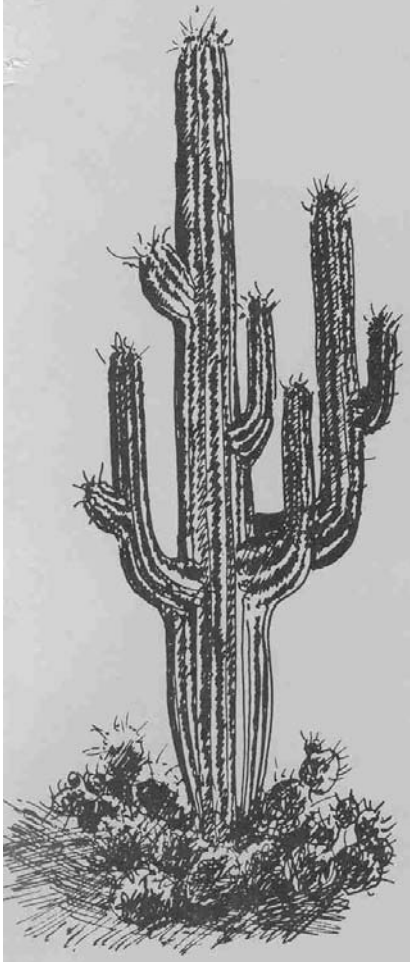

Cooperative National Park Resources Studies Unit

ARIZONA

TECHNICAL REPORT NO. 31

NON-NATIVE PLANTS OF ORGAN PIPE CACTUS NATIONAL MONUMENT, ARIZONA

by Richard S. Felger

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Tucson, Arizona 85721

Western Region
National Park Service
Department of the Interior
San Francisco, Ca. 94102

COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT
University of Arizona/Tucson - National Park Service

The Cooperative National Park Resources Studies Unit/University of Arizona (CPSU/UA) was established August 16, 1973. The unit is funded by the National Park Service and reports to the Western Regional Office, San Francisco; it is located on the campus of the University of Arizona and reports also to the Office of the Vice-President for Research. Administrative assistance is provided by the Western Archeological and Conservation Center, the School of Renewable Natural Resources, and the Department of Ecology and Evolutionary Biology. The unit's professional personnel hold adjunct faculty and/or research associate appointments with the University. The Materials and Ecological Testing Laboratory is maintained at the Western Archeological and Conservation Center, 1415 N. 6th Ave., Tucson, Arizona 85705.

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SCHOOL OF RENEWABLE NATURAL RESOURCES
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April 1990

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NON-NATIVE PLANTS
OF
ORGAN PIPE CACTUS NATIONAL MONUMENT,
ARIZONA

Richard S. Felger

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INTRODUCTION

The vascular (or seed) plant flora of Organ Pipe Cactus National Monument (ORPI) contains remarkably few species of non-native plants. A low percentage of non-native, introduced, or "exotic" plants indicates the habitat is relatively "natural," and as such can be used as an index of the condition of the vegetation. The present report includes 64 species possibly non-native to ORPI which have been documented from the monument or adjacent regions and. potentially present or invasive into the monument. In addition, a few species previously thought to be present and non-native to ORPI were found to be either native or possibly native or not present.

Bowers (1980) reported 522 taxa of vascular plants for ORPI, or about 518 species, of which about 5% were reported as introduced. Since then a few species listed by Bowers for ORPI are now known not to be present and additional species have been added to bring the total estimated flora to about 550 species (Pinkava et al., in prep.). The 64 species of potential non-natives is 11.6% of the total flora, but this is too high and misleading for a number of reasons. Some supposedly non-natives actually might be native, a few are present but not reproducing, and a number of them are present in adjacent Sonora but have not been documented for ORPI. Most significantly, a number of non-native species are not expected to persist in ORPI without continued immigration from adjacent disturbed habitats in Sonora. A non-native flora falling between 5% and 10% of the total flora speaks of a very healthy habitat, one indeed rare at the end of the 20th century. Comparisons with other floras are given below in Table 1.

Two categories of non-native species should be distinguished. Colonizing species are non-native plants invading and establishing on disturbed habitats. Invading species are those establishing among natural, non-disturbed habitats (Mooney and Drake 1986).

Table 1. Non-native species in Sonoran Desert floras.

Region	No. of non-native species	Percent of total flora	Sources
ORPI	47 64	8.5 11.6	Bowers, 1980. Felger, this report.
Gran Desierto (dune system of NW Sonora)	0	0	Felger, 1980.
Sierra del Rosario, NW Sonora	3	4	Felger, 1980; in prep.
All northwestern Sonora (incl. urban and agricultural areas)	74	16	Felger, in prep.
Tiburon Island, Gulf of California	4	1.5	Felger and Lowe, 1976.
Tumamoc Hill, Tucson	50	15	Bowers, 1985. Burgess et al., in prep.
Arizona, 1951	238	7	Kearney and Peebles, 1951.
Arizona, 1987	330	10	Burgess et al., in prep.
Sonoran Desert	146	5.7+	Felger, 1980. Wiggins, 1964.

DISCUSSION

The 62 species of potential non-natives for ORPI can be placed into 6 categories discussed below. Case by case documentation, description, and comments, are given in the species accounts (the species accounts are alphabetical by family and genus; a genus to family index is included at the end of this report).

1. Supposedly non-native but possibly native species. Included here are *Chenopodium murale, Eclipta prostrata, Erodium cicutarium,* and *Trianthema portulacastrum. Atriplex pacifica* represents something of an enigma; it might be a new immigrant (see species accounts). Another member of this group, *Plantago insularis* (Plantaginaceae), was reported as synonymous with *P. ovata* of the Old World and introduced in the New World (Bassett and Baum 1969). However, these are distinct taxa (Felger 1980; in prep.) and *P. insularis is* known from a number of pre-historic records (e.g., Van Devender 1987). *Polypogon viridis is* assumed to be an Old World species but there is plenty of room for doubt. *Bromus berterianus,* present at higher elevations in the Pinacate volcanic complex, should be sought in ORPI. It too has been reported as nonnative in North America but there is evidence to the contrary (Felger in prep.). In ORPI and nearby northwestern Sonora these species occur in natural habitats and some also occur in disturbed habitats.

2. Non-native species recorded from the monument but apparently no longer present include at least the following (Some of these are also included in the next category):

Amaranthus albus
A. blitoides
Avena fatua
Brassica nigra
Carthamus tinctorius
Linum usitatissimum
Poa annua

These plants have been documented for ORPI but seem to be no longer present. The amaranths probably owed their existence to cattle-influenced disturbances while *Poa annua* co-existed with people living at Quitobaquito. I expect that at least several other weedy species associated with the cattle operations were also present but were not documented (or I have not located such specimens). The flax *(Linum) was* probably an escape from cultivation in the region. The mustard *(Brassica nigra)* and safflower *(Carthamus)* seem to have been casual introductions that failed to establish. The *Avena* might still be present. Some, or any of these species, might reappear in the monument.

3. Introduced, purposely planted perennial plants persisting, but not capable of reproducing or propagating themselves. Include the edible fig (*Ficus carica)* and pomegranate *(Punica granatum).* These historic plantings at Quitobaquito are persisting but will not reproduce. Salt cedar trees *(Tamarix aphylla)* were planted at many of the old ranches. By the 1980s most of these salt cedar trees had perished. They will not reproduce here (see note for *T. ramosissima).*

The cottonwoods (*Populus fremontii)* might also be included here, but they may propagate by root shoots. During the mid-to-late 1980s, a few small fan palms *(Washingtonia)* were clandestinely planted at Quitobaquito. These plants were removed by ORPI staff. It is unknown if these palms would reach reproductive size.

4. A number of potential colonizing or invading species occur in adjacent regions but have not been documented from ORPI. The palm, *Washingtonia filifera,* and giant reedgrass, *Arundo donax,* are cultivated in Sonoyta. *Eragrostis lehmanniana* is a roadside weed at Why, north of the monument. The others are agricultural or urban weeds in the Sonoyta region and can be expected to turn up in ORPI within the next few years, although they might not persist in ORPI. Included here are:

Amaranthus albus
Arundo donax
Atriplex wrightii
Bassia hyssopifolia
Bromus catharticus
B. tectorum
Cleome viscosa
Echinochloa crusgalli
Eragrostis barrelieri
E. lehmanniana
Nicotiana glauca
Polygonum argyrocoleon
Rumex dentatus
Washingtonia filifera
Xanthium strumarium

Only four of these species are expected to be capable of becoming invading (persisting in natural habitats) within ORPI. Three of these are wetland plants: *Arundo, Rumex,* and *Washingtonia.* The *Rumex* poses no particular threat and the *Arundo* and *Washingtonia,* if they should become established, would be easy to control. *Eragrostis lehmanniana,* discussed below, is likely to spread into natural dryland habitats which is concern for serious impact. The others most likely would become colonizing species, immigrating into disturbed habitats, probably roadsides or roadside washes along the Sonora fenceline, and are not expected to establish or persist in natural areas away from disturbed habitats.

The most insidious potential source of non-native plants, one that should be regarded with alarm, are exotic grasses purposely introduced by the Soil Conservation Service of the USDA Plant Materials Center as range forage species (e.g., Tucson Plant Materials Center, 1988). One such grass, *Eragrostis Iehmanniana,* may soon enter the monument. Others, such as *Hyparrhenia hirta*, yet to be released by the Soil Conservation Service also pose great threat to the natural vegetation and flora of the Sonoran Desert. Dialogue should be initiated between the Park Service and Soil Conservation Service--here are actions of a federal agency seriously conflicting those of another federal agency.

5. Several documented immigrant species are well-established and have become thoroughly invading. They have become an integral part of the natural landscape and ecosystem of the monument as well as the surrounding regions. These species are not restricted, wholly or partly, to disturbed weedy habitats. These are species which are expected to remain an integral part of the flora even if all human disturbances were to be removed. In other words, their populations would out-last us.

Atriplex pacifica
Bromus rubens
Brassica tournefortii
Centaurea melitensis
Cynodon dactylon
Eragrostis cilianensis
Melilotus indicus
Pennisetum ciliare
Polypogon monspeliensis
P. viridis
Portulaca oleracea
Schismus barbatus
Tamarix ramosissima
Trianthema portulacastrum

6. In some cases, certain plants clearly have become colonizing and documentation is available. These are weedy non-native species established or occurring in disturbed habitats, but for the most part have not invaded or fully established themselves in natural habitats.

Conyza canadensis
C. coulteri
Chloris virgata
Eragrostis barrelieri
Eriochloa acuminata
Hordeum murinum glaucum
Lactuca serriola
Pennisetum setaceum
Phalaris minor
Salsola australis
Sonchus aspera
S. oleracea
Tribulus terrestris

SPECIES ACCOUNTS

Specimens have been studied at the herbaria of the University of Arizona (ARIZ), Organ Pipe Cactus National Monument (ORPI), San Diego Museum of Natural History (SD), and Arizona State University (ASU). The herbarium studies have provided significant historical depth.

Selected significant synonyms are given. Family names are conservative. Taxonomic decisions are mine, generally following that of the flora of the Pinacate Region (Felger, in prep.). Collection numbers under exsiccatae (herbarium specimens, or literally 'dried specimens') not identified with a collector's name are mine (Richard S. Felger); *s.n. (sine numero)* following a collector's name indicates no collection number and the specimen is identified by date of collection. All specimens are deposited at the University of Arizona Herbarium (ARIZ) unless otherwise indicated. In nearly every case, additional specimens are (or will be) deposited at the. herbarium at ORPI. The herbarium at Organ Pipe Cactus National Monument is identified as ORPI. All Sonora localities are located in the Pinacate-northwest Sonora region unless otherwise noted, and will be identified in the gazetteer and/or map to be included in *Plants of the Pinacate Region* (Felger, in prep.). All measurements such as those given for descriptions were taken from plants and specimens from the monument and adjacent area and/or nearby northwestern Sonora.

It should be noted that many of the characters and quantitative values or measurements are at variance with the published literature, or in some cases the plants have not been reported for ORPI or even in the regional floras. The plants are listed alphabetically by family, genus, and species (an index of genus to family is at the end of the report). Following the scientific name is the author(s) of that species, the common name in English if available, and then the common name in Spanish, if available. For O'odham names see Nabhan et al. (1982) and Felger et al. (in prep.), although native names are, obviously, often not available for recently introduced species.

AIZOACEAE - Iceplant Family

Trianthema portulacastrum L., Horse purslane, *Verdolaga de Cochi*

DESCRIPTION:

Hot-weather ephemerals. Stems becoming relatively weak and prostrate, often 15--60 cm long. Herbage semi-succulent, usually reddish green. Leaves opposite, petioled, the largest often 3--4.5 (-ca. 9) cm long on rank-growing, usually young plants; older plants with smaller, usually thicker and relatively narrower leaves, the blades obovate to orbicular. Expanded leaf-bases and stipules forming a membranous sheath around stem. Flowers solitary, sessile, partly enclosed by sheathing leaf base. Calyx lobes 5, petal-like, 2.3--12.5 mm long; "petals" absent. Fruit a circumscissile capsule, several-seeded; capsule lid hard and retaining 1 or more seeds, the others remaining in the basal portion, thus giving two possibilities for seed dispersal, seeds 2 mm long, black, kidney-shaped, dull, rough.

DISTRIBUTION:

Scattered in temporarily moist disturbed as well as natural areas, mostly in washes, low places in flats, alkaline flats, old fields, and near the springs and the pond at Quitobaquito. Common and widespread in the lowland desert in adjacent northwestern Sonora. Widespread and often weedy in the New and Old Worlds.

NOTES:

This species might have been introduced into the Americas since the time of Columbus. The genus includes about 20 species in the tropical and warm temperate regions of the old World and one species also occurs in the New World.

IMPACT AT ORPI:

Minimal, if indeed it is non-native.

EXSICCATAE:

Aguajita Wash, 88-431 (14 Sep 1988). Quitobaquito, Warren & Anderson *87-109* (24 Oct 1987, ARIZ, ORPI). Williams Spring, Van Devender s.n. (30 Aug 1978, ARIZ, ORPI). SONORA: Sonoyta, disturbed, weedy habitat, *85-942*.

AMARANTHACEAE - Amaranth Family

Amaranthus

Two native amaranth species are common and widespread at ORPI, *A. fimbriatus* and *A. palmeri*. The other two are known in the monument from only a single record each and are probably no longer present, but can be expected as occasional immigrants. Although *A. palmeri S.* Wats. is native, it is a weedy plant and thrives in disturbed as well as natural habitats. These four species can be distinguished by the following key:

1. Calyx urceolate (urn-shaped), the pistillate sepals spatulate, the claw (base) narrow; flowers in axillary clusters and dense, elongated terminal spikes: the species native.

    2. Plants monoecious; inflorescences "soft," the bracts not spiny or stiff; pistillate sepals fringed. *A. fimbriatus*

    2. Plants dioecious; inflorescence bracts and sepals stiff and often sharp; pistillate sepals not fringed. *A. palmeri*

1. Calyx not urceolate, the pistillate sepals not spatulate; flowers in axillary clusters only: non-native.

   3. Stems usually prostrate; sepals 3; seed 0.8 mm wide. *A. albus*

   3. Stems erect to ascending; sepals 4 or 5; seeds 1.5 mm wide. *A. blitoides*

Amaranthus albus L., pigweed, tumbleweed

SYNONYM:

A. graecizans of authors, not *A. graecizans L.*

DESCRIPTION:

Hot weather ephemeral weed, the mature plant often becoming a tumbleweed, reaching 1 m in height. Stems erect to ascending, yellowish at maturity. Inflorescences entirely of axillary clusters. Bracts stiff, sharp, more than twice as long as sepals. Plants monoecious; flowers greenish. Sepals of male and female flowers 3, those of female flowers not narrowed basally and nearly equal in size. Stamens 3. Utricle (the 1-seed dry fruit) dehiscent, the top falling away like a lid. Seed shiny, dark reddish-brown. 0.8 mm wide.

DISTRIBUTION:

Locally abundant as an agricultural weed and on abandoned farmland in the Sonoyta Valley. There is a single record (see below) from ORPI in 1939.

NOTES:

Since I have not seen it in northwestern Sonora except in agricultural areas, I doubt that it would persist among natural vegetation in ORPI should it get there. The single record in ORPI, in 1939, was at a time when cattle were grazing in the region and it has not been recorded since then in ORPI. I suspect that it grew in an area heavily impacted by cattle and/or horses; there is no indication that it became established. This species can be confused with *A. blitoides* (see below).

IMPACT AT ORPI:

I doubt that it will spread into ORPI, and if it does enter ORPI, it probably would not persist.

EXSICCATAE:

Alamo Canyon, Ajo Mountains, *Harbison s.n.* (13 Dec 1939, SD).

Amaranthus blitoides S. Wats.

SYNONYM:

A. graecizans of authors, not *A. graecizans L.*

DESCRIPTION:

Warm weather ephemeral.- Stems prostrate; herbage often reddish green (stems not yellowish). Plants monoecious. Sepals 4 or 5. Seeds black, ca. 1.5 mm wide.

DISTRIBUTION AND NOTES:

Reported by Bowers (1980:10) as *A. graecizans* L. from "roadsides and disturbed areas" at the Gray Ranch near the northern boundary of the monument. It has not been recorded since then from ORPI and I am confident that it is either not established or no longer present. Widespread in western North America; not native in southwestern Arizona. Not known for northwestern Sonora.

IMPACT AT ORPI:

Minimal: this amaranth probably would persist only in disturbed habitats.

CAPPARIDACEAE - Caper Family

Cleome viscosa L.

REFERENCES:

Holmes, 1981: Iltis, 1960.

DESCRIPTION:

Hot-weather annuals. Plants erect and tap-rooted. Herbage sticky glandular-pubescent. Inflorescence terminal with bright yellow flowers; petals 9--10 mm long, ovary elongated and densely studded with stalked glands, pedicels longer than flowers. Leaflets mostly about 3 cm long. "The plants... are coarse, viscid and strong smelling (somewhat with the odor of burning *Cannabis)* herbs characterized by their palmately compound leaves with five leaflets when mature. Flowers are yellow, with the bases of the petals and sepals being purplish" (Holmes 1981).

