Taxonomy of Forestiera pubescens and Forestiera neomexicana (Oleaceae)

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TAXONOMY OF *FORESTIERA PUBESCENS* AND *FORESTIERA NEOMEXICANA* (OLEACEAE)

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Abstract: *Forestiera neomexicana* is relatively constant in diagnostic features of vestiture and leaf shape across most of its range in the southwestern USA, from California to New Mexico and into western Texas. Apparent intermediacy in leaf shape and vestiture with *F. pubescens*, however, as well as glabrous forms of *F. pubescens*, have complicated identification. The two taxa are treated here as the eastern *F. pubescens* var. *pubescens* and the western **F. pubescens** var. **parviflora**. The ranges of the two taxa are mapped and variant forms are shown in Texas. Synonymy and typification are provided.

Keywords: Oleaceae, *Forestiera pubescens*, *Forestiera neomexicana*, Texas, southwestern USA.

The genus *Forestiera* has received extended and detailed taxonomic attention (Gray, 1860; Cory, 1944, Johnston, 1957, Brooks, 1977), and a new species from the southeastern United States was recently described (Anderson, 1985). Numerous taxonomic problems remain, however, especially in Mexico and even in the United States.

In a taxonomic overview of the genus, Johnston (1957) recognized *Forestiera neomexicana* A. Gray as distinct but later (1970, p. 1200) treated it as a synonym of *F. pubescens* Nutt., noting that between the two ''there is complete intergradation in western Texas. Alleged differences in pedicel length are fictitious and differences in pubescence are found even in one population. There is no very meaningful way to recognize two species in this complex.''

Recent accounts of western USA flora mostly have identified *Forestiera pubescens* as occurring from California and Nevada to Colorado and New Mexico, and *F. neomexicana* has been treated simply as a synonym of *F. pubescens*: e.g., Arizona (Dittman, 2008), California (Wilken, 1993), Colorado (Hartman & Nelson, 2001; Weber & Wittman, 2008), New Mexico (Allred, 2006), Utah (Welsh, 2003). Holmgren (1984) identified the Intermountain Flora plants as *F. neomexicana*. Other references are in the PLANTS Database (USDA-NRCS, 2008). Plants from Florida to South Carolina discussed by Brooks (1977) as widely disjunct variants of *F. pubescens* were subsequently described as *F. godfreyi* L.C. Anderson (Anderson 1985).

In the most detailed study of the genus, Brooks (1977) treated *Forestiera neomexicana* and *F. pubescens* as separate species, although she mapped a large number of collections as intermediate. In her view, emphasizing vestiture, *F. pubescens* sensu stricto is mostly restricted to central Texas, with disjunct outliers in trans-Pecos Texas, southeastern New Mexico, and southeastern Arizona; *F. neomexicana* sensu stricto occurs from California to New Mexico and trans-Pecos Texas, with disjunct outliers in west-central Texas and southwestern Oklahoma. The intermediates she identified were mainly in two classes: a) those in the geographic and morphological range of *F. pubescens* but with (atypically) smaller and glabrous leaves, and b) those in the geographic and morphological range of *F. neomexicana* but with smaller and (atypically) pubescent leaves.

The study here supports the observation that two morphogeographic entities can be distinguished, largely as Brooks mapped them. Turner et al. (2003) also recognized and mapped both taxa in Texas, the region in which most of the putative sympatry occurs. Fig. 1 shows the distribution of *Forestiera*

