



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

ECOLOGICAL SERVICES
3616 W. Thomas, Suite 6
Phoenix, Arizona 85019

September 27, 1988

N1621

MEMORANDUM

TO: Superintendent, Wupatki National Monument, Flagstaff, Arizona
FROM: Field Supervisor
SUBJECT: Status Reports for Rare Plant Species

Attached for your information is a status report for a plant species that occurs or may occur on land managed by the National Park Service. The Fish and Wildlife Service (Service) currently classifies this plant as a category 2 species, which includes those species for which the Service has insufficient information to warrant listing them as threatened or endangered. In the near future, our Service will be reviewing this and other biological information on this species. If the available information indicates that a change in candidate status is necessary, we will make the change and advise you.

If you have additional information that is not contained in this report, please let us know. If we may be of further assistance, please contact Sue Rutman (Endangered Species Botanist) or me (Telephone: 602/261-4720 or FTS 261-4720).

Sam F. Spiller

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Attachment

cc: Regional Director, Fish and Wildlife Service, Albuquerque, New Mexico
(Fish and Wildlife Enhancement) (Attn: Endangered Species Division)
Regional Director, National Park Service, San Francisco, California
Regional Director, National Park Service, Santa Fe, New Mexico

STATUS REPORT

TAXON : Amsonia peeblesii R.E. Woodson.

ENGLISH NAME : - Peebles Blue Star.

FAMILY : Apocynaceae, the Dogbane Family.

STATE(S)/NATIONS(S) WHERE : Arizona; United States.
TAXON OCCURS

CURRENT FEDERAL STATUS : Candidate Category 2.

AUTHOR : Frank W. Reichenbacher

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20181-0276-5

DATE : 1 March 1986

AGENCY FOR FURTHER INFORMATION: Endangered Species Botanist
U.S. Fish and Wildlife Service
P.O. Box 1306
Albuquerque, New Mexico 87103

CLASSIFICATION AND NOMENCLATURE

SCIENTIFIC NAME

Amsonia peeblesii R.E. Woodson.

ORIGINAL PUBLICATION

Woodson, Robert E., Jr.
1936 Additions to the genus Amsonia. Bull. Torrey Bot. Club.
36:35-36.

TYPE SPECIMEN

MBG -- T.H. Kearney & R.H. Peebles 9568. 27 May 1934. Near Leupp.
Coconino Co., Arizona.

SYNONYMS

None.

ENGLISH NAME

Peebles Blue Star.

SIZE OF GENUS

Woodson (1928) -- 19 species.
McLaughlin (1982) -- 16 species.

FAMILY

Apocynaceae, the Dogbane Family.

PLANT GROUP

Class -- Angiospermae.
Subclass -- Dicotyledoneae.

ALTERNATIVE TAXONOMIC TREATMENT

None, although non-fruiting A. peeblesii specimens have often been mistaken for the glabrous form of A. tomentosa var. stenophylla (= A. eastwoodiana).

TAXON HISTORY

Robert E. Woodson's (1936) description was based on a specimen collected by Thomas H. Kearney and Robert H. Peebles near Leupp in 1934. He notes that a specimen was collected by Susan D. McKelvey near Cameron around the time of his publication. Her specimen did not turn up during our herbarium search. An A. peeblesii specimen was collected long before then, by Marcus E. Jones in 1890 near Lee's Ferry (mislabelled A. palmeri). C. Hope, C.J. King, and H.V. Harlan collected an A. peeblesii specimen south of Leupp about one week before Kearney and Peebles collected theirs. The following season it was collected several more times in the Cameron region by Leslie Goodding, A.F. Whiting, and Peebles and H.J. Fulton. Then D.J. Jones collected it three times in two places on Wupatki National Monument in 1939. From then on it was collected sporadically in widely scattered localities stretching from the town of St. John's (Apache Co.) northwest to Cameron. A distance of about 150 miles. Many localities were discovered in the late 1970's and the early 1980's as a result of Bureau of Land Management surveys.

McLaughlin (1982) found numerous A. peeblesii specimens labelled as A. tomentosa var. stenophylla or A. eastwoodiana. He speculates that P.A. Rydberg (1913) described A. eastwoodiana on the basis of a specimen from Utah in fruit and then from a specimen from Arizona with flowers. The former specimen is clearly A. eastwoodiana but the latter specimen turned out to be what Woodson later described as A. peeblesii. This caused great confusion since incorrect flower and fruit dimensions for A. eastwoodiana were given in the keys in Woodson (1928 & 1938) and Kearney and Peebles (1960).

PRESENT LEGAL STATUS

INTERNATIONAL

None.

FEDERAL

U.S. Forest Service, Region Three, Sensitive Plant List
Dated November, 1985.

U.S. Bureau of Land Management, Sensitive Plant List,
Dated November, 1985.

U.S. Fish and Wildlife Service
1980 Notice of Review (45 FR 82480): Category 2.
1985 Notice of Review (50 FR 39526): Category 2

STATE

Not included in the Arizona Native Plant Law (Ariz. Rev. Statutes Chapt. 7)

DESCRIPTION (Fig. 1)

NON-TECHNICAL

A green leafy plant, 6 in. to 35 in. tall, composed of a loose clusters of a few spare stems or robust clumps of hundreds of stems, eight feet or more across. Leaves, stems, and flowers are completely hairless. Leaves are 2.5 in. to 4 in. long; the lower leaves are 0.13-0.5 in. wide while the upper leaves are only from 0.03-0.06 in. wide. The lobes of the calyx are blunt or sometimes thin and pointed, about 0.25 in. long. The flower is trumpet-shaped, with a narrow tube that flares abruptly at the open end; it is white or light blue; the tube is slightly swollen just below the flared oblong lobes of the flower; the whole flower is 0.5-0.75 in. long and the individual lobes are 0.25-0.4 in. long. Most members of the Dogbane Family and all Amsonia produce a pair of unique fruits called follicles. In the case of Amsonia they are long thin cylinders, 0.75-4 in. long, borne erect on the stem and contain oblong corky seeds about 0.4 long and about 0.6 in. across.

TECHNICAL

Herbaceous perennial, glabrous, 40-90 cm tall; lower leaves oblong-linear, 4-9 mm wide; upper leaves linear, 1-2 mm wide; calyx lobes ovate to linear, 2-7 mm long; corolla tube 13-19 mm long, broadest below the apex, slightly constricted at the orifice, lobes 5-10 mm long; follicles 2-10 cm long; seeds cylindrical, corky, 8-11 mm long, 1.5-2.5 mm broad (excerpted from McLaughlin, 1982).