DISTRIBUTION:

This species seems to be spreading as a roadside and agricultural weed through much of western Sonora and at least the northwestern part of Sinaloa. In the Guaymas region and northwestern

Sinaloa it has become established in natural habitats. This species was not recorded for the Sonoran Desert by Wiggins (1964) ; Holmes (1981) reported it from the United States in Pennsylvania, New Jersey, Florida, and Louisiana.

This is one of three species of Old World weedy cleomes which have become established in the New World. It has recently been found along Mexico Highway 2.

NOTES:

It might become an agricultural weed in the Sonoyta region. Although it has not become established as a reproducing population in the region, its range is expanding in Sonora, and perhaps it will eventually be found along the southern border of ORPI, especially east of Lukeville.

IMPACT AT ORPI:

Even if it should become established as a weed in adjacent Sonora and occasionally spread into ORPI, I doubt that it would persist through drought years.

EXSICCATAE:

SONORA: 19.1 mi W of Sonoyta on Mex Hwy 2, roadside, not common, 86-338.

CHENOPODIACEAE - Goosefoot Family

Atriplex, Saltbush

Three herbaceous, annual and monoecious and often weedy atriplexes may be expected at ORPI, especially along the southern boundary. Atriplex pacifica is basically an early to late spring-fruiting plant, *A. elegans* fruits from spring to fall, and A. wrightii primarily fruits in fall; thus A. pacifica and A. wrightii are not expected to occur at the same time. *Atriplex elegans,* undoubtedly native to the region, is easily distinguished by its wheel-like fruit but the plants are similar in size and appearance to those of A. pacifica. *Atriplex wrightii* plants are often much larger, but the fruits are somewhat similar except larger and may have more teeth. These species may be keyed out as follows:

1. Fruiting bracts orbicular, evenly toothed all around margin. *A. elegans*

1. Fruiting bracts widest above middle, more or less truncate with coarse teeth arising above middle.

2. Stems upright, usually more than 40 cm tall; larger leaves more than 2.5 cm long, darker green above, grayish below; fruiting bracts more than 2.5 mm wide. *A. wrightii*

2. Stems upright to prostrate, less than 30 cm tall; leaves to 2 cm long, uniformly scurfy grayish on both surfaces; fruiting bracts 1.5 mm or less in width. *A. pacifica*

Atriplex pacifica A. Nels.

DESCRIPTION:

Winter-spring and early summer ephemeral. Plants often semi-succulent, densely short-branched, forming tangled masses. Highly variable in size, smaller plants upright, 5 cm tall, the larger ones spreading, to 40 cm wide. Leaves mostly elliptic, obovate, to oblanceolate, uniformly scurfy grayish on both surfaces, margins mostly entire, larger leaves 7--20 mm long; lower leaves sometimes petiolate. Fruiting bracts mostly obovate, (1.0-) 1.2--1.5 mm wide, truncate at tip, cuneate at base, with 3 or 5 apical teeth, the margins otherwise entire; face of bracts farinose (mealy), each usually with a median keel or ridge and often with a prominent tubercle on each side of the ridge.

DISTRIBUTION:

Arizona and Sonora along the roadsides, disturbed habitats, natural desert pavements, bajadas, and arroyo or wash beds. In Arizona it occurs in Organ Pipe Cactus National Monument and Cabeza Prieta Game Refuge and in Sonora from the Sonoyta Pinacate region and much further south at the coast between Puerto Libertad and El Desemboque San Ignacio. All Arizona and Sonora collections known to me are cited below. This species was long known only from the Pacific side of Baja California Sur northward to Los Angeles County in southern California and the Channel Islands: "Largely on sea bluffs; Coastal Sage Scrub" (Munz and Keck 1963:377). Unlike the Sonora and Arizona populations, those from the Pacific coast populations are extensive and the plants often relatively large, 30--100 cm in diameter, and abundant (Munz and Keck 1963:377). At ORPI it is known from Puerto Blanco Drive and at Quitobaquito where it occurs in alkaline flats, open areas of old fields, and open disturbed places near the pond.

NOTES:

The distribution of this species in Sonora and Arizona is very patchy and the populations tend to be small and localized, which hints at colonization by individual plants. The earliest collection from Arizona or Sonora is 1966. The available information indicates it might be a new invader (introduced by human agency?) from the Pacific coast where it is much more widespread. There is, however, a strong possibility that it is native to ORPI and northwestern Sonora and was simply not collected prior to 1966.

IMPACT AT ORPI:

Insignificant, if indeed it is non-native.

EXSICCATAE:

Puerto Blanco Drive, 7--10 mi W of Ariz Hwy 85: *Van Devender 85-8* (2 Mar 1985); *Bowers 1225* (11 Apr 1978), *1721* (10 May 1979). YUMA COUNTY: Cabeza Prieta Game Refuge, along Camino del Diablo: 6 mi E of Papago Well, *Eiber 7* (13 Mar 1983); 4 mi E of Papago Well, *Hodgson 2050* (17 Apr 1983); 18.3 mi E of Tule Well, *Hodgson 4120* (29 Apr 1986). SONORA: Pinacate Region: 38 km W of Sonoyta, localized colony, roadside in gravel soil, 85-715 (14 May 1985) ; 1.1 mi S of Los Vidrios, 84-41 (1984) ; Moon Crater, locally common at north rim on black lava pavement, rare elsewhere, *Larrea-Fouquieria* association, *19229* (21 Mar 1970) ; ca. 0.5 km E of Tinaja Tule, exposed desert pavement, *18744C* (9 Mar 1970) ; 1 mile NE of Tinaja Huarache, lava mesa with pavement, occasional along trail and exposed sites, scattered and localized colonies, *19188* (19 Mar 1970) ; Bajada at SE side of Sierra Blanca, *87-18* (27 Feb 1987). Las Cuevitas, between Puerto Libertad and El Desemboque San Ignacio, vicinity 29°40'N, 112°33'W, *14282* (17 May 1966).

Atriplex wrightii S. Wats.

DESCRIPTION:

Bushy annual, maturing from early summer to fall. Plants commonly 0.4--1 m tall. Leaves ovate, elliptic, elliptic-spatulate or narrowly oblanceolate, often 2.5--6 (-7) cm long, greenish above, grayish below, margins irregularly toothed, nerves prominent. Lower leaves often petiolate, upper leaves progressively shorter and narrower. Fruiting bracts more or less obdeltoid, 2.5--2.9 mm wide, with 5 or 7 terminal teeth.

DISTRIBUTION:

A common urban, agricultural, and roadside weed in the Sonoyta regions. Western Texas to central and southern Arizona and northern Sonora.

NOTES:

Not known from ORPI. Since this plant occurs in immediately adjacent Sonora only as a weed in disturbed habitats, I presume that it is not locally native.

IMPACT ON ORPI:

It is likely that it would immigrate into ORPI but probably would persist only in disturbed habitats.

EXSICCATAE:

SONORA: Sonoyta: sandy soil; disturbed weedy habitat, *85-928*; Presa Derivadora, dry hillslopes, *86-308*.

Bassia hyssopifolia (Pall.) O. Ktze., Smother-weed, Five-hook Bassia

DESCRIPTION:

Warm weather annuals, usually germinating in spring and maturing in fall. Plants leafy and erect with a well-developed main stem. Leaves alternate, narrow, flat, and entire. Stems and leaves with white hairs; stems becoming glabrous with age. Leaves flat, linear to linear lanceolate. Calyx lobes 5, armed with hooked spines at their tips--the hooks (on our specimens) evident even on young flowers. Fruit horizontal and discoid.

DISTRIBUTION:

In the Sonoyta region it is a very common agricultural weed and is also common in urban areas and sometimes along roadsides. I have not seen it in natural desert areas. Native to Eurasia and now a widespread weed in western North America since its reported introduction in Nevada around 1915.

NOTES:

Although not known from ORPI, it might eventually show up along roadsides along the southern border of the monument. It is elsewhere a tenacious weed; the hooked fruit is especially well-adapted to animal and human dispersal.

IMPACT AT ORPI:

Potential impact seems minimal since it does not seem to be able to establish in natural habitats in the region.

EXSICCATAE:

SONORA:. Vicinity of Sonoyta: *85-699; 86-303*.

Chenopodium murale L., Net-leaf Goosefoot

DESCRIPTION:

Winter-spring ephemerals, sometime persisting into summer in shaded habitats. Herbage often becoming semi-succulent and reddish, the stems occasionally red-striped. Leaves green or reddish green, glabrous to grayish-scurfy below, often 3--10 cm long; leaf blades mostly ovate to rhombic, irregularly toothed; petioles well developed. Sepals often keeled, mostly partially spreading at maturity to reveal part of seed. Seeds black and lens-shaped; margins acute with a conspicuous thin rim; seed surfaces mostly devoid of dried pericarp, mostly with minute papillae but not alveolate, dull even after removal of pericarp.

DISTRIBUTION:

Seasonally common, mostly along washes, in wet soil and disturbed areas. Along the southern border of the monument; canyons in the Ajo Mountains including Pitahaya Canyon, and at Quitobaquito near the pond and parking lot and beneath the cottonwoods, old fields, and alkaline flats. Commonly persisting through the summer in shade beneath the cottonwoods at Quitobaquito.

In northwestern Sonora mostly on disturbed soils as an urban and agricultural weed; and in areas of cattle grazing such as along gravelly washes, playas and waterholes. In the Sonoyta region, and in ORPI, occasionally in natural washes or arroyos.

Reputedly native to the Old World and thus supposedly adventive in North America--from Canada to Guatemala. It is rather widespread in the Sonoran Desert.

NOTES:

Although reportedly not native to the New World, in my opinion it may in fact be native. It has long been established on Isla Tiburón, where non-native species are so few as to be suspect unless well-documented as being not native. The seeds were an important food resource for the Seri Indians (Felger and Moser 1985). The Seri name for the plant is an unanalyzable primary lexeme (examples of such terms in English are dog, oak, or rat) and as such, indicates considerable time depth in the culture. These are not characteristics of a non-native plant. Seeds of this species were found in adobe bricks in Spanish colonial buildings in California constructed in 1797 (Hendrey and Bellue, 1925). The lens-shaped seed with its thin rim and dull surface is diagnostic.

IMPACT ON ORPI:

Inconsequential; it has been there a long time.

EXSICCATAE:

Aguajita Spring, *Warren s.n*. (10 Nov 1983). Quitobaquito: shade of cottonwoods near edge of pond, *86-208* (23 Jul 1986), *86-269* (13 Sep 1986); *Nichol s.n*. (28 Apr 1939, ORPI). ¼ mi W of Gachado line camp on Camino Dos Republicos, 1400 ft, *Bowers 1015* (27 Jan 1978).

Salsola australis R. Br., Tumbleweed, Russian Thistle, *Chamiso Volador*

SYNONYMS:

S. *iberica* Sen. & Pau
S. *kali* of authors, not L.
S. *kali* var. *tenuifolia* Tausch
S. *pestifer* A. Nels.

DESCRIPTION:

Warm-weather annual. Plants globose at maturity, breaking off at ground level to become tumbleweeds. Leaves linear to thread-like, semisucculent, nearly cylindrical, sharp-tipped, commonly 2--5 cm long: upper leaves stiffer, spinescent, and 1--2.5 cm long. Flowers in upper leaf axils, and subtended by ovate, spinescent bracts 5--8 mm long. Sepals pinkish to whitish, becoming winged in fruit.

DISTRIBUTION:

Widespread in the Sonoran Desert as a common weed in disturbed habitats, towns, farms, and along roadsides. Apparently not spreading into undisturbed, natural habitats. It is native to Eurasia and introduced and weedy in Australia as well in many other parts of the world where it has become a troublesome weed. In disturbed habitats it is difficult to eradicate because it thrives on disturbed soils.

In ORPI it is fairy common in disturbed areas, especially roadsides and at Quitobaquito infrequent in old fields and lower bajadas.

IMPACT AT ORPI:

Seasonally it can become unsightly along roadsides and a troublesome tumbleweed blowing onto highways and to a lesser extent along unpaved roads; but it otherwise poses little problem at ORPI.

EXSICCATAE:

Roadside, Puerto Blanco Dr., 10 mi W of Hwy 85, associated with *Atriplex polycarpa*, 1100 ft, *Bowers 1720* (10 May 1979, ORPI). Aguajita: Rare, roadside in sand soil, *88-407* (14 Sep 1988); infrequent, *89-240* (19 Jun 1989).

COMPOSITAE - Composite Family

Carthamus tinctorius L., Safflower, Cartamo

DESCRIPTION:

Annual, responding here more or less as a spring ephemeral. Spiny-leaved, erect-growing herb with bright orange thistle-like flower heads.

DISTRIBUTION AND NOTES:

Safflower is a commonly grown in Sonora as an oil-seed crop. Occasional plants are seen along Mexico Highway 2 between Sonoyta and San Luis Rio Colorado, usually in sandy soil at the roadside. These plants, probably the result of seeds spilling from truckloads of safflower, only

rarely seem to reproduce. On rare occasions, a few individuals turn up along, the southern boundary of ORPI.

IMPACT AT ORPI:

None.

EXSICCATAE:

W side of Quitobaquito, in shade of *Populus, Bowers 1717* (10 May 1979, ARIZ, ORPI).

Centaurea melitensis L., Yellow Star-thistle

DESCRIPTION:

Spring ephemerals, thistle-like plants to 1.5 m tall; deep-rooted. Stems narrowly winged from decurrent leaf bases. Leaves alternate, pinnatifid. Heads thistle-like, 1.6--2+ cm high, 2.5--2.8 cm wide including spines of bracts, or 1.2--1.5 cm wide not including spines. Phyllaries spine-tipped, the spines stout, straw-color to purplish, 6--8+ mm long, with 2--3 pairs of smaller lateral spines. Flowers yellow, all alike. Achenes grayish, pappus bristles present. Flowering in late spring and early summer.

DISTRIBUTION AND NOTES:

Seasonally abundant and well-established in the dense mesquite groves of old field below Quitobaquito pond; not seen elsewhere in ORPI. Also near Sonoyta in low, temporarily wet places and locally spreading along Highway 2; localized and not widespread --probably a fairly recent arrival in the region. Ball (1933) reported that it "was first introduced at Napa" and by that date it had already spread in central California. Wiggins (1964:1648) reported it in the Sonoran Desert only from Pima County in Arizona and Imperial County in California. It also occurs elsewhere in northwestern Sonora and in the desert in Pinal and Yuma counties in southern Arizona. This introduced, European weed, is now widespread in western North America and sporadically eastward, as well as in Argentina and other regions of the world.

NOTES:

This is a new record for ORPI. It is the only yellow-flowered thistle in the region.

IMPACT AT ORPI:

Although well-established, it does not seem to be spreading.

EXSICCATAE:

SONORA: 4.5 km W of Sonoyta on Mex Hwy 2, *86-149*. Quitobaquito, along old irrigation ditch [Sonora side of fence) in pomegranate grove below pond, locally common but not seen elsewhere, *89-251*.

OBSERVATIONS*:*

Quitobaquito, RSF (13 Sep 1986; 6 Apr 1988, dry, dead plants from previous seasons).

Conyza

Tap rooted annuals or perennials. Leaves alternate. Heads numerous, small and inconspicuous, of disk florets only or with very small, often minute and sometimes numerous rays (appearing discoid because the rays are so small); flowers whitish to purplish; pappus of a few fragile capillary bristles. Two weedy species occur in our region and can be distinguished by the following key:

1. Leaves linear, entire, or lower ones sometimes with a few shallow teeth herbage not glandular. C. *canadensis*
   1. Lower and middle stem leaves obovate, conspicuously toothed to coarsely pinnatifid; herbage usually glandular. *C. coulteri*

Conyza canadensis (L.) Cronq. var. **Glabrata** (A. Gray) Cronq. Horseweed

DESCRIPTION:

Mostly a summer-fall ephemeral here (elsewhere annual). A tall, slender, erect weed, often 1--2 m tall, and unbranched except terminal, flowering portion of plant. Leaves narrow, more than several times longer than wide

DISTRIBUTION:

Bowers (1980:44) reports that it occurs in ORPI in "gravelly and sandy flats, roadsides and disturbed areas: 305 to 610 m... abundant along the boundary road adjacent to farmland in Sonora." In northwestern Sonora this unattractive plant occurs as a common agricultural weed, or less commonly along roadsides and other disturbed habitats, mostly around Sonoyta. Although native to much of North America it is certainly not native to our region. It is a very widespread weed in the Americas and has spread to the Old World.

NOTES:

There are three weakly differentiated varieties, each with a large geographic range over a portion of North America. Var. glabrata, the common variety in temperate western North

America, is distinguished as follows: Stems nearly glabrous; leaf margins ciliate and strigose all around; bracts (phyllaries) narrow, the margins conspicuously scarious, and the tips usually not purple.

IMPACT AT ORPI:

It will probably not persist several drought years, and likely there is repeated re-invasion from the larger weedy population in adjacent Sonora. It probably will not establish in natural areas, at least not at low elevations.

EXSICCATAE:

SONORA: 5 km W of Sonoyta on Mex Hwy 2, disturbed roadside next to agricultural fields, *85-959*. Ca. 1 km W of Quitobaquito and 1 km S of Mex Hwy 2, *85-985*.

Conyza coulteri A. Gray

DESCRIPTION:

Summer-fall ephemerals or weeds in our region, commonly 50--60 cm tall. Herbage glandular-sticky. Lower leaves largest, 4--8+ cm long, 1.3--3 cm wide. Rays florets minute and numerous, the corollas greatly reduced.

DISTRIBUTION:

Rare or infrequent at ORPI: occasionally in wetland habitats such as at Quitobaquito. In nearby northwestern Sonora it is an agricultural weed in the Rio Sonoyta valley and commonly at abandoned fields, and sometimes extending into relatively natural vegetation such as along the Rio Sonoyta floodplain and at Playa Diaz. It is widespread in many life zones in. southwestern United States and through much of Mexico; weedy over much of its range.