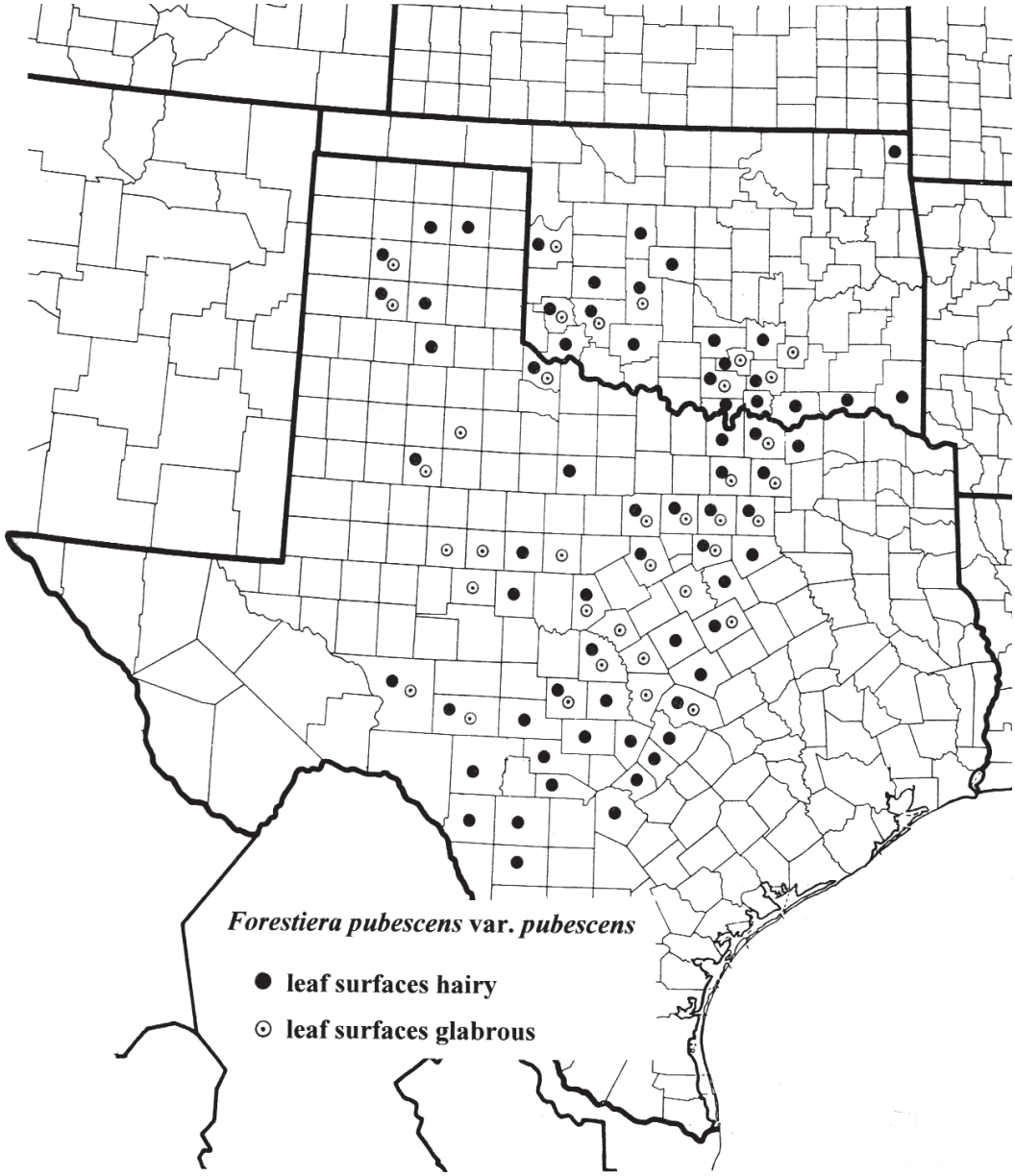

FIG. 1. Distribution of *Forestiera pubescens* var. *pubescens* in the United States. The distribution continues into Mexico (Coahuila, Nuevo León). Glabrous variants have sometimes been identified as var. *glabrifolia*. All records are from herbaria cited.

pubescens sensu stricto, including glabrous forms; Fig. 2 shows the distribution of the western *Forestiera pubescens* var. *parviflora*; Fig. 3 illustrates the distinction in leaf shape between the two entities. Because of the overlap and intergradation in leaf shape and vestiture and their lack of distinction in other features, conspecific treatment of the two taxa is appropriate.