LOCAL FIELD CHARACTERS

Amsonia peeblesii is a bright green herb with bright white or light blue flowers and distinctive follicles. As discussed above A. peeblesii is easily confused with the glabrous form of A. tomentosa var. stenophylla. The former possesses much larger flowers than the latter (13-19mm long vs. 7-12mm long) and the follicles of the former are smoothly cylindrical while follicles of the latter are moderately constricted between the seeds.

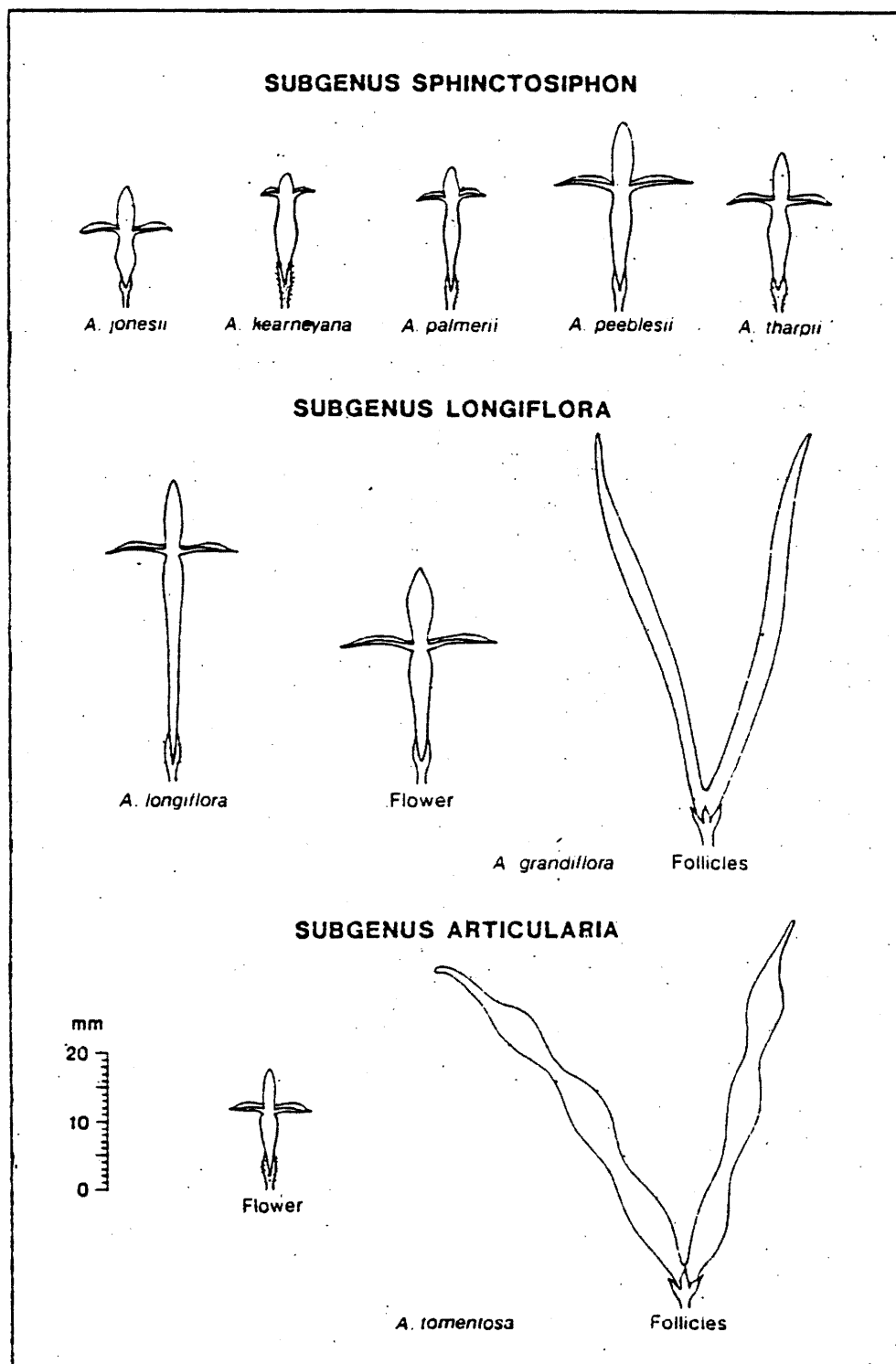


Figure 1. Corollas and follicles of the southwestern species of Amsonia. Follicles of subgenus Sphinctosiphon are similar to that illustrated for subgenus Longiflora. (from McLaughlin, 1982)

PHOTOGRAPHS AND/OR LINE DRAWINGS

McLaughlin (1982) drawing: p. 337, Fig. 1 (flower only).

SIGNIFICANCE OF TAXON

NATURAL

Largely unknown. Amsonia peeblesii is a relatively distinctive species in a genus which is characterized by imperfect reproductive barriers between taxa and/or extreme phenotypic variability. Some of the rare Amsonia taxa may represent recent evolutionary advances while others may represent fragmentation of formerly larger distributions. The wide distribution of A. peeblesii appears to be broken up into numerous isolated populations.

The pollinators of Amsonia are unknown. McLaughlin (pers. comm., 1986) speculates that the white color and tubular shape of the corolla indicates pollination by hawk moths (Sphingidae).

HUMAN

None known.

GEOGRAPHICAL DISTRIBUTION (Fig. 2)

RANGE

Apache, Navajo, and Coconino Counties. Known only from northern Arizona. Except for the Lee's Ferry collection, the plant occurs entirely within the Little Colorado River Valley. Elevations range from 4000 to 5620 ft. Important concentrations of the species are in the Cameron area of Coconino County and in the Holbrook area of Navajo County.