NOTES:

This is a new record for ORPI.

IMPACT AT ORPI:

Minimal.

EXSICCATAE*:*

Quitobaquito, infrequent, *87-291* (10 Nov 1987*).* SONORA: abandoned farmland along Rio Sonoyta, 3.km S of El Papalote, *86-168*.

Eclipta prostrata (L.) Mart., False Daisy, *Chile de Agua*

Synonyms:

E. alba (L.) Hassk.
E. erecta L.

DESCRIPTION:

Delicate ephemeral or annual in the Sonoran Desert; apparently non-seasonal and flowering more or less continuously during warm weather and winter-dormant, or freeze-killed. Leaves sessile, mostly narrowly elliptic, 5--14 cm long, green, and thin; margins with forward-pointing widely spaced small teeth or serrations. Flower heads with numerous tiny white ray and yellowish disk florets.

DISTRIBUTION:

At Quitobaquito in wetland habitats and along irrigation ditches and the dam at Sonoyta, at Quitobaquito, and in irrigation ditches in the fields south of San Luis. Elsewhere in Sonora at widely scattered riparian habitats and as a weed in irrigation canals. Worldwide in warm, especially tropical regions.

NOTES:

It has probably been established at Quitobaquito for many years. In areas of high rainfall it can be a serious agricultural weed. *Eclipta prostrata* is the only New World member of the genus, and there are claims that it is not native to the New World--and such claims seem reasonable.

IMPACT AT ORPI:

Virtually none.

EXSICCATAE:

SONORA: Presa Derivadora, Sonoyta, *86-301*. Quitobaquito: *Hesselberg s.n.* (16 Oct 1966); *Hevly s.n.* (8 Oct 1960); *Lehto 5504; Niles 724* (Mar 1966*,* ARIZ, ORPI); *Ranzoni s.n.* (13 Jul 1962, ORPI).

Lactuca serriola L., Prickly Lettuce

DESCRIPTION:

Apparently a non-seasonal annual in our region, often growing in spring and persisting through the summer in wet, shaded places. Plants with milky sap; stems and midrib of lower leaf surface

often with stiff bristles or spines. Early leaves in a basal rosette, stem leaves alternate; leaves deeply pinnately lobed, the lobes often with short, broad white spine-tipped teeth. Heads small, of ligulate (ray-like) florets only. Achenes compressed, ribbed, narrowed at base and terminally beaked like a slender neck at top of achene just below pappus; beak of achene longer than body. Pappus deciduous, usually of silky white hairs.

DISTRIBUTION:

Weedy places around Sonoyta, and to be expected as an urban and agricultural weed anywhere in the region. Weed in many parts of the world; native to Europe. Bowers (1980:45) reported it in "sandy flats and roadsides; 305 to 610 m; roadside of Highway 85 ... and particularly abundant along the boundary road adjacent to farmland in Mexico." I did not see it there in 1987 and 1988. More than likely it is generally not well-established in ORPI and there are repeated re-invasions and temporarily established populations in the monument. I doubt that it would become permanently established in wholly natural areas in ORPI.

IMPACT AT ORPI:

Probably minimal.

EXSICCATAE:

Roadside weed, Puerto Blanco Drive, 3.4 mi E of turnoff to Senita Basin, 1400 ft, *Bowers 1756* (20 Jun 1979). SONORA: Presa Derivadora, Sonoyta, *86-306.*

Sonchus

The two species in our region may be keyed out as follows:

1. Achenes with longitudinal ribs but not transversely (cross) wrinkled-roughened (area between ribs is smooth); stems sometimes more than 1 m tall; plants noticeably spiny. *S. asper*

1. Mature achenes with longitudinal ribs and also transversely wrinkled-roughened (caution: may be difficult to see if achenes not mature); stems seldom reaching 1 m tall; plants not noticeably spiny. *S. oleraceus*

Sonchus asper (L.) Hill, Spiny Sow Thistle

DESCRIPTION:

Winter-spring ephemerals or annuals in our region. Plants with milky sap and a well-developed tap root. Mostly glabrous, larger plants conspicuously spiny-prickly, sometimes reaching 1.8 m in height. Stems hollow. Lower leaves pinnatifid and largest: first leaves in a rosette, lower stem

leaves petioled, upper leaves sessile and clasping the stem; lowermost leaf segments (basal auricles) of the stem leaves rounded (not acute). Heads with ligulate (ray-like) florets only. Achenes compressed but not beaked, light brown, noticeably flattened, with three prominent ridges on each side but the surface otherwise plain and smooth between the ridges, the margin thin and sort of winged. Pappus of numerous fine soft hairs, united in groups, almost always persistent, plus a few deciduous scales.

DISTRIBUTION:

Known from Quitobaquito and Aguajita in wet places: washes, wet soil near pond and springs, old fields, and less common on sandy flats, frequently under trees. It is expected elsewhere in ORPI in wetland habitats such as desert springs. In nearby northwestern Sonora it usually occurs in disturbed and often riparian habitats. *Sonchus asper* is a widespread and common weed naturalized in many parts of the world; native of Europe.

NOTES:

It probably has been present at Quitobaquito for a long time. It is not expected away from wetland habitats.

IMPACT AT ORPI:

Minimal.

EXSICCATAE:

Quitobaquito: *7661* (14 Apr 1963); *Adams s.n*. (18 Jun 1971, ORPI); *Bowers 1608* (30 Mar 1979, ORPI). SONORA: El Papalote, water seep at border [just S of Aguajita Spring], *86-100A* (9 Apr 1986).

Sonchus oleraceus L., Sow Thistle, *Chinita*

DESCRIPTION:

Responding here as cool-weather ephemerals. Somewhat similar to S. asper but in our region the plants usually smaller and much less robust., the lowermost leaf segments (basal auricles) of the stem leaves narrow-angled (acute), the achenes roughened between the ribs or veins (see key, above).

DISTRIBUTION:

Usually growing with S. asper in riparian habitats such as at Quitobaquito and Aguajita; also recorded at "Bates Well and along the southern boundary" (Bowers 1980:46). It does not seem to occur away from wetland habitats except in exceptionally favorable years. In adjacent northwestern Sonora it is a common weed in urban and agricultural areas. Native of

the Old World, now in most of the cultivated parts of the world and often a serious agricultural weed.

IMPACT AT ORPI:

Minimal.

EXSICCATAE:

Quitobaquito: *7654* (14 Apr 1963); *Bowers 1609* (30 Mar 1979). Weed in wash on Bates Well Road ca. 2 mi E of Bates Well, *Bowers 1594* (30 Mar 1979). Wash ca. 2½ mi by road W of 2-way section of Puerto Blanco Drive, 1400 ft, *Bowers 1213* (11 Apr 1978). Wash near Sonoyta road, *MacDougal 71* (10 Apr 1941). SONORA: El Papalote, water seep at border (immediately S of Aguajita Spring], *86-100B* (9 Apr 1986).

Xanthium strumarium L., Cocklebur

SYNONYMS:

X. *chinensis* Mill.
X. *orientale* L.
X. *pensylvanicum* Wallr.
X. *saccharatum* Wallr., etc.

DESCRIPTION:

Coarse annuals with stout taproots, often reaching ca. 1 m tall. Herbage resin-dotted and with rough hairs. Petioles often 3--10 cm long, as long or longer than blades; the blades mostly deltoid-ovate, often more or less 3-lobed, the margins toothed. Monoecious, heads unisexual with disk florets only; staminate heads above pistillate ones. Pistillate heads with 2 florets tightly enclosed by a prickly bur with hooked spines and usually 2 beaks, corolla and pappus absent. Mature burs (1.8-) 2.5--3.5 cm long, formed of fused bracts; stigmas protruding from the beaks. Cotyledons relatively large, dark green and fleshy.

DISTRIBUTION:

Common in disturbed places in and around Sonoyta, e.g., along the riverbed, roadsides, and as an urban and farm weed. Often growing with warm weather in spring or summer, with fruit maturing in early fall. Although common in disturbed habitats in northwestern Sonora it has not become established in natural habitats in that region.

NOTES:

Although not known from ORPI, it will probably turn up from time to time, especially along the border road east of Lukeville. This species is a worldwide weed in warm-temperate regions.

Probably native to the New World, members of this species complex are now dispersed worldwide as weeds. The burs cling tenaciously to clothing and fur, so that the original geographic distributions are difficult to determine.

IMPACT AT ORPI:

I doubt that it will become established in any natural habitat at ORPI.

EXSICCATAE:

SONORA: Sonoyta, *85-936*.

CRUCIFERAE - Mustard Family

REFERENCE:

Rollins, 1981.

Brassica nigra (L.) Koch, Black Mustard

DESCRIPTION:

A rank-growing spring ephemeral. Differing from *B*. *tournefortii* by its usually more crowded and bright yellow flowers, and less hairy herbage.

DISTRIBUTION:

Native to Europe; occasionally encountered along roadside in the Sonoran Desert but established as a member of the flora.

NOTES:

A single collection of this species was made in ORPI in 1941 (Bowers 1980:246). It has not been recorded in ORPI since and I have not found it in nearby northwestern Sonora

Brassica tournefortii Gouan., Wild Turnip

DESCRIPTION:

Spring ephemerals; coarse, highly variable but often rank-growing plants with a well-developed tap root. Lower part of plant usually hirsute. Leaves petiolate, in a basal rosette

(8-) 15--56 cm long. Inflorescence branched, reaching (15-) 30--100 cm tall. Petals, stamens, and stigma pale yellow; sepals pale, almost translucent, drab brownish-purple. Fruit 3--6 cm long (not including the conspicuous pedicel), ascending (not appressed to stem), beak well-developed, veins in valves conspicuous. Flowering February to May.

DISTRIBUTION:

Well established in diverse natural as well as disturbed habitats in southern Arizona, northwestern Sonora, southeastern California, and northwestern Baja California. It is common and well established in natural as well as disturbed habitats throughout much of ORPI, especially at lower elevations.

NOTES:

Native to North Africa and now widely naturalized in the Sonoran Desert, it has spread almost explosively into lowland desert regions, especially in places with sandy soils. Robbins et al. (1951:216) indicate it was well-established in the Coachella Valley by 1938 and that it was a contaminant in, Hubam Clover in the Imperial Valley in 1947. Collections from northwestern Sonora date from 1970 (although it was probably present earlier). The earliest record for it in Arizona is from Yuma in 1957 (below; also *see* Mason, 1960). By at least the 1980s it had become widespread and well established in the lowland desert of northern Baja California Norte, northwestern Sonora, southeastern California and southwestern Arizona. Robins et al. 1951:216) also report that "when wild turnip matures its heavy crop of seeds and becomes dry, it is easily snapped off ... and moves with the wind as a tumbleweed. While this strategy for seed dispersal may occur in open, sandy places, elsewhere it does not develop into tumbleweed.

The plants are incredibly variable with respect to size, depending upon soil moisture. Drought-stressed plants can reproduce with leaves as small as 8 cm long, or grow to more than 50 cm in length, giving the plant a one-meter spread.

IMPACT AT ORPI:

This species is often seasonally abundant, and it may reasonably be expected that it locally displaces some native spring ephemerals, especially along roadsides during favorable years when the plants are large and rank-growing. For sure it is an unattractive addition to the flora, and one that impacts visitors because of its abundance along roadsides where visitors see wildflower displays.

EXSICCATAE:

Quitobaquito, parking lot, with *Atriplex polycarpa* and *Suaeda torreyana, Bowers 1083 (28* Feb 1978). Roadside at Visitor Center, *Bowers 1566* (16 Feb 1979). YUMA COUNTY: Yuma Mesa, *Roth s.n.* (30 Jun 1957).

Sisymbrium irio L., London Rocket, *Pamita.*

DESCRIPTION:

Plants erect, (12-) 30--60 cm tall, glabrous or with very sparse hairs on part of the herbage and pedicels. First leaves in a basal rosette, stem leaves well-developed but becoming reduced above. Leaves pinnatifid, petioled, larger ones (3-) 7--13 (-20) cm long, the blades green and thin. Flowering stem usually branched. Sepals greenish. Petals, filaments, and anthers yellow; ovary, style, and stigma green. Petals 3--4 mm long. Fruit a slender silique, (1.8-) 3--5 cm long, *0.8--1.3* mm wide, spreading (not turned down), the pedicels very slender, 5--14 mm long. Seeds 0.9 mm long, yellowish-orange brown, ellipsoid.

DISTRIBUTION:

Common in many places in ORPI, especially in disturbed sites but also well established in natural desert and semi-desert habitats, especially along washes where it may occur in locally dense stands. Recorded from the Quitobaquito region, along border road east of Lukeville, Dripping Spring, etc. This widespread weed is native to the Old World but now established among the flora of the Sonoran Desert.

NOTES:

Notes accompanying Thornber's specimens (e.g., *#7526)* indicate that this species became established in Arizona in the early part of the 20th century.

IMPACT AT ORPI:

Probably not serious because the stands are usually local and seldom extensive; however, locally it may be replacing certain less aggressive native mustards.

EXSICCATAE:

Quitobaquito, *7673* (14 Apr 1963). Aguajita Wash, *88-278* (6 Apr 1988). Alamo Canyon, *McDougall 26* (26 Mar 1941). Canyon Diablo, Ajo Mts., *Kearney 10830* (21 Mar 1933). ¼ mi W of Gachado line camp on Camino Dos Republicos, broad wash, 1400 ft, *Bowers* 1016 (28 Jan 1978). EASTERN PIMA COUNTY: Tucson, *Thornber 7526*; A recently introduced species, *Thornber 7030* (9 Feb 1908). MARICOPA COUNTY: Phoenix: *Thornber 9112;* a common species in the streets and along roadsides, apparently introduced, perhaps could be of economic value, *Thornber s.n.* (12 Jan 1913); growing commonly along roadsides at Phoenix, evidently introduced, *Thornber* s.n. (28 Mar 1909) :

GERANIACEAE - Geranium Family

Erodium cicutarium (L.) L.'her., Filaree, Heron Bill, *Alfileria*

REFERENCE:

Parish, 1890-91.

DESCRIPTION:

Winter-spring ephemerals. Herbage with glandular and non-glandular white hairs, the glands minute. Plants at first forming a basal rosette, stem leaves opposite; larger plants often producing stems to 30+ cm long, becoming decumbent to prostrate. Leaves pinnatifid (feather-like), several times longer than wide, mostly twice divided, the blades (leaflet bearing portion of leaf) 2--15 cm long, 0.8--4 cm wide, the petioles 1.8-- 7.5 cm long. Flowers in axillary umbels, regular. Petals pinkish-lavender, readily falling, slightly longer than the sepals. Umbels (1-) 3- to 7-flowered. Carpels at maturity long-beaked, separating elastically from the base and twisting spirally (The long, coiled beak of the dry, arrow-shaped fruit expands when moistened and screws the heavier, seed-bearing end into the ground). During highly favorable conditions occasional rank-growing plants becoming 2 across with lower leaves reaching 25--27 cm. Long. the peduncles 8--14 cm long, and fruit with beaks 3.5--4.5 cm long.

DISTRIBUTION:

Widespread in the New and Old Worlds. This is one of the most abundant winter-spring ephemerals in ORPI and across much of western North America. In ORPI and adjacent Sonora it is widespread from low to peak elevations.

NOTES:

It has often been claimed that filaree was introduced from the Mediterranean region in early Spanish colonial times as a forage plant. However, Hendrey and Bellue (1925) indicate that it was widely distributed in California before colonization by Europeans--prior to 1769. It seems suspiciously like a native species. Other members of the genus are native in western North America and others are native to the Old World.

IMPACT AT ORPI:

It is an important component of the natural vegetation of the region.

GRAMINEAE - Grass Family

Arundo donax L., Giant Reed, *Carrizo*

DESCRIPTION:

Bamboo-like reeds 3--5 m tall, with broad, strap-like leaf blades and large, plume-like panicles. Spikelets several-flowered, the upper florets successively smaller, breaking apart above the glumes and between the florets. Rachilla glabrous, the lemmas with long, silky hairs.

DISTRIBUTION:

Arundo donax is cultivated in towns and on some farms in the Sonoyta region as well as in Ajo, and throughout the Sonoran Desert region. *Arundo,* native to the Old World, is now widely cultivated and naturalized in the New World.

NOTES:

Arundo closely resembles the native *carrizo, Phragmites australis* (Cav.) Trin., but the former is usually more robust, usually has only very large culms, and the base of the blade, or collar, clasping the stem is often somewhat swollen. *Phragmites,* native to the Old and New Worlds, usually has both large, stout stems and smaller, slender ones. Some authors indicate a difference in the hairs around the auricle at the base of the leaf blade but I find that this character doesn't work. The sure way to tell them apart is by the spikelets. *Arundo* has glabrous rachillas and densely hairy lemmas, while *Phragmites* has densely hairy (villous) rachillas and glabrous lemmas.

Arundo has become naturalized in some remote and even pristine waterholes in Sonora, such as Tiburon Island (Felger and Lowe, 1976; Felger and Moser, 1985). I have not found it naturalized anywhere in northwestern Sonora, nor elsewhere in the vicinity of ORPI. Although it has long been presumed that *Arundo donax* is not native to the New World, this information has been repeated so many times in the literature that I wonder about "proof."

The hairy, light-weight disseminules (individual florets with the enclosed grain) are wind-borne and undoubtedly also bird-disseminated.

IMPACT AT ORPI:

There is a possibility that Arundo could become established at waterholes such as at Burro Spring and replace *Phragmites* which occurs nowhere else in the monument. *Phragmites* was once common along parts of the Rio Sonoyta, but today the. nearest population is at the La Salina pozos (Ezcurra et al., 1988).

Avena, Oat, *Avena*

REFERENCE:

Baum, 1977.

Avena is an Old World genus of about 27 species, mostly native to temperate Eurasia and North Africa. A number of the species are naturalized in temperate regions elsewhere in the world, and are especially common along the Pacific coast of North America. The common domesticated oat, *A. sativa* L., is apparently not cultivated in the Sonoyta region.