FORESTIERA PUBESCENS Nutt., Trans. Amer. Philos. Soc., new ser., 5: 177. 1837 [published 1835]. *Forestiera ligustrina* (Michx.) Poir. var. *pubescens* (Nutt.) A. Gray, Proc. Amer. Acad. Arts 4: 364.

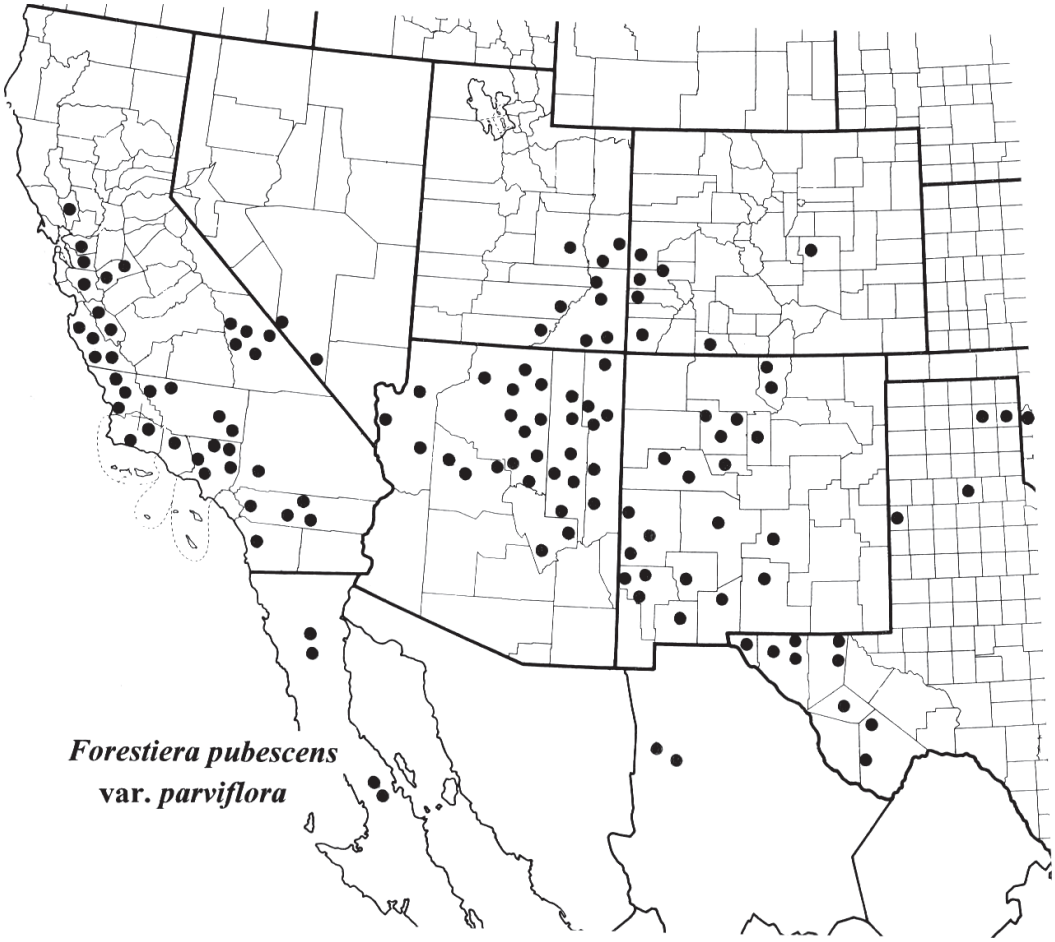

FIG. 2. Distribution of *Forestiera pubescens* var. *parviflora* in the United States. The distribution continues into Mexico (Baja California, Chihuahua, Coahuila, Durango, Sonora). Records are from herbaria cited, supplemented by records from Brooks (1977), CalFlora (2009), Weber and Wittman (2008), Intermountain Region Digital Image Archive Center (2009), SEINET (2009), and NMBCC (2009).

