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IDENTIFYING *ABUTILON PARISHII* (MALVACEAE) AND SIMILAR SPECIES IN ARIZONA AND SONORA

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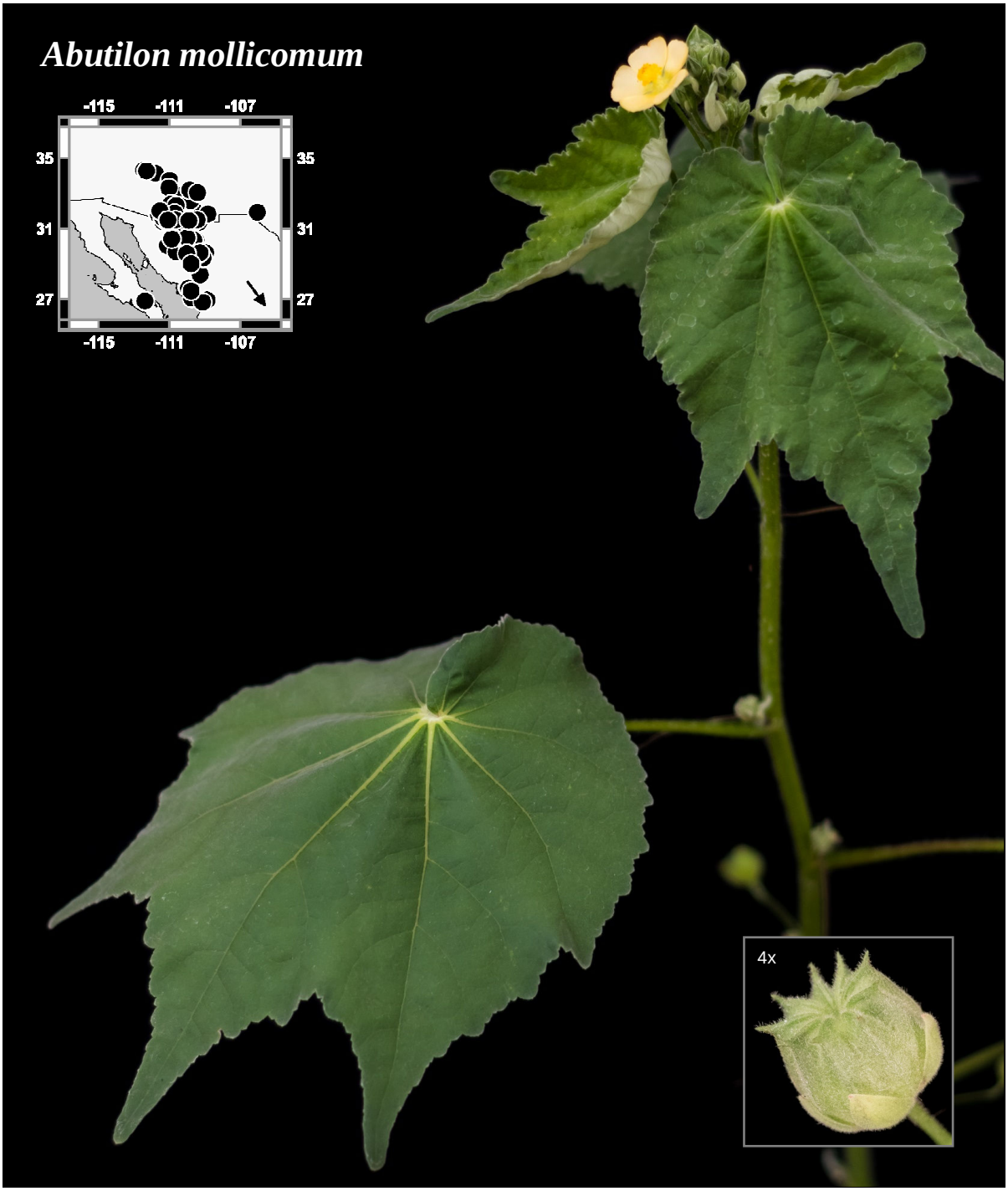
ABSTRACT

We provide a visual aid for identifying *Abutilon parishii* along with similar genera and species in the mallow family (Malvaceae) that occur in Arizona and Sonora. The primary species featured are *Abutilon mollicomum*, *A. palmeri*, *A. parishii*, *A. reventum*, and *A. wrightii*, with briefer coverage provided for *A. abutiloides*, *A. incanum*, *A. parvulum*, *A. theophrasti*, *Anoda abutiloides*, and *Herissantia crispa*. Three of the species featured, *A. parishii*, *A. reventum*, and *Anoda abutiloides*, are of conservation concern.