Avena fatua L., Wild Oat, *Avena Loca*

DESCRIPTION:

Winter-spring annuals. Erect-growing, commonly 50--100 cm tall. Open, sparse panicles. Spikelets usually on long,. slender and almost thread-like, often-curled pedicels, mostly with 2 or 3 florets. Glumes 2--3 cm long. Awn 3'.5--4.5 cm long, strongly twisted below, bent at about middle.

DISTRIBUTION:

Occasionally encountered along "roadsides and disturbed areas; 365 m to 1005 m; Bull Pasture and Estes Canyon in the Ajo Mountains and roadside of Highway 85" (Bowers 1980:7). In adjacent Sonora it is a sporadic roadside weed in and around Sonoyta and occasionally elsewhere along Mexico Highway 2.

NOTES:

I suspect that the Ajo mountain records represent cattle-related introductions, and doubt that it has persisted there. It has not established in northwestern Sonora; probably there is frequent re-introduction, probably from agricultural sources. *Avena sativa* is sometimes considered to be a variety of A. fatua; they are very closely related and often difficult to distinguish. In Sonora *A. fatua* is an agricultural weed, whereas A. sativa is planted for forage (Diego Valdez, personal communication, 1985). *Avena fatua*, native of Eurasia, is a common weed in the Pacific states of North America.

IMPACT AT ORPI:

During a favorable winter-spring season, wild oats can be expected as an occasional roadside weed along Highway 85 north of Lukeville and the border fence road east of Lukeville. It has apparently not established in the Ajo Mountains, and even if is, I doubt that it presents any threat to native species, or that it will become common.

EXSICCATAE:

Along ephemeral stream in Bull Pasture, Ajo Mts., associated with *Acacia greggii,* 3,000 ft, *Bowers 1275 & Warren* (2 May 1978). SONORA: Roadside at Sonoyta, *85-702.* 4.5 km W *of* Sonoyta on Mex Hwy 2, roadside, *86-152.*

Bromus, Chess, Brome

REFERENCES:

Beatley, 1966; Matthei, 1986; Pinto-Escobar, 1986b; Shear, 1900; Soderstrom and,Beaman, 1968; Stebbins, 1981.

Annuals, biennials, or perennials of diverse habits; cool weather ephemerals (annuals) in our region. Panicles open or dense. Spikelets large, laterally compressed or turgid and only slightly compressed, several flowered, all flowers perfect. Glumes shorter than lowermost lemma; lemma often but not always awned. Rachilla disarticulating above glumes and between florets. Cleistogamy is common in the genus.

Bromus carinatus Hook. & Arn., California Brome

SYNONYMS:

B. arizonicus (Shear) Stebbins
B. carinatus var. *arizonicus* Shear
B. marginatus Nees
B. polyanthus Scribner

NOTES:

Earlier I suspected that this grass might be non-native at ORPI. In my opinion it is native in ORPI and should be removed from the non-native list.

Bromus catharticus Vahl, Rescue Grass

SYNONYMS:

B. unioloides (Willd.) Kunth
B. willdenowii Kunth

REFERENCES:

Pinto-Escobar, 1976, 1986a.

DESCRIPTION:

Winter-spring annuals here with stems up to 50 cm tall (elsewhere, outside the desert, it can reach 100 cm in height and become biennial). Spikelets strongly compressed laterally. Lemma conspicuously keeled, V-shaped in cross-section, and awnless or with awns less than 3 mm long. Second glume and lemmas with 9--13 (or more) nerves (more nerves than other brome grasses in our region). Nerves usually prominent on mature spikelets (sometimes difficult to see on dried immature specimens).

DISTRIBUTION:

In disturbed habitats in northwestern Sonora, usually with sandy or fine=textured soils: an urban weed and in some playas with heavy cattle grazing. In southern Arizona (and northern Sonora) it is a "weed of lawns, roadsides, and ditchbanks" (Gould 1951:44). Widespread and often weedy through much of the United States and Mexico. Presumably native to South America.

NOTES:

There are no records for it in ORPI, but it is occasionally encountered in immediately adjacent areas in Sonora.

IMPACT AT ORPI:

In our region this species probably can establish itself only in disturbed habitats. I doubt that it presents a potential problem at ORPI.

EXSICCATAE:

SONORA: Sonoyta: floodplain of Rio Sonoyta, *85-94*; Plaza, 87-14. Playa los Vidrios, *Ezcurra s.n.* (7 Oct 1981).

Bromus rubens L., Foxtail Brome, Red Brome

REFERENCES:

Wu and Jain, *1978, 1979.*

DESCRIPTION:

Winter-spring ephemerals. Plants commonly (7-) 10--25 cm tall, pubescent with retrorse soft hairs on stems and sheaths. Panicles densely contracted, the branches and spikes erect or upright, the spikelets more or less sessile. Lemmas conspicuously toothed and awned; awns 12--22 mm long, stiff, stout, and straight or slightly curved but not bent and not twisted.

DISTRIBUTION:

Seasonally abundant to common in the Ajo Mountains and many other places in southern Arizona. Also in the Pinacate region. This weedy Mediterranean annual is adventive and common in western United States.

NOTES:

Bowers (1980:7) reports it as occasional and scattered in the Ajo Mountains. In 1987 I found it to be abundant and widespread in the Ajo Mountains and expect it elsewhere in ORPI, especially in mountain habitats. It was present in Ajo at least as early as 1916 (below).

In northwestern Sonora it has become very common at higher elevations in the Sierra Pinacate and at low elevations in disturbed habitats, especially in urban and agricultural areas. It seems to be spreading in southern Arizona as well as in Sonora. During the last decade I have noticed dramatic increases in *B*. *rubens* at higher elevations in the Sierra Pinacate. There are no records for it in the Pinacate region prior to 1980. It has also dramatically increased in abundance in other natural as well as disturbed habitats across the Sonoran Desert such as in the vicinity of Tucson. Although not previously reported for Mexico except from Baja California Norte (Gould and Moran 1981:31), it is widespread and common across northern Sonora (Felger, in prep.). In the higher elevations in the Sierra Pinacate it seems to be, in part, replacing the *Bromus berterianus* Colla. [= *B*. *trinii* Desv.]. The latter species, in Mexico known only from higher elevations in the Sierra Pinacate (Felger, in prep.), should be sought in similar habitats at ORPI. [*B*. *berterianus is* often reported as native to South America and introduced in North America, but there are indications (Felger, in prep.) that it is native in both continents.

Although present evidence indicates that *B*. *rubens* may be increasing at ORPI, this may be an artifact of uncritical observation because population size would vary from year to year: population size is directly correlated with winter-spring amount, duration, and distribution of rainfall. It is likely that the population at ORPI has peaked.

IMPACT AT ORPI:

This is perhaps one of the several, serious, invasive weeds in ORPI. The obnoxious spikelets break off and readily lodge into socks, shoes, and other clothing.

Management and control of. *B*. *rubens is* probably out of the question. I recommend continued monitoring by collection of herbarium specimens to be deposited in the herbaria at ORPI and ARIZ.

EXSICCATAE:

Alamo Canyon, Ajo Mts., 2,000 ft. elev., *Tinkham s.n.* (18 Apr 1942). Ajo Mt Drive (southern portion) ca. 4 mi E of-and Ariz Hwy 85*, RSF 87-332 (11* Nov 1987). Ajo, *Mairs s.n.* (Apr 1916). SONORA: Pinacate Region: vicinity Crater Salvatierra (norte), desert pavement, *Ezcurra s.n.* (3 Apr 1982); Pinacate Peak, Sierra Pinacate, ca. 1.2 km N, 960 m, *87-44*; Summit, 1250 m, *87-53.*

Bromus tectorum L., Downy Chess

DESCRIPTION:

Winter-spring ephemerals in our region. Panicles branched, slender, curved and drooping under the weight of the large, reddish brown spikelets. Lemmas hairy, 10--12 mm long, with straight awns 12--14 mm long.

DISTRIBUTION:

A common weed in southern Arizona and in less arid parts of northern Sonora. Its range in the Sonoran Desert seems to be expanding. Originally native to Europe, *B. tectorum* is extensively naturalized along the Pacific coast of North America, including mountains in Baja California Norte well above the desert, and in widely scattered regions through much of the rest of temperate North America.

NOTES:

It is probably a recent arrival to northwestern Sonora and does not seem to be firmly established in the region. There are no records for it in ORPI, but it has been found at the border fence (see below). These specimens have soft-pubescent, rather than glabrous or scabrous lemmas, and thus key to var. tectorum.

IMPACT AT ORPI:

It may eventually show up along the southern boundary of ORPI, but I do not view it as a noxious weed in our region.

EXSICCATAE:

SONORA: El Papalote, 18 km W of Sonoyta, large gravelly arroyo bed, ca. 15 m S of U.S. border (just S of Aguajita Spring), *86-133*.

Cenchrus, Bur Grass

Annuals or perennials. Stems solid. Inflorescence a highly modified panicle, usually greatly contracted and spike-like. Spikelets permanently enclosed in a spiny bur, the bur falling as a unit.

The genus, as restricted by DeLisle, (1963) contains 20 species, mostly annuals. Several species included in *Cenchrus* by DeLisle are placed in *Pennisetum* by Pohl (1980) and others. *Cenchrus* occurs in the warmer regions of the world, but mostly in the New World often in disturbed places and on sandy soils. It is very closely allied to Pennisetum, which has often been included *in Cenchrus* (see *Pennisetum).* Among *Cenchrus sensu stricto* (excluding *Pennisetum* as recognized here) 2n = 34 is usual.

REFERENCE:

DeLisle, 1963.

Cenchrus ciliaris, see **Pennisetum ciliare**

Cenchrus echinatus L., Bur Grass

DESCRIPTION:

Warm weather weed, apparently responding as an ephemeral in our region (usually annual elsewhere). Around 18--40 burs on each spike-like inflorescence. Burs often 4--5 mm wide (not including spines) and about as long to l mm longer. Larger spines of burs 3.5--6.0 mm long (reaching 7 mm long further south, e.g., in the Guaymas region).

DISTRIBUTION:

It is a common agricultural weed in the Sonoyta region and has been found along border road east of Lukeville. It also occurs as a weed at Puerto Penasco and has been a common and troublesome weed in irrigated lands near Yuma since at least the early part of this century. This species is widespread and often weedy through much of the New World and has also become weedy in the old World.

NOTES:

This is a new record for ORPI. *Cenchrus echinatus* is very closely related to *C. brownii* R. and S. and not readily distinguished from it by the novice, although most agrostologists recognize them as distinct species. *Cenchrus brownii* is widespread in warm coastal regions of the world; on the west coast of North America it occurs as far north as the vicinity of Guaymas and Baja California Sur (Felger, in prep.).

IMPACT AT ORPI:

With continued agricultural development in the Sonoyta region I expect this species to spread moderately along the southern boundary of the monument. It could increase in better-watered lowland regions, especially in areas of sandy soils. I doubt that it would become a serious pest in "natural" areas but the obnoxious spiny burs could make it a nuisance near campgrounds, etc.

EXSICCATAE:

0.5 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 meters N of border fence, 1,390 ft, *87-319* (11 Nov 1987). YUMA COUNTY: Yuma, very common in irrigation lands, *Thornber s.n.* (24 Sep 1912). SONORA: Puerto Peñasco, sandy soil, roadside, 85-765. Ejido Morelia, *ca.* 8 km W of Sonoyta and 0.5 km N of Rio Sonoyta (1.5 mi by road S of 5.2 mi W of Sonoyta on Mex Hwy 2), *87-311* (11 Nov 1987).

Chloris virgata Swartz, Feather Fingergrass, *Zacate Lagunero*

REFERENCE:

Anderson, 1974.

DESCRIPTION:

Warm weather annuals or ephemerals. Plants extremely variable in size. Stems usually numerous, often weak and geniculate spreading below (bent and turning upwards near the base). Spikes several or more (ca. 4--17), in a feathery, digitate (finger-like) arrangement, densely flowered from base to tip, upright, whitish to tawny, and with silky hairs. Spikelets 2.8--3.5 mm long (excluding awns). Glumes persistent and membranous. Rudiment conspicuous and bearing a single stout awn. Fertile lemma humpbacked on keel, bearing a conspicuous tuft of hair at tip and a single stout awn 5--7.5 mm long.

DISTRIBUTION:

In addition to the distribution given by Bowers (1980) for this species in ORPI, it was found in sandy soils along the Camino Dos Republicos fenceline road east of Lukeville. In northwestern Sonora it is a weed in disturbed places including agricultural fields, grassy playas, and depressions with extensive cattle grazing. This weedy species seems to be expanding its range in northwestern Sonora.

United States including the Southwest and Midwest and southward through tropical and subtropical South America, and also widespread in the Old World.

NOTES:

Chloris virgata seems well established in the region. It may be native at higher elevations in ORPI. However, it does not seem to be native in adjacent northwestern Sonora (Felger, in prep.), and its occurrence at lower elevations along the southern boundary of ORPI seems to represent recent immigration from weedy populations in adjacent Sonora.

IMPACT AT ORPI:

I do not think it poses any particular threat, but locally it might increase in abundance.

EXSICCATAE:

0.5 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m N of border fence, 1,390 ft, *87-315* (11 Nov 1987). SONORA: Sonoyta: *85-938, 86-401*. Playa los Vidrios, *Equihua s.n.* (5 Nov 1982). Rancho Grijalva, *Ezcurra s.n. (5 Nov 1982).* 2 mi by road S of Tinaja de los Papagos, overgrazed, sandy playa-like depression, *86-488*.

Cynodon dactyloN (L.) Pers. var. DACTYLON, Bermuda Grass, *Zacate Bermuda*

REFERENCES:

Clayton and Harlan, 1970; Harlan and de Wet, 1969; de Wet and Harlan, 1970.

DESCRIPTION:

Perennials; plants creeping with long stolons and scaly rhizomes with obvious internodes, often forming extensive mats. Stems often upright when young, soon becoming procumbent or leaning. Inflorescences mostly with 4--7 slender, digitately arranged spikes, each commonly (2-) 2.5--6 (-8) cm long, purplish to green. Spikelets numerous, crowded, (1.7-) 2.0--2.5 mm long.

DISTRIBUTION:

Waterholes and low-lying, wet or temporarily wet, and widely-scattered places in ORPI including Burro Spring, Dripping Spring, Quitobaquito, Williams Spring; occasionally along roadsides, and low swales or washes along fenceline border road east of Lukeville. This weedy grass also occurs in northwestern Sonora, mostly in disturbed places, often as an urban and agricultural weed, or near water in alkaline soils at widely scattered natural as well as disturbed riparian habitats. It has become firmly established in ORPI and nearby northwestern Sonora, even at remote waterholes. The earliest collection (below) in the region is 1941, but I suspect that it was introduced much earlier. This Old World grass is now naturalized in warm regions nearly worldwide. It is extensively planted in warm climates for forage and as a lawn grass; most lawns in the Sonoran Desert, including the ORPI and Sonoyta residences, contain Bermuda grass.

NOTES:

Harlan and de Wet recognize 6 varieties of C. *dactylon.* Var. *dactylon* has become an almost worldwide weed. The other varieties are naturally occurring (not weedy) and, for the most part, geographically segregated races. Two varieties are diploid and the others, including var. *dactylon,* are tetraploid. Var. *dactylon is* distinguished in part by its well developed rhizomes, spreading and relatively soft leaves, and relatively stout and decumbent stems forming a more or less compact plant.

IMPACT AT ORPI:

It has already become firmly established in wetland places and obviously seems to be there to stay. Except for apparently recent extensions along the southern boundary from agricultural areas east of Lukeville, it has probably already reached population equilibrium at ORPI. Undoubtedly, it has displaced some native plants at ORPI wetland habitats.

EXSICCATAE:

0.5 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m N of border fence, 1390 ft, *87-320*. Quitobaquito: *Adams s.n.* (18 Jun 1971, ORPI); *Clark* 11478; *Felger* 7665; *McDougall* 36 (25 Mar 1941). SONORA: Rio Sonoyta, vicinity of Sonoyta: *85-695, 86-296*. 1.4 mi W of Sonoyta on Mex Hwy 2, roadside, 86-311.

OBSERVATIONS:

Ca. 0.5 km W of Lukeville Post Office, within 50--100 m of international fence, small wash along surface seep in low hills, common (10 Nov 1987). 2.2 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m N of border fence, 1395 ft (11 Nov 1987). Border monument 166 (11 Nov 1987).

Dactyloctenium aegyptium (L.) Willd., Crowfoot Grass, *Zacate Pata de Cuervo*

DESCRIPTION:

Summer-fall ephemerals in the Sonoran Desert. Plants glabrous. Stems spreading-ascending, the larger ones rooting at the nodes, often forming radiating mats. Spikes digitately arranged, short and stubby 1.5--4.5 cm long, spreading at about right angles from tip of main axis. Usually 2--6 spikes, but inflorescence sometimes reduced to a single spike. Spikelets densely crowded, 2.7--3.5 mm long. Glumes unequal in size and shape; first glume awnless, second glume broad and with an awn 0.5--3.2 mm long. Lemma of the first, or larger floret 2.2--3.2 mm long and pointed to awned, the awn usually less than 1 mm long. Grain glistening reddish-brown with thin, evenly-spaced ridges; these ridges often dark brown, or almost black, and the sulcae (minute valleys) lighter colored--reminiscent of the seed of *Mollugo cerviana* (Molluginaceae).

DISTRIBUTION:

It is a common agricultural weed in the Sonoyta region. In November 1987 several small colonies (the plants rooting at the nodes) were found at Quitobaquito (below). These plants seem to be waifs from the more extensive agricultural weed populations in adjacent Sonora. It is native to the Old World and widely naturalized and weedy in the warmer parts of the New World.

NOTES:

The Quitobaquito collection is a new record for ORPI. Perhaps it was present at Quitobaquito when people were living there. Castetter and Bell (1951:167-168, 171-172) reported that the Cocopa living along the lower Rio Colorado grew crowfoot grass under "semicultivated" conditions and harvested the grain for food. There are many references to the use of the grain as food in hot, semi-arid or tropical regions of the Old World (e.g., Tanaka, 1976:240).