1860. *Adelia pubescens* (Nutt.) Kuntze, Rev. Gen. 2: 410. 1891. TYPE: **UNITED STATES**. [**Oklahoma**]. "In the prairies of Red river" [protologue], *T. Nuttall s.n.* (HOLOTYPE: BM fide Brooks 1977; ISOTYPES or HOLOTYPE fragments: NY-digital image!, PH). Two large branches, possibly separate collections, on the NY sheet apparently are accompanied by labels at the bottom, neither in the handwriting of Nuttall. The label at bottom right notes "Vicinity of Fort Towson," while that at bottom left notes "Red River." Several leaves at top left are mounted beside a fragment package, which has "Red River, Nuttall," possibly in Nuttall's hand.

Nuttall collected in present-day east-central Oklahoma in the summer of 1819 (Nuttall, 1821; Lawson, 2004). In late May through the first half of June, he explored and botanized in Oklahoma along the Kiamichi River (mostly in present day Choctaw, Pushmataha, and LeFlore counties of southeastern Oklahoma) to its mouth at the Red River; in the last half of June, he traveled along the Poteau River (LeFlore

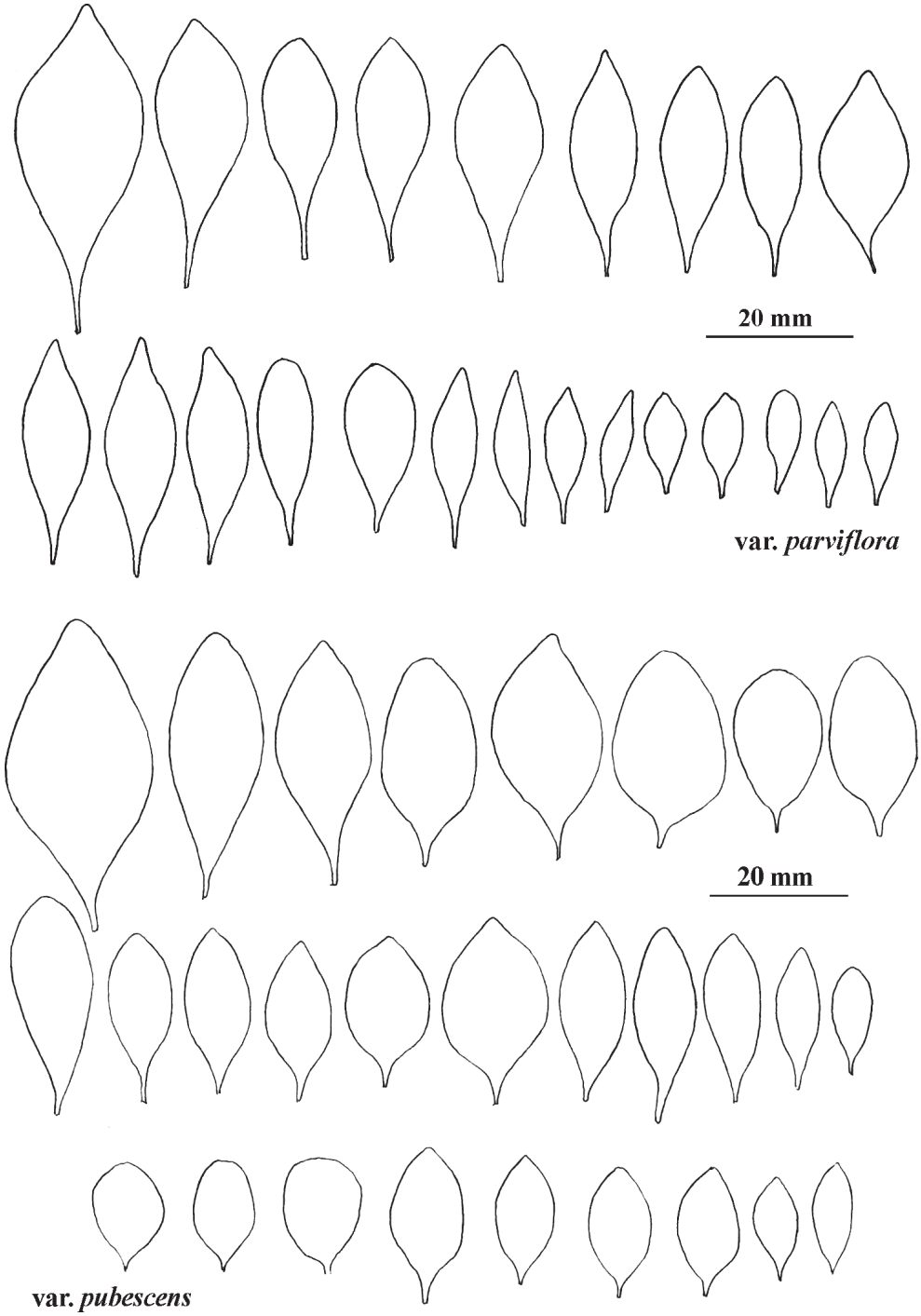

FIG. 3. Leaf shape in *Forestiera pubescens* var. *pubescens* and var. *parviflora*. Leaves are selected to represent the range of morphological and geographical variation for each variety with the top two rows showing leaves of *F. pubescens* var. *parviflora* and the bottom three rows *F. pubescens* var. *pubescens*.

Co.), returning to Fort Smith, Arkansas. Fort Towson (Choctaw Co.) was first established only in 1824, after Nuttall's trip to the area.