Abutilon (Malvaceae) species in North and Central America are typically recognizable as woody or herbaceous perennial shrubs with leaves that are simple, alternate, long-petiolate, cordate-based, toothed, and stellate-haired. Flowers are axillary or in panicles with yellow to orange petals; schizocarps typically contain 4–10 (25) mericarps (Fryxell 1988; Fryxell & Hill 2015). Similar New World genera include *Anoda*, *Bakeridesia*, *Callianthe*, *Herissantia*, *Pseudabutilon*, and *Sida* (Fryxell 1988, 1997a; Donnell et al. 2012). Various *Abutilon* species are widely cultivated (Austin 2004; Fryxell & Hill 2015; Saini et al. 2015) and commonly referred to in English as Indian mallow, flowering-maple, pintapan, and velvet leaf.

The taxonomic boundaries of the genus *Abutilon* are still poorly understood and may continue to be revised (Fryxell 2002; Tate et al. 2005; Donnell et al. 2012), but past estimates have calculated approximately 160 species worldwide (Fryxell & Hill 2015). Fryxell and Hill, in their *Flora of North America, North of Mexico* treatment of the genus, included 17 native species occurring from California to Florida. For our region of study, Arizona and Sonora, we estimate there are at least 13–14 native species of *Abutilon* and one introduced species. We provide a working draft list and key for these and similar species in Appendices A and B.



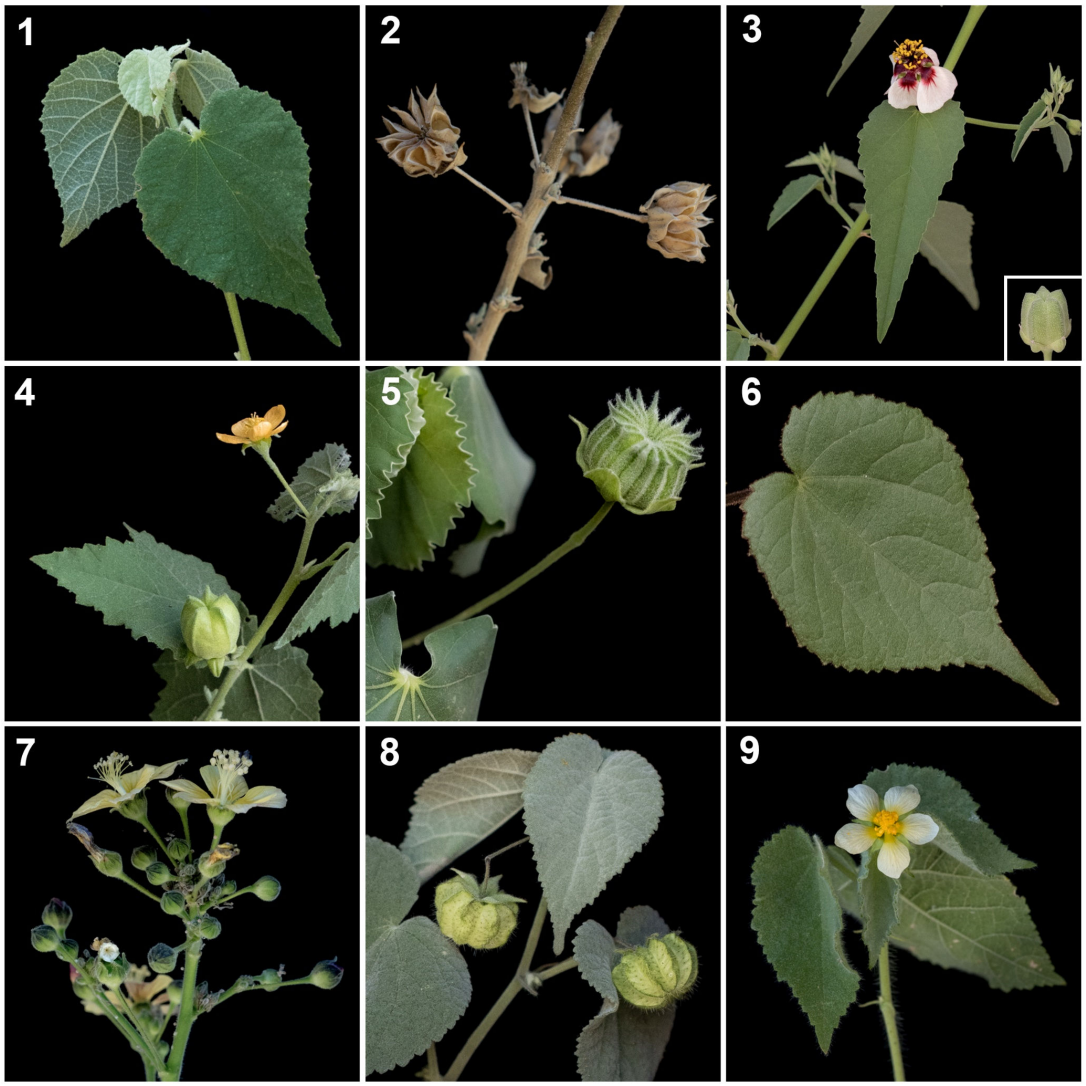
***Abutilon mollicomum* (Willd.) Sweet** [*Abutilon sonorae* A. Gray]. Mature blades to 25 cm long with maple-like lobing; blade margin hairs to 0.5 mm; mature petioles and stems with hairs 2–4 mm. Upright herbaceous perennial shrub to 3 m tall; only woody at base. Sepals (lower right image) to 1/2 length of mericarps; mericarp apices = 1–2 mm; flowers typically open for a few hours in the afternoon. Plants typically occur in rocky habitats to 1500 m, Arizona to Veracruz; NatureServe G5. The synonym *A. sonorae*, used by Asa Gray in 1853, persists in many collections, though Fryxell (1988) found that Willdenow had described the species as *Sida mollicoma* (1809) before Gray. This species is probably the most common of the large-leaved *Abutilon* in our region.