PRECISE OCCURRENCES

Populations Currently or Recently Known Extant

1. ARIZONA: Navajo Co.: Low flat hills overlooking Tanner Wash from the N; about 3 mi up from Little Colorado River; 3.5 mi E of Joseph City; greenish sandstone outcrops with eroded conglomerate becoming gravel; soil pH 8.6; Desert Shrub -- Gutierrezia, Artemisia, Ephedra, Atriplex, Coldenia, Euphorbia, Zinnia, Aster, Hilaria; light use by cattle; approx. 1 plant/5 m² in 100

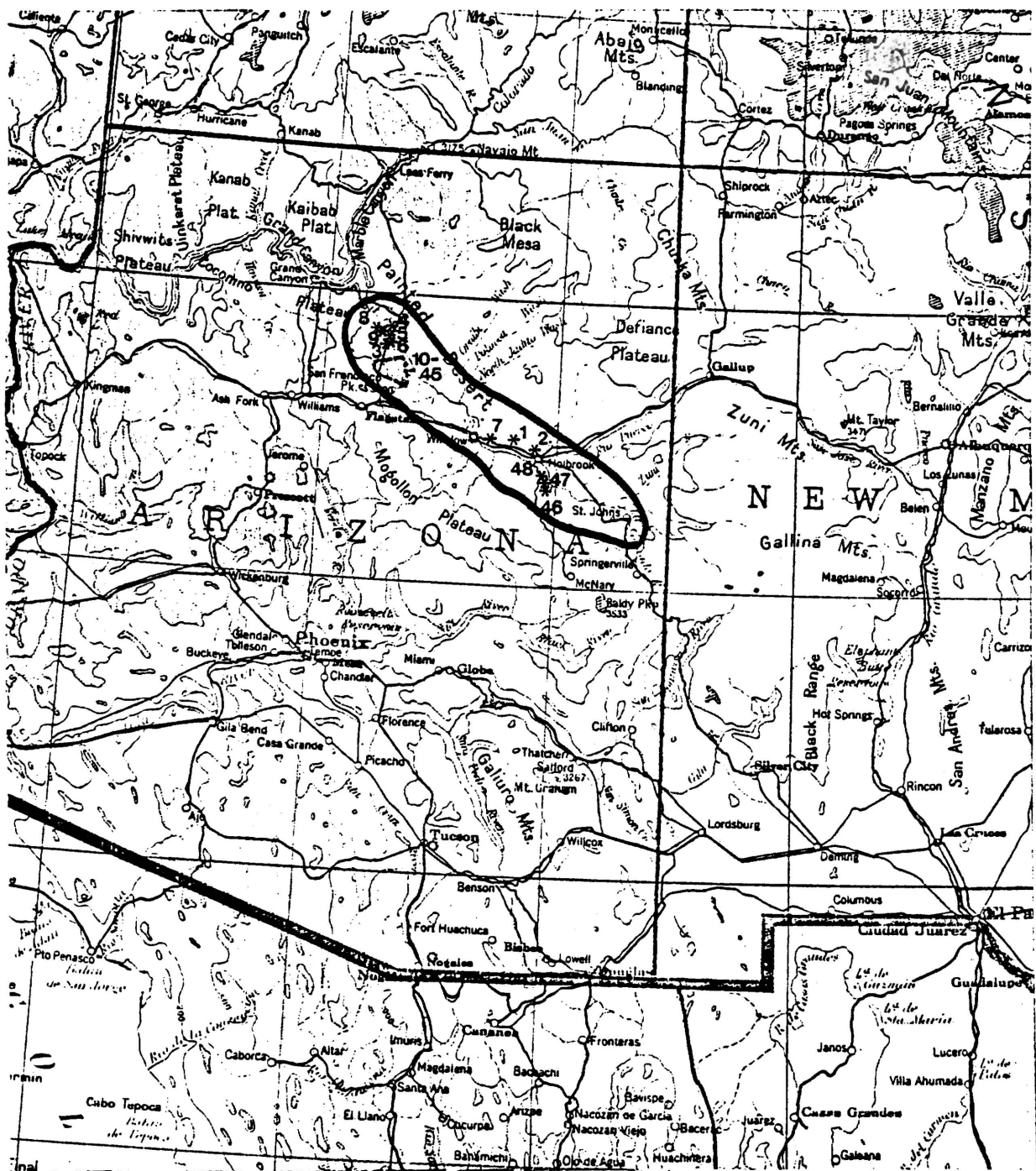


Figure 2. Distribution and occurrence of *Amsonia peeblesii*. Numbered asterisks refer to the list under "PRECISE OCCURRENCES". The eastern boundary was extended to include the St. John's specimen mentioned in Kearney & Peebles (1960), but was not extended north to include the Marcus Jones collection at Lee's Ferry on the recommendation of McLaughlin (pers. comm., 1986).

meter area; population appears healthy, several age classes seen. 17 June 1976; B.C. Johnston; 5085 ft.; T18N R19E Sec. 18 SE¼ of SW¼. Incorrect township section no., undoubtedly the same locality as the following.

ARIZONA: Navajo Co.: Northeast of Joseph City; 6 plants observed; desert scrub -- Ephedra, Gutierrezia, Eriogonum, Yucca, Erazur-
izia; silty Chinle Formation; plants growing along edge of rut road and are endangered of being driven on (flag placed near population). 1 August 1984; Mark Mohlenbrock; 5300 ft.; T18N R19E Sec. 12 NE¼. BLM, Phoenix District.

2. ARIZONA: Navajo Co.: Herbaceous root perennial, flowers white; gravelly hilltops on west side of Leroux Wash above Hidden Cove Municipal Golf Course and Holbrook sewage ponds; ?desert grassland -- Ephedra torreyana, Chrysothamnus, Hymenopappus, Gutierrezia, Cryptantha, Tiquilia latior, Arenaria, Yucca angustissima, Atriplex, Pediocactus; light cattle grazing; flowers & small fruits; >100 plants, locally common on gravelly hilltops; level to gently sloping NE exposure. 1 June 1981; T.R. Van Devender & M. Butterwick; T18N R20E Sec. 34 NE¼. Private land.

ARIZONA: Navajo Co.: About 0.25 mi., by air, due west of Holbrook Municipal Golf Course at southeast edge of partially abandoned gravel pit. Shinarump Conglomerate, Great Basin Shrub-Grassland; 68 plants counted N & NE-facing slope (only part of population), mean height of 68 plants = 7.4 in., mean minimum horizontal width = 6.5 in., mean maximum horizontal width = 8.9 in.; excavated five plants, no evidence of subsurface suckering. 11 May 1985; F.W. Reichenbacher & Tom Wilson; 5200 ft.; T18N R20E Sec. 34 NE¼. Private land.

3. ARIZONA: Coconino Co.: Herbaceous root perennial, 2.2 miles north of Gray Mountain on U.S. Route 89, in limestone canyon at bottom of drainage west of highway; Great Basin Desertscrub -- Fallugia paradoxa, Gutierrezia, Artemisia dracunculus, Rhus trilobata, Ephedra torreyana, Echinocactus polycephalus, Artemisia nova; heavy grazing by Navajo livestock but no apparent impact on plants; 2 adult plants observed. 31 May 1981; T.R. Van Devender; El. 4580 ft.; T28N R9E Sec. 29 SW¼. Navajo Indian Reservation, Coconino Co., Arizona. Bureau of Indian Affairs land.
4. ARIZONA: Coconino Co.: Herbaceous root perennial, Navajo Indian Reservation, 1.2 miles south of Buck Rogers Trading Post (about 1.7 miles south of Arizona Highway 64) on U.S. Route 89, in wash cut in Moenkopi Formation sandstone; Great Basin Desertscrub -- Atriplex confertifolia, Gutierrezia, Chrysothamnus, Amsonia tomentosa, stenophylla, Fallugia paradoxa, Encelia frutescens, Rhus trilobata, Brickellia, Ephedra torreyana, Yucca angustissima; heavy grazing by Navajo livestock; a single adult plant. 31 May 1981; T.R. Van Devender; 4500 ft.; T28N R9E Sec. 4 NW¼ of NE¼; Navajo Indian Reservation, Coconino Co., Arizona. Bureau of Indian Affairs land.