SHRUBS 1–4 m: BRANCHLETS glabrous to hirtellous or tomentose-puberulent. LEAVES deciduous, blades elliptic or rhombic-elliptic to ovate, obovate or oblanceolate, thin to relatively thick or coriaceous, punctate abaxially, glabrous to hirtellous or hirsutulous, veins pellucid, not raised-reticulate, apices obtuse or rounded to acute or acuminate, bases attenuate, margins crenulate to serrulate, sometime subentire, not thickened or revolute; petioles 1–3 mm. FLOWERS unisexual, appearing before leaf expansion from buds on branches of previous season; pistillate 5–17 in sessile fascicles to thyrses or cymes, rachises 1.5–3 mm, peduncles 0–2 mm; calyx absent or present and minute; stamens 4–5. DRUPES ovoid to ellipsoid or broadly ellipsoid, 5–8(–10) mm, blue-black and glaucous.

KEY TO THE SUBSPECIES OF *FORESTIERA PUBESCENS*

1. Leaf blades mostly elliptic-obovate with rounded or obtuse to acute or short-acuminate apices, 10–30(–40) mm wide, characteristically short-villous to hirtellous on both surfaces or adaxially glabrate (completely glabrous variants are relatively common), bases abruptly attenuate. . . . . 1. *Forestiera pubescens* var. *pubescens*
1. Leaf blades mostly rhombic-elliptic to rhombic oblanceolate with short-acuminate apices, 6–11 mm wide, characteristically glabrous on both surfaces (hirtellous to hirsutulous variants occur at least in New Mexico and Arizona), bases long-attenuate. . . . . 2. *Forestiera pubescens* var. *parviflora*

1. FORESTIERA PUBESCENS var. PUBESCENS

Forestiera pubescens Nutt. var. *glabrifolia* Shinners, Field & Lab. 18: 99. 1950. TYPE: **UNITED STATES**. **Texas**. **Bosque County**: 12.5 mi NNE of Walnut Springs, 26 May 1949, *L. H. Shinners 11331* (HOLOTYPE: SMU!; ISOTYPE: GA).

BRANCHLETS hirtellous, rarely glabrous. LEAF BLADES relatively thin, mostly elliptic-obovate, also narrowly to widely elliptic, elliptic-obovate, or ovate, 1.5–4(–5) cm × 1–3(–4) cm, short-villous to hirtellous on both surfaces or adaxially glabrate, apices rounded or obtuse to acute or short-acuminate, bases abruptly attenuate.