IMPACT AT ORPI:

I do not think that it will become firmly established at ORPI. It seems as if the most potential areas for colonization by this species would be wetland places presently occupied by such species as *Distichlis spicata* and/or *Cynodon dactylon. I* doubt that *Dactyloctenium* can compete. It will be interesting to see if the Quitobaquito population persists.

EXSICCATAE:

Quitobaquito, in wet mud beneath cottonwoods near pond, *87-289* (10 Nov 1987). SONORA: Ejido Morelia, ca. 8 km W of Sonoyta at 0.5 km N of Rio Sonoyta (1.5 mi by road S of 5.2 mi W of Sonoyta on Mex Hwy 2), weed in cotton and sorghum fields, *87-307* (11 Nov 1987).

Echinochloa, Barnyard Grass

Annuals or perennials. Stems solid but not rigid. Leaf blades flat: ligules usually absent. Panicles of few to many, densely flowered, spike-like branches. Spikelets paired or clustered, nearly sessile, awned or awnless. Fertile lemma smooth, shiny, and flat (not inrolled over grain) with margins covering a flat palea of similar texture. Grain more or less oval, hard, and moderately large.

Echinochloa is native to the warm regions of the world, and is characteristic of rich, moist, and often disturbed soils or the plants are emergent from shallow water. Gould-et al. (1972) report 7 species for the United States, 5 of which seem to be native. They provide convincing evidence that the native New World species are hexaploid, 2n = 54, and that the Old World species are tetraploid, 2n = 36.

Domesticated varieties of *E. colonum* and *E. crusgallii* have long been cultivated in tropical Asia and tropical Africa for their grain. Castetter and Bell (1951:173, 187, 190) reported that the Cocopa harvested grain from barnyard grass along the lower Rio Colorado, but I am not confident their specific identifications are correct.

REFERENCES:

Gould, et al. 1972; Hitchcock, 1920; Holm, et al., 1977:32-46; Yabuno, 1966.

Key to the Species

1. Sterile lemma and second glume often with a few hairs or short spines but not beset with harsh spines; spikelets 2.2--2.6 (-3) mm long, awnless; plants less robust; panicle branches 1--2 (-3) cm long, simple; spikelets often paired and more or less in 2--4 rows. *E. colonum*

1. Sterile lemma and second glume with harsh spines; spikelets 2.8--4 mm long (excluding awns and projections), often but not always long-awned; plants more robust; panicle branches

usually 2.5--6 cm long, usually with at least some short secondary branches; spikelets often in small clusters rather than rows. *E. crusgalli*

Echinochloa colonum (L.) Link, Barnyard Grass, Jungle Rice, *Zacate Rayado, Zacate Pinto, Zacate Tigre*

DESCRIPTION:

Tufted ephemerals or annuals; non-seasonal but best developed during warm weather. Stems erect to spreading to semi-prostrate, reaching 45--75 cm in length, but often much smaller. Leaf blades 5--9 (-12) mm wide and often with transverse purple bars or blotches. Inflorescence branches spike-like, 1.5--3.0 cm long, appressed to spreading, and densely flowered from the base. Spikelets paired, 2.2--2.6 (-3) mm long, sharp-pointed but not awned.

DISTRIBUTION:

Echinochloa colonum has been collected at several localities in ORPI but is probably even more widespread. It can be expected during favorable years, especially following summer-fall rains, in open ground at waterholes, washes and arroyo beds and roadside depressions. It is fairly common in washes and depressions along the international fence road (Camino Dos Republicos) east of Lukeville. In northwestern Sonora it is a common agricultural and urban weed, fairly common along streambeds, and in disturbed as well as some natural habitats, usually on wet soil but sometimes extending onto non-riparian soils during favorable conditions. Native to the Old World and believed to be adventive in the New World; widespread in tropical and subtropical regions worldwide, mostly as a weed.

NOTES:

Echinochloa colonum has not been reported in the literature for ORPI. Vigorous plants of *E. colonum* might be confused with *E. crusgalli,* but they can be distinguished by characters given in the key above. Some herbarium specimens from our region are labeled as being perennial. I seriously doubt if it becomes perennial in our region, the plants succumb to freezing weather and I have so far not found them overwintering in ORPI nor anywhere in northwestern Sonora.

The report of *E. crusgalli* at Williams Spring (Bowers, 1980:7), was based on a robust specimen of *E. colonum (Van Devender s.n.,* 31 Aug 1978). It seems to be established in the monument, although there undoubtedly are repeated new invasions from the adjacent farmland and disturbed wetlands in adjacent Sonora. It is likely that it has been in the monument for some time, and that it was probably present at settlements such as Quitobaquito when people were living there. This species thrives in open temporarily wet places, such as washes, agricultural lands, etc. The purplish bands or cross-bars on the leaves are an easy to recognize key character.

IMPACT AT ORPI:

The minor invasion of this plant does not seem to present any particular problem at ORPI.

EXSICCATAE:

2.0 mi NE of Visitor Center on Ajo Loop Road, rare in moist soil in shade along wash, *Van Devender 84-45* (9 Sep 1984). 0.5 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m N of border fence, 1390 ft, *87-323* (11 Nov 1987). Williams Spring, *Van Devender s.n.* (31 Aug 1978, ORPI). SONORA: Rio Sonoyta, 21 km W of Sonoyta, ca. 1.5 km SW of Quitobaquito, *85-973*. NE side of Sonoyta, sandy soil, disturbed weed habitat, *85-944*. Presa Divididora, Sonoyta, 86-295. Ejido Morelia, ca. 8 km W of Sonoyta at 0.5 km N of Rio Sonoyta (1.5 mi by road S of 5.2 mi W of Sonoyta on Mex Hwy 2), *87-310* (11 Nov 1987).

Echinochloa crusgalli (L.) Beauv. var. **Crusgalli**, Barnyard Grass

DESCRIPTION:

Coarse, warm-weather annuals, often 0.3--1.8 m tall. Stems erect to upright from decumbent branches. Larger leaf blades mostly 1--1.5 cm wide. Spikelets awnless to awned, even on the same plant and same panicle; longer awns 2.6--5.8 cm long and often purplish. Second glume and sterile lemma often with papillose-hispid hairs along nerves.

DISTRIBUTION:

Echinochloa crusgalli occurs in and around Sonoyta in seasonally wet mud along riverbed, ditches, and shores of Presa Derivadora. I have not seen this species *in* natural areas in the Sonoran Desert. Gould et al. (1972) report var. *crusgalli* as the only common, widespread variety in the United States. *Echinochloa crusgalli is* native to the Old World and is apparently adventive in the New World; it is now widespread worldwide in subtropical and warm temperate places.

NOTES:

There is little doubt but that *E. colonum* and *E. crusgalli* are distinct species, but awnless plants can be confusing if you are not familiar with both species. In northwestern Sonora they can be distinguished by habitat and general appearance of the plants. In the absence of awns, presence of numerous spines on the spikelets (second glume and sterile lemma) of E. crusgalli provides a reliable character (see key, above).

There is a strong possibility this species might colonize, probably temporarily, in washes and depressions along the southern boundary of ORPI during a year of favorable hot-weather rainfall. It may have occurred at Quitobaquito when that area was occupied by people.

Palmer collected it along the Rio Colorado in the late 19th century and Castetter and Bell (1951:1) reported it in the delta region of the Rio Colorado. However, there is a possibility that these plants could have been a native species such as *E. cruspavonis* rather than *E. crusgalli* (see below).

IMPACT AT ORPI:

Potential impact in ORPI seems negligible.

EXSICCATAE:

SONORA: Sonoyta: Presa Derivadora: *86-141, 86-305*; NW side of town, *86-397*. "Colorado River, *Palmer 950* and *951* in *1889*" (Hitchcock 1920:147; at U. S. National Herbarium, not seen by Felger).

Eragrostis, Lovegrass

Annuals or perennials. Plants and inflorescences highly variable. Spikelets laterally compressed, awnless, few- to many-flowered, breaking apart above glumes and sometimes between florets. Glumes thin; glumes and lemmas deciduous, palea usually persistent (remaining attached to rachilla).

Around 350 species in temperate and tropical regions of the world; a minority of species extend into deserts.

Eragrostis barrelieri Daveau

DESCRIPTION:

Warm weather annuals. Stems tufted, erect or decumbent, sometimes prostrate-spreading, (10-) 25--30 (-50) cm tall, branching at base, usually with a complete or partial ring of glandular tissue below the nodes. Leaf sheaths pilose at the summit, otherwise glabrous; ligule a row of hairs 0.5 mm or less long. Leaf blades flat to involute at tip, mostly glabrous, 2--10 (-15) cm long, 2--5 mm wide. Inflorescences' open, but narrow, 3--15 cm long, 2--6 (-8) cm wide with glandular areas or rings on the rachis below the branches; branches rather stiff, ascending to spreading, frequently with glandular spots or rings, spikelet-bearing nearly to base, the axils glabrous. Spikelets linear, slightly compressed, 10--15 (-20)-flowered, ca. 1 cm long, 1--1.5 mm wide, the rachilla persistent; first glume 1--1.5 mm long, the second slightly longer; lemmas grayish-green or with reddish tinge, 2 mm or slightly more long, the lateral nerves conspicuous; paleas about equaling the lemmas, ciliolate on the upper half of the keels, persistent. Grain ovate-elliptic, bluntly-rounded at both ends, ca. 0.8 mm long.

DISTRIBUTION:

A weedy species introduced from southern Europe. It is common as a "street weed" in Arizona, including Pima and Yuma counties, and is an agricultural weed in Sonora (at least in the southern part of the state). It is apparently established as an urban weed in Lukeville and Sonoyta and is expected in the agricultural regions as well. This weedy species is probably frequently overlooked, but can be expected throughout much of southern Arizona and most of Sonora.

NOTES:

The recent collection in Lukeville (below) indicates that it probably will be found in ORPI, at least along roadsides and probably along washes. Unlike the native *E. pectinacea,* which it rather closely resembles, *E. barrelieri* thrives in our region with winter-spring rains as well as during the summer-fall rains.

Eragrostis barrelieri is the only annual *Eragrostis* in Arizona or Sonora which has prominent glandular areas or rings on the stems (the internodes) and the inflorescence axis (at least in the lower part). These glandular areas always seem to be present, and are often large, shining, and quite conspicuous. Frequently they are yellowish or pinkish. (Description and information mostly from J.R. Reeder, personal communication 1987, and specimen cited below.)

IMPACT AT ORPI:

Elsewhere in Arizona it seldom becomes truly abundant and potential impact to ORPI seems minimal.

EXSICCATAE:

Weed at United States border station, Lukeville, 87-276.

Eragrostis cilianensis (All.) Vign. Lut., Stinking Lovegrass, Stink Grass, *Zacate Apestoso*

DESCRIPTION:

Summer-fall ephemerals. Highly variable in size, sometimes reaching 40--45 cm in height but often much smaller. Spikelets and inflorescence branches pale green, turning straw color at maturity. At least a few glands at margins and/or keels (midnerves or midribs) of glumes, lemmas, and leaf sheaths. Spikelets compressed, 3.5--21 (-26) mm long and 2.0--3.0 (-3.6) mm wide.

Although highly variable in size, the plants from southwestern Arizona and northwestern Sonora tend to be relatively small for the species. It is easily recognized by the pale spikelets and inflorescence branches and the relatively large, compressed spikelets. The presence of glands, making the plants viscid (sticky) and stinky, is often used as a key character, but these glands may be relatively scarce on plants from the Sonoran Desert. If you look hard enough you usually will find at least a few glands, which are like small scales or warts. Like most species of *Eragrostis,* spikelets appear with only a few florets and may continue to develop more florets at the apex for some time. For this reason plants with young inflorescences may look different from older ones.

DISTRIBUTION:

Bowers (1980:7) reported *E. cilianensis* from "sandy soil in washes; 455 m and above; Cuerda de Lena Wash near the northern boundary and in the southeastern corner of the monument; scattered in the monument." I found it at Aguajita Wash and along the southern boundary of the monument from Lukeville eastward.

In nearby northwestern Sonora this grass is an urban and agricultural weed in and around Sonoyta and San Luis, and at various temporarily well-watered, low-lying natural habitats in the Pinacate region. Seasonally, it is sometimes extremely abundant in playas in the Pinacate region such as Playa Diaz and the surrounding alluvial flats, or similar sandy or fine-textured soils where water may accumulate during the hotter months; it seems to be firmly established in such places, although it is not otherwise widespread in the Pinacate Region. It also occurs here and there along the Rio Sonoyta watercourses, and in many disturbed sandy-soil lowland habitats within the Pinacate region.

This Old World native is now nearly worldwide, often as a weed. It is well established in the Sonoran Desert although most often encountered in disturbed habitats.

NOTES:

Eragrostis cilianensis has been in ORPI at least since 1939.

IMPACT AT ORPI:

Impact in the monument seems minimal; this species is seldom very common *in* ORPI. I suspect that the populations in certain places in ORPI have diminished since removal of cattle (it often thrives with cattle grazing). I predict that the largest populations in ORPI most likely will be encountered in the Sonoyta valley east of Lukeville and just north of the new agricultural areas in Sonora.

EXSICCATAE:

Harbison s.n. (Nov-Dec 1939, ARIZ, SD). Wash 2.0 mi NE of Visitor Center on Ajo Loop Road, 1,720 ft, in sandy soil on edge of wash, *Van Devender 84-447.* Arroyo (wash) of Aguajita Spring, *86-287* (13 Sep 1986). Ca. 0.5 km W of Lukeville Post Office; within 50-100 m of international fence, small wash along surface seep in low hills, *87-282* (10 Nov 1987). 0.5 mile east of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m north of border fence, 1,390 ft, *87-324* (11 Nov 1987). SONORA: Pinacate Region: local playas, vicinity Pinacate Junction (7 km E of Los Vidrios on Mex Hwy 2): *86-350, 86-365*. Suvuk, Romero floodwater field, *Nabhan & Burgess s.n.* (25 Sep 1982).

Eragrostis lehmanniana Nees, Lehmann Lovegrass

DESCRIPTION:

Perennials with tufted stems often 50--60 cm tall. Stems mostly erect to ascending, sometimes decumbent or bent at lower nodes. Leaf blades relatively short, usually less than 10 cm long; leaf sheath of lower nodes glabrous. Panicles open, branched, the pedicels ascending to spreading, less than one-third as long as spikelets. Spikelets slightly compressed, often dark grayish-green or straw-colored, often 1.3--1.6 mm long, several- to ca. 12-flowered. The grain ellipsoid with one side flattened, ca. 0.6--0.8 mm long.

DISTRIBUTION:

Native to South Africa, this introduced grass is now well-' established across much of southern Arizona. It is usually most abundant in grassland and towards the upper elevational limits of the desert, but it has also established in the Sonoran Desert.

NOTES:

This grass was introduced into Arizona by the U.S. Soil Conservation Service prior to World War II as a forage grass. In recent decades it has become incredibly abundant and widespread in northern Sonora and southern Arizona, but mostly in south-central and south-eastern Arizona. It is a common street weed in Tucson.

IMPACT AT ORPI:

The recent discovery of *E. lehmanniana* at Why, a few kilometers north of the monument, is somewhat alarming and surprising. Although it is common across much of the O'odham Reservation, I had not expected it as far west as Why. It seems likely that it will show up in ORPI within a few years unless severe drought sets in. As a roadside weed it might not persist; it is a perennial and perhaps will not survive a drought year. At higher elevations it may become established and possibly quite common. The one thing that may prevent it from becoming abundant is that it seems to prefer grassland plains and rolling hills; perhaps it will not establish itself in very rocky places such as the Ajo Mountains. Control is virtually impossible; it thrives in disturbed as well as natural areas.

EXSICCATAE:

Why, Pima Co., roadside, disturbed habitat, desert plain, gravelly soil, with *Larrea-Ambrosia dumosa,* common perennial, *87-5* (26 Feb 1987).

Eriochloa acuminata (Presl) Kunth var. ACUMINATA, Southwestern Cupgrass

SYNONYMS:

E. lemmonii Vasey & Scribn. var. *gracilis* (Fourn.) Gould
E. gracilis (Fourn.) Hitchc.
Piptatherum acuminatum Presl

REFERENCES:

Shaw and Webster, 1987; Swallen, 1951.

DESCRIPTION:

Hot weather ephemerals; maturing in late summer and early fall. Plants often reaching 30--50 cm or more in height, stems often weak. Leaf blades thin, flat, bright green, and glabrous to sparsely pubescent. Spikelets very short-pedicelled, readily shattering below the glumes when ripe or nearly ripe, with a cup-shaped disc at the base (The genus is readily recognized by this disc, which represents a reduced first glume tightly enclosing and fused with a rounded callus derived from a segment of the rachilla). Spikelets usually densely pubescent, 4--5 mm long (including cup and mucro, or awn). Second glume and sterile lemma similar in size and texture. Second glume awnless or extending into a short mucronate tip. Margins of lemmas inrolled over the sides of the tightly gripped palea. Fertile lemma awnless or with a mucronate tip (mucro) to 0.1 (-0.3?) mm long.

DISTRIBUTION:

Weedy, disturbed urban and agricultural habitats in the Sonoyta region, and in ORPI along the southern boundary east of Lukeville and as a lawn weed in residential area. Known from Baja California Sur and much of mainland Mexico and southwestern United States, from lowland deserts to montane, pine-oak woodland; also in southeastern United States where it seems to be adventive.

NOTES:

In northwestern Sonora and adjacent western Pima County, Arizona, I have found this grass only as an urban and agricultural weed in well-watered places during hot weather, or if in "natural" areas, then immediately adjacent to disturbed places. For this reason I believe that it is not native to the region. It is a hot-weather ephemeral that very quickly dries up and disappears as soil moisture diminishes.