5. ARIZONA: Coconino Co.: 8 miles south of junction of Highways 64 and 89, sandy wash with Lycium, Atriplex. 13 May 1979. S. Sutherland. 4500 ft. Navajo Indian Reservation, Coconino Co., Arizona. Bureau of Indian Affairs land.
6. ARIZONA: Coconino Co.: 3.6 miles north of Gray Mountain, wash on east side of U.S. Highway 89. 14 June 1979; S.P. McLaughlin, J. Bowers, S.D. Sutherland; 4500 ft.; Navajo Indian Reservation, Coconino Co., Arizona. Bureau of Indian Affairs land.
7. ARIZONA: Navajo Co.: North of Interstate 40 between Hibbard and Winslow; over 30 plants observed; Desert Scrub -- Ephedra, Atriplex canescens, Atriplex confertifolia, Eriogonum, Opuntia phaeacantha var. major, Gutierrezia, Sclerocactus whipplei; Shinarump conglomerate, growing on steeper slopes in bloom and fruit. 9 July 1984; Mark Mohlenbrock; 5040 ft.; T19N R17E Sec. 31 NE $\frac{1}{2}$. Private land.
8. ARIZONA: Coconino Co.: 2 miles NE [sic = NW] of Gray Mountain; bottom of rocky wash, several isolated scattered clumps in 100 yard stretch; robust clumps in full flower, no fruits April 16, fruits and flowers present May 26; grazing by horses and sheep, does not seem to disturb plants; Moenkopi sandstone, loam soil, pH 8.2; cold desert shrub -- Gutierrezia sarothrae, Atriplex confertifolia, Fallugia paradoxa, Lycium andersonii, Forestiera neomexicana, Salsola kali, Tridens pulchellus; 5% slope. 16 April & 26 May 1977; James Rominger; 5000 ft.; T27N R8E Sec 1. Private land. Possibly the same locality as next.
9. ARIZONA: Coconino Co.: Dry wash just west of Gray Mtn. and north of dump; 8 in 70 m of wash, 50 m break then 5 in 20 m stretch, 120 m break then 3 clumps near section line [Navajo Indian Reservation boundary]; clumps were vigorous producing numerous flowering stems; previous years stems have been cut back and have burned tips; no fruit or seed; on gravelly alluvium from Kaibab limestone; cattle and horse grazing; Great Basin Desertscrub -- Fallugia paradoxa, Forsellesia spinescens, Bouteloua curtipendula, Gutierrezia sarothrae, Sporobolus airoides, Rhus trilobata. 8 May 1984; Mary Butterwick; (also 4 April 1985; F.W. Reichenbacher & Tom Wilson; plant just beginning to bud; many in wash bottom damaged by floodwaters) slope level 4960 ft.; T29N R9E Sec. 6 E $\frac{1}{2}$ of NW $\frac{1}{4}$. BLM, Phoenix District.

ARIZONA: Coconino Co.: Wupatki National Monument. Following localities are from several communications with Wupatki NM, particularly Steve Cinnamon, Resource Management Specialist (Cinnamon, pers. comm. 30 Nov 1982; Cinnamon, pers. comm., 12 July 1984); also from Henry L. Jones, pers. comm., 29 Nov 1982; and field surveys at a few of Cinnamon's sites by us. Specific soils data are unavailable for most of these populations. Some populations in the western half of the Monument lie on Quaternary lava flows and deep cinders, others in the western half lie on a layer of cinders, usually less than a foot deep on top of Kaibab limestone and sandy soils derived from Kaibab limestone. In the

Wupatki Basin area most populations lie on soils derived from Moenkopi Formation sandstones. In the southeastern portion of the Monument and adjacent areas there is a layer of cinders on the Moenkopi soils which in some areas is several feet deep.

10. Ca. 2.7 mi. east of U.S. Hwy. 89; about 200 plants along flats adjacent to Cedar Canyon; Plains Grassland -- Bouteloua curtipendula, Sporobolus airoides. 4 April 1985; F.W. Reichenbacher & Tom Wilson; 5360 ft.; T25N R8E Sec. 1 NE½ of SE½.
11. Ca. 1.5 mi. east of U.S. Hwy. 89; about 300 plants along wash bottom. 5440-5480 ft.; T25N R8E Sec. 2 SE½.
12. Ca. 0.25-0.75 mi. east of U.S. Hwy. 89; along wash bottom; 5560 ft.; T25N R8E Sec. 10 SE½ of SE½.
13. Ca. 1 mi. east of U.S. Hwy. 89; 70 plants in wash bottom; 5520 ft.; T25N R8E Sec. 11 NW½ of SW½.
14. Ca. 1.4 mi. east of U.S. Hwy. 89; 3 plants in wash bottom; 5530 ft.; T25N R8E Sec. 11 CTR of S½.
15. Ca. 2.5 mi. east of U.S. Hwy. 89; ca. 100+ plants along bottom Cedar Canyon; 5440 ft.; T25N R8E Sec. 12 SW½ of SE½.
16. Ca. 2 mi. east of U.S. Hwy. 89; 28 plants along Hulls Wash; 5520-5560 ft.; T25N R8E Sec. 14 E½ of SE½, Sec. 13 NW½ of NW½.
17. Ca. 2 mi. east of U.S. Hwy. 89; ca. 10 plants along bottom of Cedar Canyon; 5500 ft.; T25N R8E Sec. 13 N½ of NW½.
18. Ca. 2.4 mi. east of U.S. Hwy. 89; ca. 10-15 plants along small drainage; 5460 ft.; T25N R8E Sec. 13 N½.
19. Ca. 2.4 mi. east of U.S. Hwy. 89; along small drainage; 5500 ft.; T25N R8E Sec. 13 S½ of N½.
20. Below SW end of North Mesa; about 90 plants along wash; 5360 ft.; T25N R9E Sec. 5 N½.
21. Cedar Canyon bottom just north of Magnetic Mesa; 5360 ft.; T25N R9E Sec. 6 NW½ of SW½.
22. Just east of South Mesa along upper Citadel Wash; 5440 ft.; T25N R9E Sec. 7 SE½.
23. Wupatki Basin, just south of lower Citadel Wash along small drainage; 4620 ft.; T25N R10E Sec. 6 NE½ of NE½.
24. Wupatki Basin, between lower Citadel Wash and Antelope Wash along wash; 4700 ft.; T25N R10E Sec. 6 SW½ of SW½.
25. Wupatki Basin, Doney Mtn. Wash; 4700 ft.; T25N R10E Sec. 7 S½ &

Sec. 18 NW¼ of NE¼.