Flowering Jan–Mar(–Apr), fruits maturing May–Jun. Ledges, rocky canyons, limestone outcrops and soil, blackland prairies, caliche ridges, granite outcrops, creek edges and terraces, sandy slopes, fencerows, fields, woodland margins, deciduous woods, post oak-juniper flatwoods, post oak-blackjack oak woods; 100–300(–400) m; Oklahoma, Texas; Mexico (Coahuila, Nuevo León).

2. **Forestiera pubescens** var. **parviflora** (A. Gray) Nesom, comb. nov. Based on *Forestiera acuminata* (Michx.) Poir. var. *parviflora* A. Gray, Proc. Amer. Acad. Arts 4: 364. 1860. *Adelia parviflora* (A. Gray) Coville, Contr. U.S. Natl. Herb. 4: 148. 1893. TYPE: **UNITED STATES**. **New Mexico**. Near Santa Fe, steep rocky bank of the Rio del Norte, 25 May 1847, *A. Fendler 547* (LECTOTYPE: GH, designated by Johnston, 1957; ISOLECTOTYPES: F-digital image!, MO!, PH). Other collections cited by Gray were *C. Wright 1699* from between Chihuahua and El Paso (Texas) and *J. M. Bigelow s.n.* from "Semeleuque Springs" along the Mexican boundary (New Mexico?).

Forestiera sphaerocarpa Torr., Bot. Mex. Bound. 2: 168. 1859. *Adelia sphaerocarpa* (Torr.) Kuntze, Rev. Gen. 2: 410. 1891. TYPE: **UNITED STATES**. [**Texas**. **Jeff Davis County**]: Dry arroyos near the Limpia, 25 Jul 1852, *J. M. Bigelow s.n.* (HOLOTYPE: NY-digital image!, GH-fragment). The NY sheet has "1097" written in pencil at the top right of the original label. The type has leaves with hirsutulous surfaces and intermediate in shape between typical *F. pubescens* and *F. neomexicana*, (var. *parviflora*) but all plants from the trans-Pecos region, particularly Jeff Davis Co., are identified here as var. *parviflora*, with recognition that this is a zone of intermediacy.

Forestiera neomexicana A. Gray, Proc. Amer. Acad. Arts 12: 63. 1876. *Adelia neomexicana* (A. Gray) Kuntze, Rev. Gen. 2:

410. 1860. *Forestiera pubescens* subsp. *neomexicana* (A. Gray) A.E. Murray, Kalmia 13: 6. 1983. *Forestiera pubescens* var. *neomexicana* (A. Gray) A.E. Murray [nom. illeg.], Kalmia 13: 6. 1983. TYPE: **UNITED STATES**. **New Mexico**. Near Santa Fe, steep rocky bank of the Rio del Norte, 25 May 1847, *A. Fendler 547* (LECTOTYPE: GH, designated by Johnston, 1957; ISOLECTOTYPES: F-digital image!, GH, MO!, and PH as cited by Brooks). Gray listed his earlier *Forestiera acuminata* var. *parviflora* in synonymy of *F. neomexicana* and cited collections by "Fendler, C. Wright, Palmer, Brandegee." *Forestiera acuminata* var. *parviflora* and *F. neomexicana* are homotypic, and it is possible that Gray intended *F. neomexicana* to be a renaming of the earlier taxon at different rank.

The combination by Murray at varietal rank is illegitimate, as he should have used one of the epithets published much earlier by Asa Gray at varietal rank. Although both of Murray's combinations were published simultaneously, they are at different rank and the combination for subsp. *neomexicana* is legitimate (McNeill et al., 2006, Art. 34.2). Use of varietal rank follows precedents for Oleaceae in the United States and for Texas nomenclature (e.g., Turner et al., 2003).

Forestiera neomexicana A. Gray var. *arizonica* A. Gray, Syn. Fl. N. Amer. 2: 76. 1878. *Forestiera arizonica* (A. Gray) Rydb., Amer. Botanist (Binghamton) 27: 62. 1921. TYPE: **UNITED STATES**. **Arizona**. [**Prescott County**]: Near Prescott, April 1876, *E. Palmer 580* (HOLOTYPE: GH; ISOTYPES: F-digital image!, MO!, NY-3 sheets-digital images!, US-digital image!). The type is a plant with leaves hirtellous on both surfaces.