***Abutilon palmeri* A. Gray.** Most blades under 18 cm, the wide outline similar to *A. reventum*, though more velvety to the touch; blade margin hairs to 0.5 mm. Upright herbaceous perennial shrub to 2 m; only woody at base. Sepals (lower left image) about equal to mericarp apices; flowers open afternoon to evening. Plants occur mostly in California, Arizona, Sonora, and Baja California; NatureServe G4G5. *Abutilon parishii* was synonymized under this name in the first edition of the Arizona Flora, a decision that was reversed in the Supplement (Kearney et al. 1960).

***Abutilon parishii* S. Wats.** Mature blades under 18 cm with long, acuminate tips; blade margin hairs 0.75–1.25 mm; petiole and stem hairs to 2.5 mm. Upright herbaceous perennial shrub to 2 m; only woody at base. Sepals (lower right image) half the length or slightly longer than schizocarp; mericarp apices 1–2 mm; flowers opening, if at all, for a few hours in the late afternoon to evening. Plant occurs in rocky habitats to 1500 m in Arizona and Sonora; NatureServe G3, U.S. Forest Service Region 3 and BLM Sensitive. Future conservation studies should refer especially to the large baseline dataset contained within the Status Report for *A. parishii* submitted to the U.S. Fish and Wildlife Service by Van Devender et al. (1994). See also: Van Devender et al. (1991), AGFD Abstract (2000), ARPC (2001), CPC (2018).

***Abutilon reventum* S. Wats.** Mature blades to 25 cm long, often with relatively small lateral lobes and a long acuminate tip that may curl inward as shown above; blade margin hairs under 0.5 mm; mature petioles and stems appearing glabrous, rarely with sparse, single-based hairs to 3 mm. Upright herbaceous perennial shrub to 2.5 m; only woody at base. Sepals (lower left image) to 1/2 the length of mericarps; mericarp apices subtle or absent; flowers opening for a few hours in the afternoon. Similar to *A. mollicomum*, *A. xanti* [*A. carterae*], and *A. palmeri*. See Fryxell (1988). Plant occurs in rocky habitats to 1500 m in Arizona to Oaxaca; NatureServe G3G5, N2 in Arizona.