26. Wupatki Basin, between Antelope Wash and Deadman Wash; 4560 ft.; T25N R10E Sec. 8 S¼ of SE¼.
27. Wupatki Basin, just north of Deadman Wash; 4540 ft.; T25N R10E Sec. 16 CTR of NW¼.
28. Wupatki Basin, just north of Deadman Wash; 4600-4660 ft.; T25N R10E Sec. 16 W¼ of W¼ & Sec. 17 E¼.
29. Wupatki Basin, 1.5 mi. NE of Wupatki Ruin; 73 plants along small wash; 4760-4800 ft.; T25N R10E Sec. 19 NE¼ of NE¼ & Sec. 20 NW¼ of NW¼.
30. Wupatki Basin, just north of Deadman Wash; along small drainage; 4660 ft.; T25N R10E Sec. 20 NW¼ of NE¼.
31. Wupatki Basin, just north of Deadman Wash; 4660 ft.; T25N R10E Sec. 20 NE¼.
32. Wukoki Ruin, flat southeast of ruin and drainage northwest of ruin; about 20 plants; 4600-4620 ft.; T25N R10E Sec. 21 NW¼ of SE¼. Also recorded by D.J. Jones, 19 April 1939.
33. Kana a Wash, southern border of Monument; 1 plant; 4700 ft.; T25N R10E Sec. 28 SW¼ of SE¼.
34. Heiser Wash, southern border of Monument; 4800 ft.; T25N R10E Sec. 32 NW¼ of NE¼.
35. Between Kana a Wash and Heiser Wash, southern border of Monument; 4800 ft.; T25N R10E Sec. 32 SE¼ of NE¼.
36. Kana a Wash, southern border of Monument; 4800 ft.; T25N R10E Sec. 32 E¼ of SE¼.

Localities Adjacent to Wupatki NM, From Sources Given Above:

37. Ca. 0.7 mi. south of Wupatki NM turnoff on U.S. Hwy. 89, west side of hwy.; 7 clumps on northeast side of lava flow outcrop in deep black cinders; plants just starting to flower; growing through thick tangles of tumbleweed drift; clumps range from 15-36 in. in diam.; Plains Grassland -- Bouteloua curtipendula, B. eriopoda, and B. gracilis co-dominant, also Rhus trilobata. 4 April and 9 May 1985; F.W. Reichenbacher & Tom Wilson; 5620 ft.; T25N R8E NW¼ of NW¼. State Trust land.
38. Citadel Wash; 5200 ft.; T26N R10E Sec. 34 SE¼ of SE¼ & Sec. 35 SW¼ of SW¼. Approx. 1/2 State Trust land and 1/2 Private land.
39. Wupatki Basin, just north of Citadel Wash, along small drainage;

- 4600 ft.; T26N R10E Sec. 31 NE¼ of SE¼. Private land.
40. Kana a Wash, just south of southern border of Monument; 60-80 plants; 4780 ft.; T25N R10E Sec. 33 W¼. Private land.
 41. Flats adjacent to Kana a Wash, just south of southern border of Monument; 4840-4900 ft.; T24N R10E Sec. 5 W¼ of E¼. Private land.
 42. 0.8 mi., by paved road to Sunset Crater Nat'l. Mon., south of boundary fence of Wupatki Nat'l. Mon.; Great Basin Desertscrub, Artemisia & Chrysothamnus, on deep cinders; 21 clumps in area of ca. 1.5 acres; deep cinders on sand in bottom area; Mean height 21 plants = 19.8 in., mean minimum horizontal width = 59.9 in., mean maximum horizontal width = 90.5 in.; excavated one group of plants which appeared to be 4-8 separate plants, actually only 2-3 separate plants, roots descend deep (ca, 3-5 ft.), plants sucker off roots 6-18 in. beneath surface. 4 April & 9 May 1985; F.W. Reichenbacher & Tom Wilson; 4980 ft.; T24N R10E Sec. 8 SW¼ of SW¼ & Sec. 7 NE¼ of SE¼. (Probably the locality of D.J. Jones, "Coyote Spring, 5100 ft.", 6 May and 15 June 1939; J.E. Bowers, "Dark volcanic soil, Coyote Springs, south of Wupatki National Monument. 5000 ft. elevation." 13 April 1979; S.P. McLaughlin, J.E. Bowers, and S. Sutherland, "Coyote Springs, just south of Wupatki National Monument; with Fallugia paradoxa, Chrysothamnus nauseosus, Hilaria belangeri, Oryzopsis hymenoides. 5000 feet elevation. 15 June 1979".) Approx. 1/2 private land and 1/2 State Trust land.
 43. Flats adjacent to Kana a Wash, just south of southern border of Monument; 5000 ft.; T24N R10E Sec. 8 SE¼ of NW¼. State Trust land.
 44. Just west of Kana a Wash, south of southern border of Monument; 6 plants; 5100 ft.; T24N R10E Sec. 17 SW¼ of NNW¼. Private land.
 45. Along Kana a Wash, south of southern border of Monument; 5160 ft.; T24N R10E Sec. 17 S¼ of NW¼. Private land.
 46. ARIZONA: Navajo Co.: East base of Woodruff Butte, 3/4 mi. north of Woodruff center by main street, then left at fork for ¼ mi.; 1 plant on roadside; uncertain soil type probably derived from the basalts of Woodruff Butte; barren flats dominated by Gutierrezia sp. 11 May 1985; F.W. Reichenbacher & Tom Wilson; 5200 ft.; T16N R22E Sec. 8 CTR of E¼ of E¼. (Probably the locality of H.M., "Woodruff, six miles southwest of Snowflake", 26 July 1937; Larry Gardner, "1 mi. N of Woodruff. Near volcanic butte, abundant, w/ Sphaeralcea, flowers white, ca. 5200'"; and Charles Turley, "Moist soil; Woodruff [presumably in the Little Colorado R. floodplain which is very near our locality] 5570 ft. elev.") Private land.
 47. ARIZONA: Navajo Co.: Along roadside and in adjacent flats north of Woodruff Butte; 14 plants, many robust, in full flower; soils

derived from Moenkopi Formation sandstone; Great Basin Desert-scrub -- Artemisia sp., Gutierrezia sp., Oryzopsis hymenoides. 11 May 1985; F.W. Reichenbacher & Tom Wilson; 5210 ft.; T16N R22E Sec. 5 NW¼ of SE¼. Private land.