[An apparently closely related species, *E. aristata* Vasey var. *aristata*, should be sought in the monument in better-watered natural areas. It occurs in the Pinacate region where it seems to be native (Felger, in prep.). It is distinguished most readily by its larger spikelets--6.5 mm long or more (measured from the base of the cup to the awn tip).]

IMPACT AT ORPI:

This delicate, very ephemeral grass seems to pose no particular threat to ORPI.

EXSICCATAE:

Lawn weed in residential area, *86-266*. Ca. 0.5 km W of Lukeville Post Office; within 50--100 m of international fence, small wash along surface seep in low hills, *87-2*81 (10 Nov 1987). 0.5 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m north of border fence, 1390 ft, *87-314* (11 Nov 1987). SONORA: Sonoyta, *85-935*. Ejido Morelia, ca. 8 km W of Sonoyta and 0.5 km N of Rio Sonoyta (1.5 mi by road S of 5.2 mi W of Sonoyta on Mex Hwy 2), *87-309* (11 Nov 1987).

Hordeum murimum L. subsp. **Glaucum** (Steud.) Tzvel.

SYNONYMS:

H. glaucum Steud.
H. stebbinsii Covas

REFERENCES:

Baum and Bailey, 1984; Booth and Richards, 1976, 1978; Bothmer and Jacobsen, 1982; Covas, 1949; Davidson, 1971; Feinbrun-Dothan, 1986: 179-184; Nevski, 1941.

DESCRIPTION:

Spring ephemerals. Plants reaching about 30 cm in height. Spikes 5.5--7 cm long excluding awns (Covas says the spikes are 4--9 cm long). Central spikelet 16--36 mm long *including* awns. Glumes of central spikelet and the adjacent rachis with long cilia (hairs horizontal to axis of spikelet) on their margins. The 2 lateral spikelets reduced to stout bristles 1.8--3.5 cm long.

DISTRIBUTION:

In ORPI it is common along the southern border from Lukeville eastward, especially along roadsides just north of the agricultural areas in the Sonoyta valley, and it was formerly present at Quitobaquito. In addition, it has been found at widely scattered waterholes, canyon bottoms, and disturbed habitats including Bates Well and in the Ajo Mountains, e.g., Arch Canyon (Bowers 1980:7). It is a common urban and agricultural weed in northwestern Sonora, at least around Sonoyta. Also common in northwestern Baja California Norte and across northern Sonora, especially in disturbed habitats. Native to the Mediterranean and Middle East, it is now widespread and weedy in temperate regions including western North America.

NOTES:

Hordeum murinum subsp. *leporinum* (Link) Aschers and Graebrn is a common weed in Tucson and occurs in irrigated areas near Casa Grande and Yuma, Arizona. It may show up in irrigated areas in northern Sonora, and possibly could spread into ORPI. Subsp. *glaucum* and subsp. *leporinum* are both native to the Mediterranean and Middle East and are now widespread in the world, mostly in temperate regions. They are difficult to distinguish; key characters often used to distinguish them are as follows:

1. Rachilla joints mostly less than 2 mm long so that spikelets relatively more crowded; anthers of central spikelet 0.5 mm long or less, included (they don't stick out) at *anthesis.*
   H. murinum subsp. *glaucum*

1. Rachilla joints mostly (1.5-) 2 mm long or more, so that spikelets relatively less crowded; anthers of central spikelet 0.8--1.5 mm long, exserted at anthesis.
   H. murinum subsp. *leporinum*

The taxonomy of the *H. murinum* aggregate species is a complex situation with somewhat conflicting taxonomic opinions even among recent workers. Booth and Richards (1978) found that the morphology of the several very closely related taxa does not correspond with ploidy level or seed protein-content analysis. They recognize *H. murinum* L. as a monotypic species (no infraspecific taxa) native to Britain and France in the northwestern part of the complex. Their findings show that further south it passes into the leporinum taxon, and then within that complex, those in the most arid regions correspond to glaucum taxon, but the two are not easily separable. It is interesting to note that the weedy plants that have established in our region correspond to the glaucum taxon, the taxon from the more arid spectrum of the distribution of the species complex. Booth and Richards (1978) recognized the *glaucum* and the *Ieporinum* taxa as subspecies of *H. leporinum.* Baum and Bailey (1984) found that differences in the lodicules and epiblast are the most reliable characters to the distinguish the taxa. However, these are not easy characters to deal with; for purposes of this report a more conservative taxonomic arrangement is retained.

IMPACT AT ORPI:

This weedy annual can be expected in gravelly-sandy washes and roadside along the southern boundary of the monument, with continual re-introduction from urban and agricultural regions in adjacent Sonora. It will probably not persist long in natural areas. The bristly spikelets are easily lodged in socks and clothing and occasional introduction may occur along hiking trails. It does not seem to be able to persist except in disturbed habitats.

EXSICCATAE:

Quitobaquito, *Nichol s.n.* (28 Apr 1939,,ARIZ, ORPI). Gachado Line Camp, 2.0 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m N of border fence, 1,390 ft, *87-327* (11 Nov 1987). SONORA: Sonoyta, weed, *87-16*.

Panicum antidotale Retz., Giant Panic Grass, Blue Panicum

DESCRIPTION:

Coarse perennials with hard, knotty bases and short, stout rhizomes, the plants looking somewhat a dwarf bamboo or Johnson grass *(Sorghum halepense*). Stems 1.4--2+ m tall, branching at the swollen nodes to well above the middle. Stems and leaf blades often glaucous. Panicles mostly terminal, broad and spreading, the branches often drooping with weight of the grain. Spikelets 2.3--3 mm long. Grain (fertile lemma) smooth and shiny, ca. 2 mm long.

DISTRIBUTION:

Occasional colonies of this grass, seemingly well-established, occur in washes along the international border east of Lukeville. Native to Australia, it is established in a few widely scattered places in southern Arizona.

NOTES:

This is a new record for ORPI. It will be interesting to see if *P*. *antidotale* survives drought. Although the colonies in ORPI are well-established, I have not seen evidence that they are reproducing. More than likely it is being grown as a forage grass in adjacent agricultural areas in Sonora, and the ORPI plants are waifs from that source. It is a highly desirable forage and fodder grass.

IMPACT AT ORPI*:*

Potential impact at this time seems minimal.

EXSICCATAE:

2.2 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m N of border fence, 1,390 ft, *87-326* (11 Nov 1987).

Pennisetum

REFERENCES:

Chase, 1921; DeLisle, 1963; Pohl, 1980:459-470.

Annuals or perennials, sometimes rather woody. Leaf blades flat. Panicles dense and spike-like. Spikelets enclosed in bristles united at their bases to form a bur that falls as a unit; the bristles derived from modified sterile branches. About 80 or more species in the tropics and subtropics of the New and Old Worlds.

Pennisetum and *Cenchrus* are closely allied and the boundary between them is somewhat fuzzy. The bur of Pennisetum seems less specialized than that of *Cenchrus.* In *Pennisetum* the bristles are distinct (or only scarcely united at their very bases) while in *Cenchrus* the bristles are clearly united for a substantial portion of their length and are usually spine-like. Chromosomal differences seem especially significant: among *Pennisetum,* n = *9,* while among *Cenchrus sensu stricto,* n = 13*,* 17, etc. *Cenchrus* seems to have evolved from *Pennisetum.* There should be no difficulty in distinguishing the genera; the distinction seems to be a natural one and they are at least as distinct as many other genera of grasses. A number of Old World pennisetums are economically important, e.g., *P. americanum* (L.*)* Leeke (= *P. typhoides* (Burm.f.) Stapf & Hubb.), pearl millet; *P. clandestinum* Hochst., kikuyu grass; and *P. purpureum* Schum., elephant or napier grass.

Pennisetum ciliare (L.) Link, Buffelgrass, *Zacate* Buffel

SYNONYM:

Cenchrus ciliaris L. (DeLisle lists 50 additional synonyms)

REFERENCES:

Narayan, 1951; Snyder et al., 1955.

DESCRIPTION:

Usually robust perennials, but here facultative ephemerals, annuals or perhaps perennials (robust annuals may appear perennial). Leaves often reddish during cooler weather. Leaf blades nearly glabrous (except near collar) to sparsely hairy, especially on lower surface; larger blades 23-34 cm long, 7-10 mm wide; midrib prominent. Leaf sheaths also nearly glabrous to sparsely hairy; hairs near collar usually sparse, white, straight reaching ca. 5 mm with enlarged bases. Inflorescences dense and spike-like, 10--12.5 cm long; burs crowded. Bristles on burs flexible, purplish brown, inner ones largest, 5--12 mm long, and feathery at their bases with spreading silky white hairs.

DISTRIBUTION:

Native to the warmer parts of Africa, Madagascar, and India, and widely introduced in hot, semi-arid regions of the world for forage and fodder. It is the most important and extensively planted forage grasses in Sonora. Since about the late 1960s and early 1970s it has spread into many natural areas in Sonora and southern Arizona including desert habitats. It also has become established as an urban weed and is particularly abundant along roadsides.

By the mid-1980s it was fairly well established here and there as a roadside weed throughout much of northwestern Sonora and many places in southern Arizona. At that time it had become fairly common in northwestern Sonora near Sonoyta, scattered along Mexico Highway 2 across the Pinacate region and the western granitic mountains west of the Pinacate volcanic region,

along various well-travelled dirt roads, and near agricultural fields. I have not seen it in undisturbed natural desert areas in the Pinacate region. The plants in the Pinacate region are often very reduced in size and annual or ephemeral rather than perennial; but following a period of sufficient rainfall the plants become robust, fully developed and appear perennial. I did not see it in northwestern Sonora during the early 1970s.

It began to appear in ORPI in about the mid-1980s. It was still relatively uncommon, perhaps even rare, in ORPI at the end of 1987. Between 1984 and 1988 I noticed a local increase in this grass at Quitobaquito.

NOTES:

This is an unpublished record for ORPI.

Two errors in identification of historic collections could be misleading about dates of introduction for P. ciliare in Sonora. DeLisle (1963:325) cites a specimen of *Cenchrus ciliaris* as "Sonora, Mexico, J.N. *Rose et a1. 12866,* March 15, 1910 (NY)." The same collection number was cited by Agnes Chase (1921:220) as *Pennisetum karwinskyi* Schrad., "Sonora: Alamos, *Rose, Standley, and Russell 12866."* Chase's identification is correct. *Pennisetum karwinskyi (= Cenchrus multiflorus* Presl) occurs in subtropical deciduous thornscrub as far north as central Sonora (foothills and mountains east of Hermosillo) but does not enter the Sonoran Desert proper. Another collection of *P. karwinskyi,* 8 mi NE of Matape [east-central Sonora], *Wiggins and Rollins 429* (9 Sep 1941, ARIZ, etc.), was originally identified and distributed as *Cenchrus ciliaris.* DeLisle (1963:325) corrected the error and cited it as *C. multiflorus.* At the time of Wiggins and Rollins' collection these two species were primarily distinguished on characters of the bristles:

1. Bristle or spine margins somewhat sparsely or moderately ciliate. *P. karwinskyi*

1. Bristles or spines margins densely ciliate (Mrs. Chase said conspicuously plumose). *P. ciliare*

Some of the Sonoran material of *P. karwinskyi*, including part of the Wiggins and Rollins collection, has bristles more densely ciliate than usual. These might be mistaken for the feathery bristles of *P. ciliare,* especially if one did not have specimens of *P. ciliate* for comparison. However, spikes on even the same plant of *P. karwinskyi* from central Sonora may have burs with almost plumose bristles as well as ones with "normal" non-plumose, sparsely ciliate bristles.

According to Pohl (1980:463) P. *ciliare* "lies close to the intermediate boundary line between *Pennisetum* and *Cenchrus.* Because of the hard-based perennial growth habit, lack of flattened, retrorsely-barbed spines, the basic chromosome number of $\underline{x} = 9$, and the extensive occurrence of apomixis, it seems more closely allied to *Pennisetum* than to *Cenchrus."* DeLisle (1963) recognizes both genera but retains this species in *Cenchrus.* However, he shows that this species and a few other closely related ones differ from other *Cenchrus* species by their karyotype and several other characters. McVaugh (1983:109) keeps it in *Cenchrus* and says that "The

distinction between *Cenchrus* and *Pennisetum* is at best arbitrary." In my opinion it should be aligned with Pennisetum for the reasons given above.

ORPI IMPACT AND POSSIBLE MANAGEMENT:

The impact of this weedy grass at ORPI probably will be serious. It is difficult to say whether or not plant by plant eradication can be effective because of a continued seed source from adjacent regions. It seems only a matter of time before it spreads into places such as the Ajo Mountains. If it can be prevented from becoming established, then it would be worthwhile expending the effort to eradicate it: my feeling on the matter is that it will probably be futile but worth trying. As with P. setaceum, if the panicles are already formed, then they should be carefully cut off inside a plastic bag and burned, and the plants dug up, or killed with a very local application of anon-persistent herbicide. Although use of an herbicide in the monument is, of course, not a desirable policy, strictly local, direct application on only the target plants would seem advisable. If the plants are dug up, then the site needs to be revisited later in the same growing season, or early in the next growing season, to remove seedling and/or young plants growing in the disturbed micro-site where the parent plant was removed. The seedlings thrive in disturbed habitats. If action is going to be taken, it must not be delayed.

EXSICCATAE:

Aguajita spring, *86-326,* (14 Sep 1986). Quitobaquito, base of granitic hills immediately W of pond, along small wash, *88-448* (14 Sept 1988). Near Growler Valley rain gauge, *Anderson s.n*. (29 Oct 1984, ORPI). 4 mi W Bates Well, *Anderson s.n*. (8 Mar 1986, ORPI). SONORA: Roadside, 38 km W of Sonoyta on Mex Hwy *2, 85-714* (14 *May* 1985). 3.4 mi by road S of Pinacate Junction, *86-374* (14 Sep 1986). 19.2 mi SW of Sonoyta on Mex Hwy 8, *86-508* (1986). 4 km N of Puerto Penasco on Mex Hwy 8, roadside, *85-774* (25 Jun 1985).

OBSERVATIONS:

SONORA: Roadside, along Mex Hwy 2 on N side of Sierra del Viejo (ca. 100 km E of San Luis), at km 106, 14 May 1985. 7.5 km by road S of San Luis, roadside in agricultural region, 6 Oct 1985.

Pennisetum setaceum (Forssk.) Chiov., Fountain Grass

SYNONYM:

*P. ru*ppelii Steud.

DESCRIPTION:

Coarse tufted perennials, often 1--1.3 m tall, the stems unbranched with terminal panicles. Leaf blades narrow, scabrous (rough to the touch). Panicles about 15--20 cm long, slightly curved (nodding), pinkish to purplish at anthesis. Spikelets readily disarticulating at maturity.

DISTRIBUTION:

Scattered along the roadside of Highway 85, especially near the Visitor Center. Native to the Old world, widely cultivated in Arizona and elsewhere in southwestern United States; now firmly established in many canyons in the Tucson region and as a street and roadside weed.

NOTES:

This is a new record for ORPI. It is widely used perennial ornamental landscape subject in southern Arizona where it is slowly spreading into natural habitats. I do not know of naturalized plants of this grass in northwestern Sonora, although in 1986 a few plants were found along the highway in ORPI (Richard Anderson, personal communication, 1987). In 1987-1988 these plants were still present and reproducing, although some were removed by ORPI staff.

ORPI IMPACT AND RECOMMENDATIONS:

This grass is one of the several potentially very serious weeds in ORPI. It is easy to detect, no other roadside grass in the region is so large and coarse; and the feathery panicles are unique. At maturity the spikelets readily disarticulate and then it is nearly too late for control (unless extended drought follows and the seeds do not survive). I strongly recommend removing and destroying it whenever sighted, not waiting until the spikelets begin disseminating, nor waiting for "down-the-road" funding. The staff at ORPI needs to be militant about destroying the plants when sighted, otherwise there may be a most unwanted addition to the local vegetation. Once established in local wetland habitats it will probably replace certain desirable and perhaps rare native species.

It is an attractive landscape subject, and probably is being planted at why, Ajo, and Sonoyta. There is a sterile (or nearly sterile), reddish-leaved horticultural variety, sometimes known in the horticultural trade as cv. '**cupreum**'. Since it is essentially sterile, it will not spread. This plant is somewhat unusual and generally regarded as a more attractive landscape subject than the wild, weedy form. The reddish-leaved cultivar is readily propagated by divisions (rhizomes). I strongly recommend purchasing and/or propagating it at the ORPI nursery and distributing plants to Sonoyta, Lukeville, Why, and Ajo. The people in Sonoyta probably would appreciate having it in their gardens and might share divisions with friends and neighbors. This strategy offers a very inexpensive, effective, and practical alternative to a potential disaster. If this grass spreads to some of the better watered canyons, it could become a serious problem and, at that point probably become impossible to eradicate.

EXSICCATAE:

Roadside, ca. 1 mi N of junction of Ajo Mt Drive and Ariz Hwy 85, *87-333* (11 Nov 1987).

Phalaris minor Retz., Little-seed Canary Grass

REFERENCE:

Anderson, 1961.

DESCRIPTION:

Winter-spring annuals or ephemerals. Plants highly variable in size depending upon soil moisture. Panicles spike-like, mostly several centimeters in length, but sometimes becoming 8--10 cm long. Glumes 4.5--5.5 mm long, longitudinally green and white striped or banded, keel expanded into a conspicuous wing near the tip; the wings often notched or with small irregular teeth. Each spikelet with only one sterile floret.

DISTRIBUTION:

In ORPI mostly in localized colonies or small populations along washes and low wet places. In northwestern Sonora in wet places, roadsides, and around fields, towns, and corrals. "The range of P. minor is world-wide at the present time. The original range, as given in older floristic treatments, appeared to be roughly the area bordering upon the Mediterranean Sea" (Anderson 1961:35).

NOTES:

This introduced weed is seldom common in the region except at Sonoyta where it is seasonally common along the Rio Sonoyta, as an agricultural weed, and in roadside depressions. Repeated incursions from the Sonoyta region are to be expected.

IMPACT AT ORPI:

Negative impact from this species seems improbable; it seems to pose no particular threat.