***Abutilon wrightii* A. Gray.** Mature blades to 8 cm; leaf tip acute to rounded; blade margin hairs to 0.75 mm; petiole and stem hairs to 2 mm. Decumbent herbaceous perennial shrub under 0.5 m tall; young plants not always decumbent; base of plant usually herbaceous. Sepals (lower right image) long and often obscuring the schizocarp; calyces flared at base; mericarp apices to 2 mm; flowers opening late afternoon to evening. Plant occurs in various habitats to 1500 m with approximately 10 known locations scattered across New Mexico, Sonora, and Arizona; much more commonly recorded from Texas and northeastern Mexico; NatureServe G4. Note that young plants may be mistaken for *A. parishii*. See discussions in Hamilton (1932), Shreve & Wiggins (1964), and Reina-Guerrero & Van Devender (2013).



Other morphologically similar species in the region

1–2. *Abutilon abutiloides* (Jacq.) Garcke ex Britt. & Wilson. A common woody per. shrub to 2 m with smooth gray bark above the base; sepals often large, obscuring schizocarp (but not as long as in *A. wrightii*); leaf and stem hairs more clustered than with other spp.; possible synonyms still needing further investigation include *A. berlandieri*, *A. californicum*, *A. lignosum*, and *A. scabrum*.

3. *Abutilon incanum* (Link) Sweet. A common woody per. shrub to 2 m with smooth gray bark similar to *A. abutiloides*; leaf hairs on this and similar spp., such as *A. malacum* and *A. parvulum*, are nearly impossible to see without magnification; see J. Fryxell (1983) and Felger et al. (2015).

4. *Abutilon parvulum* A. Gray. The smallest leaved *Abutilon* in the region; per. shrub to 0.5 m.

5. *Abutilon theophrasti* Medik. Introduced; herb. per. shrub mostly occurring in cultivated fields; large leaves superficially similar to *A. reventum*; unlikely to occur with similar spp. treated here; has a relatively large schizocarp with more mericarps than native species; see Appendix A.

6–7. *Anoda abutiloides* A. Gray. A woody per. to 3 m with greenish bark; leaf tips long-acuminate; NatureServe G3; limited to Arizona and Sonora.

8–9. *Herissantia crispa* (L.) Briz. [*Abutilon crispum*]. A common herb. per. shrub, usually decumbent; fruits papery, transparent; leaf margins often doubly serrate.

METHODS

For species identification we relied on the following: (1) photographic observations of wild and cultivated plants; (2) a study of type specimen images hosted by GBIF (2018); (3) in-person study of specimens at the University of Arizona Herbarium (ARIZ), the Arizona State University Vascular Plant Herbarium (ASU), and the Desert Botanical Garden Herbarium (DES); and (4) a review of taxonomically relevant literature and data (especially Watson 1885, 1886; Hamilton 1932; Kearney et al. 1951, 1960; Shreve & Wiggins 1964; P. Fryxell 1976, 1988, 1993, 1997a, 1997b, 2002; J. Fryxell 1983; Tate et al. 2005; Donnell et al 2012; Felger et al. 2015; Fryxell & Hill 2015; Verrier 2018; SEINet 2018; GBIF 2018; CPC 2018).

Several plants photographed in this study were obtained from Desert Survivors Nursery in Tucson, Arizona (desertsurvivors.org). Indirect sunlight was used to illuminate whole plant scenes, with a black cotton cloth draped behind the subjects. Artificial lighting was used for the fruit close-ups using six Ikea Jansjo lights attached to a makeshift scaffolding. Each Jansjo light was diffused with a white table tennis ball cut to fit over it. Digital photographs were taken in Raw format using Nikon DSLRs paired with prime lenses, especially the Tokina 100mm. Raw format images were processed in Adobe Lightroom (especially using the "blacks" and "whites" adjustment sliders). The Adjustment Brush feature in Lightroom, with a lowered exposure slider, was used to further darken background areas in each image.