48. ARIZONA: Navajo Co.: In wash and in flats adjacent to wash; 2 plants in wash bottom and 2 plants adjacent; shallowly outcropping Moenkopi Formation sandstone boulders cover most of wash bottom; about 1.5 miles NW of Woodruff Butte; Great Basin Desertscrub -- Artemisia, Gutierrezia sp., Oryzopsis hymenoides. 11 May 1985; F.W. Reichenbacher & Tom Wilson; 5200 ft.; T17N R21E Sec. 36 SE¼ of SE¼. State Trust land.

Historically Known Populations Where Current Status Not Known

1. ARIZONA: Coconino Co.: 5 mi. N of Grand Falls; sandy wash. 20 May 1961; Delzie Demaree; 4300 ft.
2. ARIZONA: Coconino Co.: Near Lee's Ferry. 13 June 1890; M.E. Jones. McLaughlin (pers. comm., 1986) has not seen this specimen but is inclined to believe the plant is misidentified or that the locality data is erroneous.
3. ARIZONA: Navajo Co.: Clemen's Cattle Co., Winslow. 10 May 1962; C.C. Michaels; 5300 ft. [unable to locate Clemen's Cattle Co.]
4. ARIZONA: Coconino Co.: South of Leupp. 19 May 1934; C. Hope, C.J. King, H.V. Harlan.
5. ARIZONA: Coconino Co.: Near Leupp. 27 May 1934; T.H. Kearney & R.H. Peebles.

BIOGEOGRAPHY AND PHYLOGENY

Woodson (1928) discussed the phylogeny and biogeography Amsonia in some detail. He placed the genus in section Plumerioideae of Apocynaea on the basis of floral characteristics. The most closely related genus of Dogbane to Amsonia is Haplophyton, also a southwestern genus of perennial herbs. Woodson divided Amsonia into three subgenera while McLaughlin (1982) divided it into four subgenera. Woodson's subgenus Euamsonia (McLaughlin's subgenus Amsonia) has a trans-Pacific distribution with eight species in the southeastern U.S. and one species in Japan. This reflects the temperate mesophytic forest biogeography envisioned by Cain (1944). The other subgenera are endemic to the southwestern U.S. and northern Mexico. Amsonia peeblesii is placed in subgenus Sphinctosiphon by both Woodson and McLaughlin and both authors conclude that it is most closely related to A. palmeri. Sphinctosiphon is the largest southwestern subgenus recognized by McLaughlin and is distributed from West Texas to western Colorado, southeastern Utah, all of Arizona, and southwestern New

Mexico. A few A. palmeri specimens are known from northern Sonora and Chihuahua.

HABITAT DESCRIPTION

ENVIRONMENT AND HABITAT SUMMARY

Amsonia neeblesii is a plant of Great Basin environments in northern Arizona. Winter low temperatures of the Little Colorado River valley fall to as low as -20° F at Holbrook. The valley is north of the Mogollon Escarpment and east of the Kaibab and Coconino Plateaus, so it is very dry; mean annual precipitation is from 5-11 in.. The species is found in Plains Grassland, Great Basin Shrub-Grassland, and Great Basin Desertscrub communities (mostly the latter). Substrate types range from strongly alkaline sedimentary conglomerates to volcanic cinders.

PHYSICAL CHARACTERISTICS

Precipitation and Temperature

	Precipitation (inches)				Temperature (° F)	
	Mean Annual	Mean June-Sept.	June-Sept. of total	%	Mean temperatures July	January
COCONINO CO.						
Cameron	5.13	2.47	48.14		80.8	32.7
Gray Mtn. T.P.	5.15	2.21	42.91		--	--
Wupatki N.M.	7.14	4.32	60.50		80.0	34.9
Leupp	6.27	3.38	53.90		77.0	31.3
NAVAJO CO.						
Holbrook	7.37	3.89	52.78		77.4	18.5
APACHE CO.						
Saint Johns	10.63	5.78	54.37		90.9	48.5

From Sellers and Hill (1974)

Average Frost-free Season

Court (1974): 130-180 days.

Conway et al. (1963): 130-180 days.

Physiographic Province

Colorado Plateau, Canyon Lands Section, Grand Canyon Section, and Navajo Section (Hunt, 1967).

Edaphic Factors

Amsonia peeblesii occurs on several extremely different soil types. In the Cameron area it occurs on calcic soils derived from Kaibab limestone (Moore et al., 1960). The one pH from this area (Rowinger, 16 April 1977) is moderately alkaline at 8.2. Farther to the southeast it occurs on deep cinders deposited by Quaternary vulcanism of the San Francisco Volcanic Field (Moore et al., 1960). Sometimes these cinders only form a shallow layer over soils derived from Kaibab limestone or Moenkopi Formation sandstone. Most of the populations in the western half of Wupatki NM lie on cinders, a few are on Kaibab limestone soils. In the eastern half of the monument most lie on Moenkopi Formation soils but some in the southeastern corner are on very deep cinders. The historic localities in the Leupp area probably lay on Moenkopi soils, Shinarump Conglomerate soils, or on Chinle Formation soils (Moore et al., 1960). In the Joseph City and Holbrook regions the plant grows on soils derived from Shinarump Conglomerate (Wilson et al., 1960). Our only pH from this area (Johnston, 17 June 1976) is strongly alkaline at 8.6. Plants in the Woodruff area lie on soils derived from Moenkopi sandstone (Wilson et al., 1960).

Elevation

Mean elevation of 48 stations = 5007 ft.
Range = 4000-5620 ft.

BIOLOGICAL CHARACTERISTICS

Vegetation Physiognomy

Shrubland; widely scattered low shrubs (5-20% cover) with perennial grasses (0-10% cover). Shrub-grassland; widely scattered shrubs (5-20% cover) with perennial grasses (20-40% cover). Grassland; perennial grasses (30-70% cover) with shrubs less than 5% cover. Amsonia peeblesii occurs primarily in shrubland in the Cameron area and Wupatki NM with a few populations in grassland and a few in shrub-grassland. In the Joseph City-Holbrook area it occurs almost exclusively in shrub-grassland. Plants in the Woodruff area occur in shrubland.