EXSICCATAE:

Gachado Line Camp, 2.0 mi E of U.S. border crossing station at Lukeville on road paralleling international fence, ca. 15-20 m N of border fence, 1,390 ft, *87-328* (11 Nov 1987, plants dry, dead). Growler Canyon, Bates Mts., sandy wash, associated with Prosopis *glandulosa* and *Cercidium floridum,* 1,400 ft, *Bowers 1603* (30 Mar 1979). Roadsides of 2-way section of Puerto Blanco Drive, ca. 2 mi W of Hwy 85, associated with *Prosopis glandulosa* and Larrea, ca. 1,400 ft, *Bowers 1722* (10 May 1979). SONORA: Sonoyta: Riverbank and roadside, 85-700; Along river, *86-89*.

Poa annua L., Annual Bluegrass, Winter Grass, *Pastito de invierno*

DESCRIPTION:

Winter-spring ephemeral in the Sonoran Desert. Plants relatively small, often 5--15 cm tall (potentially more than twice as tall). Plants soft, glabrous, light green, erect to spreading, tufted and branching from base. Panicles pyramidal, 2--5 cm long.Spikelets clustered at ends of panicle branches; spikelets 3.6--4.6 mm long, commonly with (2) 3 or 4 florets plus rudiments. Second glume 1.8--2.3 mm long, larger than the first one. Lemmas 2.1--2.7 mm long, ovate, blunt-tipped, with 5 nerves; the nerves silky-haired towards base to nearly glabrous. Palea silky on keel.

DISTRIBUTION:

Previously present at Quitobaquito and currently an urban weed in Sonoyta. Reported as native to Europe, it is widely naturalized in many places in the world including North, Central, and South America. It is "one of the world's most widespread weeds" (Soreng 1985:403).

NOTES:

Although it was collected at ORPI in 1945, it has not been reported for the monument in the literature. This dwarf weedy grass is common in lawns and well-watered gardens in Sonoyta. The earliest regional collection is from Quitobaquito at a time when people were living there and grazing cattle; it has not been collected in ORPI in recent years. *Poa annua* has apparently seldom, if ever, become established in the Sonoran Desert away from well-watered human settlements or agricultural weedy habitats. Relative to non-desert regions, *P. annua* plants from the Sonora Desert tend to be relatively small, shorter-lived die during the summer heat, and have fewer-flowered spikelets with somewhat smaller organs. Outside the desert it can be longer lived--Pohl (1980:487) says "annual to indefinite" for the Costa Rica highlands.

IMPACT AT ORPI:

Occasional plants are to be expected in winter and spring along the international border just north of the Sonoyta region, but for sure it will not persist in ORPI.

EXSICCATAE:

Quitobaquito, in marsh around reservoir, 1,200 ft, Darrow 2405 (17 Mar 1945). SONORA: Sonoyta, lawn beneath trees, Motel Excelsior, *87-13* (1987).

Polypogon

Annuals and perennials. Leaf blades flat, thin, and bright green. Panicles dense and spike-like. Spikelets small, breaking away below glumes, 1-flowered, and mostly awned. Grain widest

above middle. About 10 species, mostly in temperate regions, Old and New Worlds. Many of the species commonly occur on alkaline or partially saline soils in wetland habitats.

REFERENCE:

Björkman, 1960.

Polypogon monspeliensis (L.) Desf., Rabbit-foot Grass, *Zacate Cola de Zorra*

DESCRIPTION:

Non-seasonal ephemerals. The plants highly variable in size depending upon soil moisture, mostly 8--100 cm tall. Leaf blades 3.5--22 cm long, 5--20 mm wide. Panicles very dense and furry-looking with tawny-colored awns, suggesting a rabbit's foot, terminal on a long stem, spike-like and sometimes with short, dense branches, (1.5-) 3--15 cm long. Glumes each with a slender awn 4--7 mm long, body of glume 1.5--2.2 mm long. Lemmas and paleas thin and translucent, slightly exceeding grain. Grain about half as long as body of glume.

DISTRIBUTION:

Native to Europe, now widespread in western North America. In ORPI, known from Quitobaquito and nearby springs and wetland habitats. In adjacent northwestern Sonora it is often very common in permanent to temporarily wet and often highly alkaline soils along the riverbed and banks of the Rio Sonoyta, as an agricultural and urban weed, and sometimes along roadsides near settlements--as long as the soil is wet, at least temporarily. During the late 1970s and 1980s it was found at several widely scattered wet places within the Pinacate region, mostly on semi-saline or alkaline soils.

NOTES:

This species has been *in* North America for some time it seems to be spreading in northwestern Sonora but the populations in ORPI seem more or less stable. It has been at Quitobaquito at least since 1939. Its advance in Sonora seems largely correlated with human disturbance of the region. Over much of its range outside of the desert it is perennial rather than annual.

IMPACT AT ORPI:

During an exceptionally wet spring it might become locally common or abundant in low wet places, waterholes, in washes, etc., especially along the southern margin of the monument. It does not seem to pose any particular threat to native plants.

EXSICCATAE:

Quitobaquito: 7677; *Nichol s.n.* (28 Apr 1939, ORPI). Burro Spring: *Bowers 1310* (4 May 1978); with *P. viridis, 86-2158*.

SONORA: El Papalote (adjacent to Aguajita Spring), *86-123*. Rio Sonoyta, 31°34 'N, 113°17 'W, 110 m, fluxisol, Ezcurra s.n. (25 Apr 1981, ARIZ, MEXU). Sonoyta, riverbed and wet places at roadside: *85-697, 86-98.*

Polypogon viridis (Gouan) Breistr., Bull. Soc. Bot. France 110 (Sess. Extr. 89):56, 1966. Water Bent

SYNONYMS:

Agrostis viridis Gouan, 1762
Phalaris semiverticillata Forssk., 1775
Agrostis verticillata Vill., 1779
A. semiverticillata (Forssk.) C. Christ., 1922
Polypogon semiverticillatus (Forssk.) Hylander, 1945.
P. semiverticillatus (Forssk.) R.F. Hoover, 1948.

REFERENCE:

Tutin, 1980.

DESCRIPTION:

Perennials, summer-flowering. Stems erect to spreading and decumbent, often reaching 30--50 cm, often rooting at nodes in wet soil or shallow water. Leaf blades flat, often 5.5--9 cm long and 3.5--13 mm wide. Panicles densely flowered, 5--8 (-12) cm long, often spike-like. Glumes 15--21 mm long, membranous and translucent with a broad green midstripe or sometimes partially or all purplish, and speckled with minute scabrous hairs. Lemmas 8--9 mm long. Grain slightly shorter than lemma.

DISTRIBUTION:

Well-established colonies occur in wet alkaline soil and shallow water at Burro Spring, and at Quitobaquito in shallow water at the spring and running ditches. The nearest population is at Quitovac in northwestern Sonora. There are no other records for it in the region. I expect that it did, or does occur in similar habitats along the Rio Sonoyta. Native to warm regions of the Old World, it is now widespread in the New World.

NOTES:

Although European authors have demonstrated that this species is best placed in *Polypogon* rather than *Agrostis,* most American authors have persisted in treating it as an *Agrostis* because of its awnless glumes, the only thing that really ties it to *Agrostis* rather than *Polypogon.* For sure the boundary between the two genera is blurred, but the presence or absence of awns does not seem to be a conservative character: *Agrostis* may have awned or awnless glumes, and *Polypogon* may have short-awned glumes. There are even greater problems in placing some of

the South American species of *Agrostis* (Bjorkman 1960:88). Most *Agrostis* are perennials with small, 1-flowered spikelets that break off above the glumes at maturity, and with the grain widest at or below the middle. There are about 125 species of *Agrostis,* mostly in temperate and cold regions around the world. *Agrostis* in Arizona and Sonora occurs at high elevations and does not extend into desert habitats, and is not especially salt-or alkaline-tolerant. *Agrostis* viridis is an older name for *A. semiverticillata*.

In and around the Sonoran Desert *P. viridis grows* where *P. monspeliensis is* also present, although *P. viridis* has a much more restricted distribution. Perhaps the perennial habit of *P. viridis* does not allow it as much "ecological latitude" as is seen in *P. monspeliensis.*

ORPI IMPACT AND RECOMMENDATIONS:

The small colonies at Burro Spring and Quitobaquito are probably somewhat precarious. It is a biologically fascinating, isolated population. It is not at all certain that it is not native. It would be a shame to loose the population. Even if it is non-native, it poses no threat and should not be molested.

EXSICCATAE:

Quitobaquito: *Darrow 2409* (17 Mar 1945); *88-318* (6 Apr 1988); *Supernaugh s.n.* (15 Jan 1949, ORPI). Burro Spring: Bowers *1311* (4 May 1978, ARIZ, ORPI); *86-215* (23 Jul 1986). SONORA: Quitovac, *Nabhan s.n.* (14 May 1982).

Schismus barbatus (L.) Thell., 1907, Mediterranean Grass

SYNONYMS:

Festuca barbata L., 1756
S. arabicus Nees, 1841
S. barbatus subsp. arabicus (Nees) Marie & Weill., 1939.

REFERENCES:

Conert and Turpe, 1974; Hoover, 1936.

DESCRIPTION:

Small, tufted winter-spring ephemerals. Stems erect, (4-) 10--20 (-22) cm tall, often spreading to sometimes semi-prostrate with age. Leaf blades soft, bright green, narrow, and often numerous. Panicles compact and many-flowered.

Spikelets several-flowered, (2.9-) 3.5--5.5 (-6.2-) mm long, often purplish tinged. Florets 1.5--2.4 mm long.

DISTRIBUTION:

Seasonally very common in lowlands nearly throughout our region; most abundant on sandy soils of sand flats, arroyos and washes, and along roadsides. During favorable years it may be quite common or abundant.

Native to the Old World and now widely established in arid and semi-arid regions of the world. During the present century it has become widespread and well established in southwestern United States and northwestern Mexico.

NOTES:

The earliest record for this grass in North America seems to be in 1926 from southern Arizona and by 1928 it had become established (see exsiccatae). The first record for it in California seems to be in 1935 from Fresno County (Hoover 1936). This is one of the few well-documented cases of the spread and establishment of a non-native grass in our region. It is here to stay. It is a good forage grass although the plant is probably too small to be significant.

Two species are reported from southern Arizona, *S. arabicus* Nees from S. *barbatus,* but I cannot consistently separate them and am treating them as a single species, at least as they occur in ORPI and probably the Sonoran Desert. Key characters used to separate them include glume lengths, pubescence of lemmas, and depth of notch at tip of lemmas. These characters broadly intergrade (Gould 1951:174) and do not seem to be correlated with each other, at least in the Sonoran Desert. Another possibility is that the populations in ORPI are actually intermediates or plants of hybrid origin (Burgess et al., in prep.; Faruqi, 1981). You can often place a specimen in one or the other taxon but only if you do not use more than one character. I cannot distinguish a difference in appearance of the plants or their ecological distribution in the Sonoran Desert. Conert and Turpe (1974:70) report that "material from areas where the distribution of the two annual species overlaps the morphological distinctions often become obscured.

Nevertheless, each species can be recognized by applying the given diacritical characters."

IMPACT AT ORPI:

This small grass seems to present no particular threat to native plants at ORPI, although during favorable years it can become abundant and widespread.

EXSICCATAE*:*

Aguajita Spring, associated with *Prosopis glandulosa, Cercidium floridum*, *Haplopappus acradenius, Condalia globosa,* 1,130 ft, *Bowers 1043* (11 Feb 1978). Aguajita Wash, *88-301*(6 Apr 1988). Ca. 1.6 mi N of Pozo Nuevo at roadside, *Larrea-Hilaria rigida* association, 1,200 ft, *Bowers 1109 (30* Mar 1978). N of ORPI headquarters, *Ranzoni s.n.* (26 Mar 1965, ORPI); 2.1 mi E of Az Hwy 85 on Ajo Mountain Loop Drive, annual on flats, *Van Devender s.n.* (18 Feb 1984, ORPI). Near old corral in Alamo Canyon, 2,500 ft, associated with *Prosopis glandulosa, Bowers 1558* (16 Feb 1979, ORPI). PINAL

COUNTY: Magma, Peebles, *Harrison, Porter*, & *Loomis 846* (22 Feb 1926; annotated in Peebles' handwriting but without date: "First collection in United States, fide Hitchcock"). MARICOPA COUNTY: Paradise valley, abundant along roadside, Peebles 5100 (25 Mar 1928; annotated by Peebles without date: "This species is assuming importance as spring forage in a number of localities in central Southern Arizona."). SONORA: Interdune trough, 2 mi N Sierra del Rosario, *20776.* 4 km W of Sonoyta, weed at edge of alfalfa field, *86-147.* Rio Sonoyta, 10 km W of Sonoyta, *86-196.* 6 km S Puerto Libertad, edge of big dune, *Martin s.n.* (24 Feb 1978).

Sorghum halepense (L.) Pers., Johnson Grass, Zacate *Johnson*

DESCRIPTION:

Coarse perennials with strong rhizomes in better-watered places during favorable seasons, but in the extreme aridity our region the feral plants often annuals or ephemerals without rhizomes. Stems usually 0.5--2 m tall or more depending on soil moisture and temperature. Leaf blades 0.8--2.3 (-5) cm wide. Fertile spikelets elliptic, or more slender than those of the grain sorghums, and deciduous at maturity.

DISTRIBUTION:

Weakly established in washes and low places along the Dos Republicos road paralleling the international fence in the southeastern part of the monument.

In the Sonoyta region and the northwestern part of the Pinacate region it is weakly established along roadsides, and more firmly established as an urban and farm weed, especially in the vicinity of Sonoyta. I doubt if it would persist in natural areas of the Sonoran Desert if there was not repeated introduction from agricultural fields and urban weed populations.

NOTES:

This is a new record for ORPI. It is often grown as a forage grass, but is also regarded as a noxious weed. Originally from the Mediterranean region, it is now weedy in the warmer parts of the world.

IMPACT AT ORPI:

The plants I observed were small, stunted, and seemingly not well-established. However, with an ample seed source "across the street" in Sonora, repeated immigrations into ORPI are expected. It might establish at some of the waterholes or semi-riparian habitats such as canyons in the Ajo Mountains, but as noted above, it has so far not spread into natural areas in the Pinacate region. It does not seem to present any particular threat in ORPI at this time.

EXSICCATAE:

1.0 mi by road E of Lukeville, *87-325*. SONORA: Roadside weed at Sonoyta, *85-704*. Pinacate Junction, 7.5 km E of Los Vidrios on Mex Hwy 2, roadside: *85-996, 86-364*. 20 mi E of San Luis on Mex Hwy 2, *16697B*.

OBSERVATION:

Dos Lomitos Ranch (11 Nov 1987). Camino Dos Republicos, 4.8 mi by road E of Lukeville (11 Nov 1987).

LEGUMINOSAE - Legume Family

Melilotus indicus L., Sour Clover, Yellow Sweet Clover, Al falfilla

DESCRIPTION:

Cool weather ephemerals. Plant most erect, to ca. 50+ cm tall. Flower pea-like, yellow, in spike-like racemes. Pods ovoid, ca. 2 mm long, mostly 1-seeded.

DISTRIBUTION:

Known from Quitobaquito and vicinity and wetland habitats near Sonoyta, such as along the sandy banks and floodplain of the Rio Sonoyta. Native to the Mediterranean and now widespread in the world, especially in temperate regions. It is spontaneous in wet places through much of the Sonoran Desert but has not spread into the open desert.

At Quitobaquito it is infrequent to locally common in the old fields, especially along old irrigation ditches and moist soil around Quitobaquito pond; and infrequent in washes.

IMPACT AT ORPI:

This species is not very aggressive at ORPI and its impact has certainly been minimal.

EXSICCATAE:

Quitobaquito: *Bowers 1607* (30 Mar 1979, ORPI); about pond, *Clark s.n.* (25 Mar 1944, ORPI); *7659* (14 Apr 1963). SONORA: Rio Sonoyta at Sonoyta, *85-706.*

LINACEAE - Flax Family

Linum usitatissimun L., Common Flax

DESCRIPTION:

Spring annuals with slender, erect stems. Leaves sessile, entire. Petals blue, showy. Capsules ca. 1 cm high.

DISTRIBUTION:

Native to Europe, it is a commonly cultivated crop. Bowers (1980:35) reports it from "disturbed areas, 395 to 520 m; Bates Well and near the Visitor Center" adding that it "apparently never became established in the monument." I do not know of subsequent records for it at ORPI and have not found it in northwestern Sonora.

EXSICCATAE:

Near *Chirioni* Well, *McDougall 66* (9 Apr 1941).

MALVACEAE - Mallow' Family

Malva parviflora L., Cheeseweed, *Malva*

DESCRIPTION:

Winter-spring ephemerals in our region (elsewhere often annual to biennial). Plants nearly glabrous to sparsely hairy, especially the new growth and petioles with soft, white hairs. Leaf blades nearly orbicular, green. Floral bractlets slender. Corolla exceeding calyx by ca. 20--30%, the petals *ca.* 5 mm long, white with pale pinkish lavender tinge, obovate, deeply emarginate (notched at apex), the lobes broad, the claw forming the base of the petal glabrous (not bearded). Fruit disc-shaped. Carpels 1-seeded, separating from each other at maturity.

DISTRIBUTION:

Bowers (1980:37) reported it "near corrals and other disturbed areas; 730 m; vicinity of the Gray Ranch in Alamo Canyon." At Quitobaquito it occurs in the old fields and elsewhere in temporarily wet soil

In adjacent northwestern Sonora it is a common urban and rural weed and often *in* other disturbed sites. It is an especially common weed in and around Sonoyta, and is sometimes present but not a common plant among the natural vegetation. Native to Eurasia and now widely naturalized around the world.

IMPACT AT ORPI:

Minimal; it is probably not permanently established in the monument.