The maps we include were generated in QGIS (2018) using herbarium specimen data from SEINet (2018). Latitude and longitude grids are provided along the borders of each map with the U.S.A.-Mexican border running through the center and the Pacific Ocean in dark gray. Updated occurrence maps and other imagery can be found at SEINet (http://swbiodiversity.org) and its partner network, Red de Herbarios del Noroeste de México (http://herbanwmex.net/portal/). Some SEINet occurrences used in creating the maps in this paper will need further verification and/or annotation.

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APPENDIX A

Working draft key for *Abutilon parishii* and similar species in Arizona and Sonora

1. Hairs on blade margins and elsewhere generally ≤ 0.2 mm and difficult to see without magnification, giving plants a nearly glabrous appearance; leaves usually concolorous, i.e. light green above and below. See *A. incanum* [*A. pringlei*], *A. malacum*, *A. mucronatum*, *A. parvulum*, *A. trisulcatum*.
1. Hairs on blade margins and elsewhere generally ≥ 0.3 mm (sometimes shorter in *A. abutiloides*) and visible without magnification; some species with strongly discolorous leaves, i.e. dark green above and whitish beneath (e.g., *A. parishii*), though this character is not always consistent.

    2. Largest blades 15–25 (30) cm on mature individuals; plants to 3 m.

        3. Petiole and stem hairs to 4 mm ..... **Abutilon mollicomum**
        3. Petiole and stem hairs generally under 3 mm.

            4. Plants not conspicuously velvety; carpels ≥ 15; (introduced) ..... **Abutilon theophrasti**
            4. Plants conspicuously velvety; carpels ≤ 11; native.

                5. Petiole and stem surfaces completely obscured by thick layer of minutely stellate hairs; of limited distribution in eastern Baja California Sur deserts and coastal regions, and also on the mainland in coastal Sonora and Sinaloa ..... **Abutilon xanti**
                5. Petiole and stem surfaces visible through hairs ..... **Abutilon reventum**

    2. Largest blades generally < 15 cm on mature individuals; plants generally under 2 m.

        6. Mature plants with grey bark well above the base of the plant; most hairs on plant under 0.3 mm, especially on stems and petioles ..... **Abutilon abutiloides**
        6. Mature plants herbaceous; petiole hairs usually at least to 0.5 mm or longer

            7. Mature stems decumbent or at least several at a 45° angle (*Pseudabutilon* stems sometimes erect); blades usually under 9 cm.

                8. Schizocarp wall papery, transparent ..... **Herissantia crispa**
                8. Schizocarp wall hardened, opaque.

                    9. Blade pubescence dense, obscuring abaxial surface ..... **Abutilon wrightii**
                    9. Blade pubescence sparse, not obscuring abaxial surface ..... **Pseudabutilon thurberi**

            7. Mature stems upright on mature plants; largest blades 12–18 cm.

                10. Length to width ratio of mature blades nearly 1:1 ..... **Abutilon palmeri**
                10. Length to width ratio of mature blades nearly 3:2 ..... **Abutilon parishii**

APPENDIX B

Working draft list of *Abutilon* and similar species in Arizona and Sonora.

For information on infrageneric divisions in *Abutilon* including sects. *Armata*, *Mexabutilon*, and *Oligocarpa*, see J. Fryxell (1983) and P. Fryxell (1976; 1988; 2002). See also Felger et al. (2015) for illustrations of several of the genera and species below.

Abutilon abutiloides [*A. lignosum*]
Abutilon berlandieri (possible synonym of *A. abutiloides*)
Abutilon californicum (possible synonym of *A. abutiloides*)
Abutilon incanum [*A. pringlei*]
Abutilon malacum
Abutilon mollicomum [*A. sonorae*]
Abutilon mucronatum
Abutilon palmeri
Abutilon parishii
Abutilon parvulum
Abutilon reventum
Abutilon trisulcatum
Abutilon wrightii
Abutilon xanti [*A. carterae*]
Anoda abutiloides
Anoda pentaschista
Herissantia crispa [*Abutilon crispum*]
Hermannia pauciflora
Hibiscus spp.
Horsfordia spp.
Malvastrum bicuspidatum
Pseudabutilon thurberi [*Abutilon thurberi*]
Rhynchosida physocalyx
Sida abutilifolia [*Sida procumbens*]
Sphaeralcea spp.