BRANCHLETS glabrous, rarely hirtellous. LEAF BLADES mostly rhombic-elliptic to rhombic oblanceolate, 1.5–4(–6) cm × 0.5–2(–3) cm, relatively thick to coriaceous, glabrous, less commonly hirtellous to hirsutulous on one or both surfaces, apices usually short-acuminate, much less commonly acute to obtuse, rounded, or retuse, bases long-attenuate.

Flowering Mar–Apr(–Jul), fruits maturing May–Sep(–Oct). Stream and river banks, canyons and arroyos, rock outcrops and talus, dry stream beds, alkali marshes, salt lake edges, salt flats, gypsum flats, dry limestone hills, volcanic cliffs, lava beds, cottonwood-ash-maple riparian, pinyon-juniper woodland; (100–)1100–2200 m; Arizona, California, Colorado, Nevada, New Mexico, Oklahoma, Texas, Utah; Mexico (Baja California, Chihuahua, Coahuila, Durango, Sonora).

A single collection of *Forestiera pubescens* var. *parviflora* is recorded here from Oklahoma (Fig. 2). Roger Mills Co.: 3 mi S, 2.5 mi W of Cheyenne, densely wooded floodplain forest along Sergeant Major Creek, 625 m, 31 May 2001, *Morse 6380* with Freeman (TEX). The adaxial leaf surfaces are moderately short-villous.

Leaf shape is the most consistent character in distinguishing the two geographic entities of *Forestiera pubescens*. In general, the western plants (var. *parviflora*) are less variable in shape and vestiture than var. *pubescens*. Both taxa, as identified here by leaf shape, occur in Randall Co., Texas (Palo Duro Canyon): var. *pubescens* (*Thomas 53294*, NLU); var. *parviflora* (*Taylor 10114*, NLU).

In both *Forestiera pubescens* var. *pubescens* and var. *parviflora* leaf surfaces may be hairy or completely glabrous, and absence (loss) of vestiture appears to be abrupt and complete. The same pattern of variation occurs within other species of the genus (e.g., *F. ligustrina* (Michx.) Poir., *F. angustifolia* Torr., *F. phillyreoides* (Benth.) Torr.). Within the range of typical *F. pubescens*, glabrous-leaved plants (var. *glabrifolia* Shinners) occur with regularity throughout the range, as mapped in Fig. 2. They have been observed and collected in Texas populations with typically hairy-leaved plants, e.g., **Cooke Co.**: glabrous—*Shinners 12443* (SMU); hairy— *Shinners 12442* (SMU); **Crockett Co.**: glabrous—*Turner & Warnock 255* (SMU); hairy— *Turner & Warnock 256* and *257* (SMU); **Palo Pinto Co.**: glabrous—*Shinners 13164* (SMU); hairy—label of 13164 notes "growing with var. *pubescens*;" **Potter Co.**: glabrous— *Nesom & O'Kennon 935*

(BRIT); hairy— *Nesom & O'Kennon 936* (BRIT); **Randall Co.**: glabrous—*Taylor 10114* (NLU); hairy— *Taylor 10114* (BRIT); **Somervell Co.**: glabrous—*Shinners 12155* (SMU); hairy— *Shinners 12154* (SMU); Sutton Co.: glabrous—*Johnston 5262* (TEX); hairy—*Johnston 5261* (TEX).

Glabrous leaves are modal for *Forestiera pubescens* var. *parviflora*, but at least in Texas, New Mexico, Arizona, and California, hairy-leaved plants occur in the range of plants with glabrous, typically shaped leaves. *Forestiera neomexicana* var. *arizonica* A. Gray was based on a plant with pubescent leaves. Plants of *F. pubescens* var. *parviflora* with pubescent leaves are shown in photos of "*Forestiera pubescens*" on the Northern Arizona Flora web site (www.nazflora.org) and on the Calflora web site (http://ucjeps.berkeley.edu/cgi-bin/get_cpn.pl?25982).

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