Vegetation Type

- Bailey (1976) -- Colorado Plateau Province (P3130).
Kuchler (1966) -- K32, Great Basin sagebrush.
K47, Grama-galleta steppe.
Brown & Love (1980) -- 152.1, Great Basin Desertscrub.
142.1, Plains Grassland.
142.2, Great Basin Shrub-grassland.

Dominant and Co-Dominant Plants

Shrubs & leaf succulents -- Gutierrezia sarothrae
Gutierrezia sp.
Atriplex confertifolia
Fallugia paradoxa
Lycium andersonii
Forestiera neomexicana
Ephedra torreyana
Chrysothamnus sp.
Yucca angustissima
Artemisia nova
Rhus trilobata
Encelia frutescens

Perennial Grasses -- Bouteloua eriopoda
Bouteloua curtipendula
Bouteloua gracilis
Oryzopsis hymenoides
Hilaria jamesii
Tridens pulchellus
Sporobolus airoides

POPULATION BIOLOGY

Successional Relations

A few plants in the Woodruff area and apparently some of the plants discovered by Johnston near Joseph City are in road-cuts or on berms created by road-making. In the Cameron region most of the plants occur in bottoms of active drainages and are subject to periodic flood damage. Otherwise the species occurs in apparently climax communities.

Phenology

Plants we visited on 4 April 1985 were just beginning to leaf out and to produce flower buds at the same time. By May 9 1985 nearly all plants were in flower but only a tiny fraction had produced fruits. Other collectors report the following:

Buds -- Apr 4.

Flowers -- Apr 16, May 26, June 1, May 12, May 10,
June 17, May 19, June 18, June 2, May 15,
Apr 19, May 6, June 15, May 8.

Fruits -- May 26, June 1, May 31, Aug 20, July 10,
June 2, May 6, June 15.

Hybridization

Although Amsonia species can be highly variable in characters that seem to overlap frequently with each other A. peeblesii is apparently stable. We did not see any evidence of hybridization in the field, in fact the only Amsonia we saw was A. peeblesii. Van Devender (31 May 1981) recorded Amsonia tomentosa var. stenophylla with A. peeblesii but makes no mention of any possible hybrid offspring in the area.

Reproductive Biology

Little if anything is known about the reproductive biology of Amsonia. Presumably the long tubular white (occasionally very light blue) flowers are pollinated by sphinx moths (Sphingidae). The flowers are not protandrous so there is a possibility that the plants are self-fertile. Fruits set abundantly.

LAND OWNERSHIP AND MANAGEMENT

Ownership

Twenty-seven of 48 known extant Amsonia peeblesii localities occur on Wupatki National Monument. Of the remainder, 12 are on private land, 4 are on the Navajo Indian Reservation, 4 are on State Trust land, and 2 are on Bureau of Land Management lands.

Management

The Navajo Nation currently supports a rare plant, animal, and habitat data base in cooperation with The Nature Conservancy. This office is aware of the presence of Amsonia peeblesii on the Reservation (Donna House pers. comm., 1985). No tribal mechanism yet exists for the active management of these species and no activities specifically dealing with A. peeblesii are planned. The BLM has discovered several populations during its inventory process, again no active management is yet contemplated. Wupatki National Monument identified a number of populations during its inventory process and many others through the diligent efforts of Resource Management Specialist Steve Cinnamon. The Monument

considered the presence of an A. peeblesii population adjacent to a planned parking area at Wukoki Ruin but otherwise has not developed an active management plan for the species.

EVIDENCE OF THREATS TO SURVIVAL

Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The only clearcut instance of destruction of a population of Amsonia peeblesii known is at Woodruff Butte. Larry Gardner (12 May 1962, #205) specifically notes that the plant is abundant in the vicinity of Woodruff Butte. We had no trouble in finding a few scattered plants but it was clearly not abundant. It is likely that local residents have cleared vegetation for pasturage around the base of the butte or have temporarily detained large number of cattle in the area. Although Amsonia is extremely unpalatable to cattle the plants are probably easily destroyed by trampling.

The population northwest of Holbrook lies on the edge of a partially abandoned gravel pit. It presumably lies partly or perhaps entirely within the property of the gravel pit owners. We do not know if operations will eventually expand in the direction of the A. peeblesii.

Over-utilization for Commercial, Sporting, Scientific, or Educational Purposes

Herbarium specimens are occasionally collected by botanists but the plant is otherwise not utilized.

Disease or Predation

Although livestock may rarely sample the plant it is unpalatable and probably poisonous in large quantities.

Inadequacy of Existing Regulatory Mechanisms

Outright habitat destruction is the only known threat to Amsonia peeblesii. Most of the species range lies in remote or sparsely settled regions where such destruction is not likely to occur very often. Since the bulk of the known populations of the species is on Wupatki National Monument it is important that the Monument staff continue to include A. peeblesii in their process and give it a relatively high priority. Otherwise existing regulatory mechanisms appear to be adequate.

ASSESSMENT AND RECOMMENDATIONS

GENERAL ASSESSMENT

Amsonia peeblesii occurs in numerous, isolated, and relatively small populations of from one to several hundred plants in a large area of northern Arizona. It occurs on a variety of substrate types generally in desert scrub or shrub-grassland habitats. As far as is known half the species occurs on Wupatki National Monument. Although the plant is not at all cryptic, botanical documentation of the region is far from complete, particularly on the Navajo Indian Reservation. No systematic, broad-scale searches for the species have ever been undertaken. There are undoubtedly many undiscovered populations.

CONSERVATION AND RECOVERY RECOMMENDATIONS

Basic biological data is almost completely lacking for *Amsonia peeblesii*. Data on pollination biology and demographic data may provide some clues to explain the fact that the species only occurs in small isolated populations.

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HERBARIA CONSULTED

1. ASU 05796 -- Delzie Demaree 41158. 20 May 1961. 5 mi N of Grand Falls. Sandy wash. 4300 ft. Coconino Co., Arizona. As A. jonesii Woodson. (flowers)
2. ASU 05798 & 05795 -- Delzie Demaree 43991 & 43991 (same nos.). 15 May 1961. Wupatki Nat'l. Mon. Small sandy dry wash. Large clumps. 4850'. Coconino Co., Arizona. As A. jonesii Woodson. (flowers)

ARIZ 157083 & 157097 -- Delzie Demaree 43991 & 43991 (same nos.). Small sandy dry wash. Large clumps. Wupatki National Monument. El. 4850 ft. Coconino Co., Arizona.

