers of the Corps of Engineers for the pictographs but above all for the water (Fig. 3 bottom, the blue arrow not far from the red one). Turning back to Pope’s expedition of 1854, that intuition seems quite plausible indeed. In this regard, John H. Byrne wrote (in Pope 1854, p. 53): “The tanks containing the water are immense reservoirs, hollowed out by the hand of nature. That upon the west side is capable of holding about five hundred gallons; the other, upon the east side, would contain, when full, perhaps fifteen hundred gallons.”

Third, the availability to users of the type population from seed banks such as USDA Pullman and CIAT is important because of its reference value. The wild teparies are distributed over a huge triangle from the Ajo Mountains in Arizona (Felger & Rutman 2015) to the Davis Mountains in Texas (specimen *DS Correll* 33663 in NA) (and possibly the Barilla Mountains: Albert Michael Powell, pers. comm., 24 September 2025) and down to Michoacán, Mexico (specimen *JL Labat* 1279 in P) (Nabhan & Felger 1978; Debouck 2019). Over such a huge area, in spite of the limited gene flow (the reproductive system of tepary is cleistogamy: Lord & Kohorn 1986), variation in the wild occurs in seed color (Fig. 9), in foliar characteristics (narrow to ovate leaflets: Nabhan 1979; Delgado-Salinas 1985; Pratt & Nabhan 1988), in reactions to diseases (common bacterial blight: Vargas et al. 2014) and pests (common bean weevil: Porch & Beaver 2022), in seed storage proteins (Schinkel & Gepts 1988), and populations differentiate from one another, or at least between subregions (Bornowski et al. 2023). The genetic erosion in the landraces over the last century has been important: Freeman (1913, p. 414) reported that he had assembled a collection of 216 varieties, while the accessions of cultivated teparies in CIAT genebank would not reach one hundred once the redundancy is cleared (for example, 99 white-seeded lines with 100-seed weight in 13–17 g out of 161 accessions; <https://www.genesys-pgr.org/a/overview/v2ZW81Qwlep>). Thus, the potential for the future breeding of this crop lies in the wild form. One can anticipate that in the use of wild forms as a reference the material from the type locality, starting with the correct taxonomical identification, will be necessary from time to time.

Fourth, the population of wild tepary found at Hueco Tanks seems to recover because of its presence in small patches of open grassland (Fig. 5 top), while it continues to be more abundant between boulders and on rocky outcrops (Fig. 5 bottom and Fig. 8 left). This recovery highlights the important role of the Texas Parks and Wildlife Department, not only in preserving a very important cultural heritage (Sutherland 2006), in accordance with their mission statement (<https://tpwd.texas.gov/about/mission-philosophy>), but in conserving the native flora as well. This flora was never exposed to introduced herbivorous mammals such as cattle of Old World origin (Diamond 2002; Larson et al. 2014) with a different grazing pattern as compared to the pronghorn antelope (*Antilocapra americana*), the desert mule deer (*Odocoileus hemionus crooki*) and the desert bighorn sheep (*Ovis canadensis nelsoni*) (Cantu & Richardson 1997; Sutherland 2006; Cornett 2013). The representation of these three ungulates in the archaic artwork (5,000 years before present) on cave walls at Hueco Tanks (Sutherland 2006) well indicated the nature of original grazing pressure.

Finally, in informing the Texas Parks and Wildlife Department about which wild relatives of crops exist within current protected areas, the *in-situ* conservation work by the Department gains in relevance and biological scope. When biodiversity and people compete for land, that information becomes critical for appropriate planning and management of protected areas (Khoury et al. 2020). Hopefully, when human societies reconsider the water consumption per unit of food produced, they will be interested in frugal crops such as tepary bean (Silber-Coats et al. 2025) and in supporting these conservation efforts that require long-term commitments. In times of scarcity, we as conservationists more often than not need justifications for investment. Charles Wright through his collection #1311 just gave us one!

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