3. ARIZ 224419 -- M.E. Jones. 13 June 1890. Near Lee's Ferry. As A. palmeri. Coconino Co., Arizona.
4. ASU 05802 -- Larry Gardner 205. 12 May 1962. 1 mi. N of Woodruff. Near volcanic butte, abundant, w/ Sphaeralcea, flowers white. ca. 5200'. Navajo Co., Arizona. (flowers)
5. ARIZ 147863 -- C.C. Michaels 2257. 10 May 1962. Clemens Cattle Co., Winslow. Elev. 5300 ft. Navajo Co., Arizona. (flowers)
6. ARIZ 86294 -- Charles Turley. 20 Aug 1952. Moist soil; Woodruff. 5570 ft. elev. Navajo Co., Arizona.
7. UTC 146224 -- B.C. Johnston. 17 June 1976. Low flat hills overlooking Tanner Wash from the N; about 3mi up from Little Colorado River; 3.5 mi E of Joseph City. Greenish sandstone outcrops with eroded conglomerate becoming gravel. T18N R19E Sec. 18 [sic probably Sec. 12] SE¼ of SW¼. 1550m. Navajo Co., Arizona. (flowers)
8. ARIZ 93090 -- C. Hope, C.J. King, H.V. Harlan 9393. 19 May 1934. South of Leupp. Coconino Co., Arizona. (flowers)
9. ARIZ 103028 & 103395 -- L.N. Goodding. 18 June 1935. Cameron region. Coconino Co., Arizona. (flowers)
10. ARIZ 93092 -- A.F. Whiting 756/1098. 10 July 1935. Road to Cameron; sandstone; frequent. Upper Sonoran Life Zone. Coconino Co., Arizona. (fruits)
11. ARIZ 93091 -- R.H. Peebles & H.J. Fulton 11810. 2 June 1935. 12 mi. S. of Cameron. 5050 ft. Coconino Co., Arizona. (flowers & fruits)
12. ARIZ 93087 -- D.J. Jones 16-1939. 19 April 1939. Near Wukoki (2 miles east of Wupatki Ruin). Wupatki Nat. Mon. Alt. 4900 ft. Coconino Co., Arizona. (fruits)
13. ARIZ 93088 -- D.J. Jones 1-1939. 6 May 1939. Coyote Spring. 5100 ft. Wupatki Nat. Mon. Coconino Co., Arizona. (flowers & fruits)
- ARIZ 93089 -- D.J. Jones 17-1939. 15 June 1939. Coyote Spring. Wupatki Nat. Mon. Coconino Co., Arizona. (flowers & fruits)
- PC 254755 -- David J. Jones. 6 May 1939. Coyote Spring, Wupatki National Monument. 5100 ft. elev. Coconino Co., Arizona. (flowers)
14. ARIZ 235730 -- T.R. Van Devender & M. Butterwick. 1 June 1981. Herbaceous root perennial, flowers white; gravelly hilltops on west side of Leroux Wash above Hidden Cove Municipal Golf Course. T18N R20E Sec. 4 NE¼. Navajo Co., Arizona.

ARIZ 257879 -- F.W. Reichenbacher 1711 & Tom Wilson. 11 May 1985.

About ¼ mi., by air, due west of Holbrook Municipal Golf at southeast edge of partially abandoned gravel pit. Shinarump Conglomerate, Great Basin Shrub-Grassland. T18N R20E Sec. 34 NE¼. El. 5200 ft.

15. ARIZ 32369 -- H.M. coll. 101. 26 July 1937. Woodruff, six miles southwest of Snowflake.
16. ARIZ 235729 -- T.R. Van Devender. 31 May 1981. Herbaceous root perennial; 2.2 miles north of Gray Mountain on U.S. Route 89. Along wash cut in limestone. T28N R9E Sec. 29 SW¼. Coconino Co., Arizona.
17. ARIZ 235728 -- T.R. Van Devender. 31 May 1981. Herbaceous root perennial; Navajo Indian Reservation, 1.2 miles south of Buck Rogers Trading Post (about 1.7 miles south of Arizona Highway 64) on U.S. Route 89. In wash cut in sandstone. 4500 feet elevation. T28N R9E Sec. 4 NW¼ of NE¼. Coconino Co., Arizona.
18. ARIZ 235431 -- S. Sutherland. 13 May 1979. 8 miles south of junction of Highways 64 and 89. Sandy wash with Lycium, Atriplex. 4500 feet elevation. Coconino Co., Arizona.
19. ARIZ 235427 -- J.E. Bowers. 13 April 1979. Dark volcanic soil, Coyote Springs, south of Wupatki National Monument. 5000 feet elevation. Coconino Co., Arizona.
20. ARIZ 235464 -- S.P. McLaughlin 2205, J.E. Bowers, S.D. Sutherland. 14 June 1979. 3.6 miles north of Grey Mountain, wash on east side of U.S. Highway 89. 4500 feet elevation. Coconino Co., Arizona.
21. ARIZ 235467 -- S.P. McLaughlin 2210, J.E. Bowers, S.D. Sutherland. 15 June 1979. Coyote Springs, just south of Wupatki National Monument; with Fallugia paradoxa, Chrysothamnus nauseosus, Hilaria belangeri, Oryzopsis hymenoides. 5000 feet elevation. Coconino Co., Arizona.
22. ARIZ (not yet accessioned) -- F.W. Reichenbacher 1701 & Tom Wilson. 9 May 1985. 0.8 mi., by paved road to Sunset Crater Nat'l. Mon., south of boundary fence of Wupatki Nat'l. Mon. Great Basin Desertscrub, Artemisia & Chrysothamnus, on deep cinders. T24N R10E Sec. 8 SW¼ of SW¼. El. 4980 ft. Coconino Co., Arizona.
23. ? -- H.D. Ripley & Rupert C. Barneby 8449. "Near St. John's, Apache County (Kearney & Peebles, 1960).

FIELD RESEARCH

15 July 1984, 3-5 April 1985, 8-11 May 1985.

KNOWLEDGEABLE INDIVIDUALS

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APPENDIX

Areas Unsuccessfully Searched For Amsonia peeblesii

1. Grand Falls; Delzee Demaree (20 May 1961) locality. Searched by F.W. Reichenbacher, Tom Wilson & Donna House; none found. The locality data ("5 mi N of Grand Falls") was too vague to locate on the ground. Roads are very complex north of Grand Falls and several have been constructed since the early sixties.
2. Tanner Wash; Mark Mohlenbrock and B.C. Johnston localities. Johnston's locality data are apparently erroneous. We failed to note that his data reads "overlooking Tanner Wash from the N" which is impossible from the township section given, T18N R19E Sec. 18. An unsuccessful search for the plant was made.
3. Cursory searches from the road were made in the vicinity of Leupp, but locality data were too vague.

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Main stands of
Amsonia pettiblesii
in Wupatki National Mon.