EXSICCATAE:

Quitobaquito, primarily in wet soil below pond, *7663 (14* Apr *1963)*. SONORA: 1.1 mi W of Sonoyta on Mex Hwy 2, roadside, *88-17*. Pinacate Junction, roadside depression with standing water and dried, cracked mud, *88-62B*.

MORACEAE - Mulberry Family

Ficus carica L., Fig, Higuiera

DESCRIPTION, NOTES AND RECOMMENDATIONS:

A small orchard of Mission Fig shrubs yet barely survives in old fields along old irrigation ditches below pond at Quitobaquito: cultivated by Tohono O'odham (Papago) from Spanish introductions. Although many of the trees were still alive in the late 1980s, they had been sadly neglected for many years.

Normally a small tree, in the 1970s and 1980s the Quitobaquito figs had become reduced to shrub due to drought stress and perhaps freezing weather (possibly made worse by the already weakened condition of the plants). The largest ones are about 3--5 m tall. These are the so-called Mission Fig, a black fig which is probably not different from the plants introduced by Eusabio Kino in the 18th century. In fact these figs could have been grown clonally (by cuttings) from clonal material of the original Kino figs. A likely source would have been Quitovac (see Nabhan et al., 1982).

These plants are of course not reproducing. This germplasm, now locally endangered, need to be protected and properly cared *in situ*, not only for the historic value but for educational, aesthetic, conservation values. A simple drip irrigation system should ensure their survival and allow the trees to recover. Occasional fertilizer, applied at the appropriate season, would probably be advisable. A horticultural expert, such as Dr. Mark Dimmitt of the Arizona-Sonora Desert Museum should be consulted.

The status of these plants should be changed from "alien" to "locally endangered" or whatever would be most appropriate under the circumstances. This is a genetic resource that should not be lost.

EXSICCATAE:

S. of Quitobaquito pond, in mesquite thicket, in a row paralleling a row of pomegranates: *88-452* (14 Sep 1988); *Galiano s.n*. (27 May 1987, ORPI).

PALMAE - Palm Family

Washingtonia filifera Wendl., Fan Palm

DESCRIPTION AND DISTRIBUTION:

This large fan palm, native to Arizona, California, and Baja California Norte, is commonly cultivated in Sonoyta. It is distinguished by the palmate (fan-shaped) leaves, dull rather than shiny green blades, and small black fruit in inflorescences that far exceed the leaves in length.

NOTES:

Small fan palm, apparently this species (rather than *W. robusta*, distinguished by its narrower trunk and greener, smaller, and thinner leaves) were clandestinely planted at Quitobaquito in the late 1980s. These plants, removed by ORPI staff, were obviously nursery-grown since the roots showed that they were container-grown. However, it is reasonable that birds could transport the seeds from nearby Sonoyta, and if established, the plants would probably persist at Quitobaquito but not elsewhere. Two additional small plants (89-258, below) were found at Quitobaquito. They were either clandestinely planted or resulted from bird-introduced seeds from nearby Sonora. It is doubtful they would survive to become large enough to reproduce.

EXSICCATAE:

Quitobaquito, two small plants growing together, estimated 2 or 3 years old, in alkaline soil below spring seep to NE of pond, *89-258* (19 Jun 1989).

POLYGONACEAE - Buckwheat Family

Polygonum argyrocoleon Steud. ex Kunze, Silversheath Knotweed, Persian Wireweed

DESCRIPTION:

Non-seasonal annual, with a stout tap root. Stems and leaves glaucous; leaves alternate, sessile or nearly so, mostly narrowly elliptic to narrowly lanceolate, larger leaves 2--6.5 cm long and soon deciduous; upper leaves usually reduced to inconspicuous bracts (the plant often functionally leafless or nearly). Flowers small, the sepals petal-like, usually white or pink. Fruit a lens-shaped or 3-angled achene.

DISTRIBUTION:

Common along the Rio Sonoyta, and elsewhere in the Sonoyta region in major gravelly washes, occasional in roadside depressions, and common as an agricultural weed. Native to Near and

Middle East, now widespread in southwestern United States and northwestern Mexico, especially as a weed in agricultural and other disturbed areas.

IMPACT AT ORPI:

This weed species can be expected along the southern border of the monument but will probably not become well-established, if at all.

EXSICCATAE:

SONORA: El Papalote (just S of Aguajita Spring], *86-165*. Riverbed of Rio Sonoyta, at Sonoyta, *85-7098*.

Rumex dentatus L. subsp. KLOTZSCHIANUS (Meisn.) Rech. f., Dock

REFERENCES:

Hitchcock and Cronquist, 1964; Pinkava et al., 1975.

DESCRIPTION:

In western Sonora a "long-lived" winter-spring ephemeral and perhaps sometimes an annual. Plants with a stout, deep tap root, and strong, erect stems with a spike-like panicle of densely clustered flowers, or when better-watered an open, branched inflorescence. Fruit dry, tawny reddish-brown, persisting on inflorescence for some time. Valves (larger perianth segments) tough and hard, with conspicuous teeth and large callosities (or grains).

DISTRIBUTION:

Wet mud in bottom of roadside ditches, vernal pools in savanna-like swamps, and other low-lying temporarily wet places. Although young plants grow only in wet mud, or even emergent from shallow water, the older plants with their deep tap roots can persist and produce seeds long after the surface turns to dried, caked mud and other wetland herbaceous plants have perished.

NOTES:

Said to be native to southern and eastern Asia and introduced into America. Rechinger (1937:131) knew of *R. dentatus* in North America only from Oregon and San Juaquin County, California, and placed them in subsp. *klotzschianus* (Meisn.) Rech. f. *Rumex dentatus* has spread widely since that time and has become well-established in southern Arizona, Sonora, and Baja California. The earliest record for the Sonoran Desert is a specimen collected in Arizona by Vince Roth in 1957 (below). It was reported new for the flora of Arizona by Pinkava et al. in 1975.

IMPACT AT ORPI:

Probably not significant.

EXSICCATAE:

SONORA: Rio Sonoyta at Sonoyta: *85-95*; Presa Divididora, *86-139*, *86-300*. El Papalote, waterseep in large wash at international fence, *86-161*.

PORTULACACEAE - Portulaca Family

Portulaca oleracea L. var. **Oleracea**, Purslane, Verdolaga

REFERENCE:

Dannin et al., 1978.

DESCRIPTION:

Summer ephemerals. Plants very succulent, glabrous except for a few inconspicuous stipular hairs visible only with magnification, usually becoming prostrate with age and size. Stems few to many, usually much branched and relatively thick except in stunted plants. Leaves alternate or subopposite, clustered at stem tips, spatulate to obovate, commonly 1.0--1.5 cm long. Petaloids yellow. Seeds numerous, cochliate, 0.6--0.8 mm wide, the surface dull black and granulate, with a thin white strophiole at hilum.

DISTRIBUTION:

Probably a common weed in the Sonoyta region, it has been recorded from Aguajita wash and occurs in several places in the Pinacate region. It is widespread in the Sonoran Desert, often in disturbed habitats and seasonally common in washes and floodplains.

Native to the Old World, perhaps India, it is now cosmopolitan and one of the world's most serious and ubiquitous weeds.

NOTES:

This is a new record for ORPI. Sometimes used as a potherb and seasonally sold in markets in Sonora and locally in southern Arizona. Var. *oleracea* is the common, widespread wild and weedy form. However, some forms of this species appear to be native to the new world.

IMPACT AT ORPI:

Insignificant.

EXSICCATAE: Aguajita, wash and floodplain, *88-432* (14 Sep 1988).

PRIMULACEAE - Primrose Family

Anagallis arvensis L., Scarlet Pimpernel, *Hierba de Pajaro*

REFERENCE:

Pinkava et al., in prep.

DESCRIPTION:

Low annuals, glabrous, with delicate, herbaceous, leafy stem. Leaves entire, sessile, ca. 5-8 mm long. Corollas salmon colored, ca. 8--10 mm wide. Seeds many in small capsules.

DISTRIBUTION:

Native to Europe, now widespread in North America and elsewhere.

IMPACT AT ORPI:

None; it is a rare plant at ORPI growing only as a well-watered garden weed. From time to time it may be expected as a garden weed at the residence areas but it would doubtfully survive the desert conditions elsewhere in ORPI.

EXSICCATAE:

Resource Center, *Heal & Heal s.n.* (ORPI 6491).

PUNICACEAE - Pomegranate Family

Punica granatun L., Pomegranate, *Granada*

DESCRIPTION:

Shrubs to 3 m tall: flowers bright red-orange, the fruit pulp whitish; flowering in March and April.

DISTRIBUTION, NOTES, AND RECOMMENDATIONS:

Long ago planted in along irrigation ditches below the pond at Quitobaquito (old fields); cultivated by Tohono O'odham (Papago) from Spanish introductions. Although many of the pomegranates were still alive and a few thriving in the late 1980s, they have been badly neglected for many years and most of them are in poor condition. Pomegranates are readily

propagated by cuttings, and these are probably all the same clone. These are historic plantings and deserve protection and care in the same manner as the figs which are planted in rows immediately to the west. Conservation of this germplasm needs to be carried out in *situ.*

EXSICCATAE:

Quitobaquito: *86-205* (23 Jul 1986) ; 88-309 (6 Apr 1988), *Van Devender* s.n. (31 Aug 1978, ORPI).

SALICACEAE - Willow Family

Populus fremontiI S. Wats. subsp. **Fremontii**, Cottonwood, Alamo

DESCRIPTION:

This is the largest native tree in the Sonoran Desert. There are several medium sized cottonwoods, ca. 12 m tall, at Quitobaquito. The wood is soft and the trees are capable of very fast growth. Flowering in January and February, leaves appearing shortly thereafter. Leaf blades shiny green, about as broad as long, and more or less triangular in outline.

DISTRIBUTION:

There are well-established colonies at Quitobaquito, Quitovac, and scattered along the Rio Sonoyta near Sonoyta. I know of no other native or long-established cottonwoods southward along the coast of Sonora until the Rio Yaqui.

NOTES:

The Quitobaquito and Quitovac cottonwoods, and most if not all those along the Rio Sonoyta at Sonoyta, were probably planted from cuttings. These trees are few in number but have been important to the local people. Perhaps cottonwoods were native along the Rio Sonoyta before degradation of the riparian habitat earlier in the 20th century.

There is no mistletoe in these cottonwoods, which suggests that these are introduced and not native cottonwoods. Apparently the Quitobaquito trees are all pistillate, and it would interesting to determine the sex of the Quitovac and Sonoyta trees. In 1987 I noticed a root-sprout on one of the Quitobaquito cottonwoods, indicating vegetative propagation. In 1988 someone had clandestinely placed cottonwood cuttings along the ditch between the spring and pond.

EXSICCATAE:

Quitobaquito: *Benson s.n.* (5 Mar 1940, pistillate); *Peebles 14563* (5 Mar 1940, pistillate).

SOLANACEAE - Potato Family

Calibrachoa parviflora (Juss.) D'Arcy, Wild Petunia

REFERENCE:

D'Arcy, 1989.

SYNONYM:

Petunia parviflora Juss.

DESCRIPTION:

Annuals, the plants spreading-prostrate, rooting at nodes, reaching 1 m across. Herbage sticky (viscid) hairy, the stems weak, sprawling to prostrate. Leaves simple, entire, subopposite, semi-succulent, mostly narrow, 5--20 mm long. Flowers solitary in leaf axils, 5-merous, corollas ca. 8 mm wide, the tube yellowish, the lobes purplish and showy. Fifth stamen smaller, often lacking or very reduced. Fruit a capsule, the seeds numerous, 0.5.-mm long.

DISTRIBUTION:

Nearly barren moist soil of alkaline flat ca. 100 m NW of pond at Quitobaquito; rare, six plants seen. Recorded from the Colorado River at Yuma; California to Florida and southward to southern South America. This species is probably a native of South America.

NOTES:

There is no available conclusive evidence that this species is not native to North America. It is apparently a rare plant at ORPI and as such should be protected; however, recent activity at Quitobaquito may have impacted on this tiny, isolated population.

IMPACT AT ORPI:

Virtually none;

EXSICCATAE: Quitobaquito, *88-317* (6 Apr 1988).

Nicotiana glauca Graham, Tree Tobacco

DESCRIPTION:

Sparsely branched open shrub or small tree, 2--3+ m tall. Leaves glaucous, smooth, somewhat thick, and with a well-developed petiole. Flower yellowish and tubular, frequented by hummingbirds.

DISTRIBUTION:

In the Sonoyta region it is an urban and agricultural weed, and sometimes occurs along roadsides and other disturbed habitats. Native to South America and now widely naturalized in North America.

NOTES:

Not recorded for the monument flora but it is a potential immigrant, especially along the southern border. It would probably thrive in the Ajo Mountains.

IMPACT AT ORPI:

Minimal; if established it would probably not become common.

OBSERVATIONS:

SONORA: Weed at Sonoyta (4 Oct 1985). Agricultural weed, vicinity of San Luis (6 Oct 1985).

TAMARICACEAE - Tamarisk Family

Tamarix ramosissima Ladeb, Salt Cedar, *Pino Salado*

SYNONYM:

T. chinensis of authors, not Lour.

REFERENCES:

Baum, 1967; 1978; Horton, 1964.

DESCRIPTION:

Shrubs or trees, often 2--4 m tall. Branchlets, or ultimate twigs, winter- and tardily drought-deciduous, their internodes shorter than, and obscured by, overlapping scale leaves. Long. shoots perennial. Leaves scale-like, completely encircling stem, leaves of ultimate branchlets 1.1--1.4 mm long, those of the long shoots 2.3--2.5 mm long: stipules absent. Flowers 5-merous, in dense

racemes or spikes, regular, bisexual, small, usually pink, sometimes white but to pink, flowering much of the year. Recorded in flower from January to October.

DISTRIBUTION:

Abundant in wet soil around Quitobaquito pond and at the springs, near water sources in washes, and old fields. Occasional individuals turn up elsewhere in the monument, but so far the only well-established population is in alkaline-wet soils in the Quitobaquito region.

In northwestern Sonora it is abundant along the Rio Sonoyta and the Rio Colorado and its delta, as an agricultural weed, in roadside depressions, and at many wetland places including Laguna Prieta and the pozos at La Salina. Native to the Old World, now widespread, weedy and invasive in many of the warmer, drier parts of the world, especially in disturbed riparian habitats in deserts.

NOTES:

I am including all of the shrubby, pink-flowered, short-shoot deciduous tamarisks in southwestern North America in *T. ramosissima*. I am unable to apply the technical devises proposed to distinguish micro-differences of herbarium specimens to plants in the field, at least in our region.

The tree Salt Cedar, *Tamarix aphylla* (K.) Karst., is a common shade tree in the Sonoran Desert. It is native to North Africa and the Eastern Mediterranean. It was planted at some of the ranches and settlements in ORPI, and is a common tree at Sonoyta and Lukeville. Once planted and established, it may persist or even thrive for many years with no supplementary water. Apparently, all tree tamarisks in the Sonoran Desert have been propagated clonally by cuttings, perhaps all from a single clone. I have never found seedlings of this tree anywhere in the Sonoran Desert and it poses no management problems at ORPI. T. aphylla is readily distinguished from the weedy shrub tamarisk by its white, sessile flowers, and large stature (a tree with a massive trunk). In addition, T. aphylla does not have winter-deciduous twigs.

IMPACT AT ORPI:

There is no doubt but that this weedy shrub is competing and preventing other more desirable plants from establishing in the Quitobaquito region. Eradication there is not economically feasible, although periodic control of larger shrubs might be an option although somewhat costly. The adjacent populations in Sonora are so extensive that eradication at Quitobaquito is out of the question. Elsewhere, when an individual plant is located it should be eradicated, which is the present ORPI management policy.

EXSICCATAE:

Quitobaquito: Growing in drained portion of lake, associated with sedges, *West 96* (30 Sep 1961); Quitobaquito Spring, tree to 10 ft, growing in seep, associated with *Scirpus ol*neyi and *Anemopsis californica*, *Bowers 1391* (25 Jul 1978).

OBSERVATION:

North Alamo Canyon, ca. 2,780 ft, *William Mikus* (1 Nov 1988), a solitary plant ca 8 ft tall, removed by ORPI staff.

ZYGOPHYLLACEAE - Caltrop Family

Tribulus terrestris L., Puncture Vine, Goathead, Torito, Toboso

DESCRIPTION:

Hot weather ephemerals. Plants prostrate. Leaves even-pinnate, leaflets of lower pair unequal (different sized). Flowers yellow, single in axils, the petals usually 5 mm or less in length. Fruit ca. 1.5--1.8 cm across, intricately sculptured and spined, at maturity breaking into 5 spiny nutlets (mericarps), each nutlet several-seeded and with (1) 2 larger spines; after separation the vicious tack-like nutlet lands with the biggest spines upward.

DISTRIBUTION:

Often abundant in disturbed habitats such as roadsides and urban and agricultural areas. I have not found it established in natural habitats in northwestern Sonora. Native to the Old World, this obnoxious weed is now widespread in the warmer regions of the world.

NOTES:

There are no specimens from the monument, but certainly it must be present along the highway, especially near Lukeville, and along the Camino Dos Republicos border road east of Lukeville, and a weed in residential area. It is likely that it would persist only in highly disturbed areas. It is abundant in disturbed habitats in adjacent Sonora, but I have not found it establishing in natural habitats anywhere in northwestern Sonora. The scientific names translate as "tribulation of the earth."

IMPACT AT ORPI:

As mentioned above, it will probably not become established in natural areas, but it would be an obnoxious addition to the ORPI flora around campgrounds, residential areas, and along roadside.

EXSICCATAE:

SONORA: Sonoyta, *85-939*.

MANAGEMENT CONCLUSIONS AND RECOMMENDATIONS

Most of the non-native plants in ORPI seem relatively benign and probably present little or no potential for negative impact within the monument. However, four species are cause for considerable concern: *Bromus rubens, Eragrostis lehmanniana*, *Pennisetum ciliare*, and *P. setaceum.* The two *Pennisetum* species warrant immediate management decisions *(see* Species Accounts for specific recommendations).

When this project was initiated, the primary concern for undesirable vegetative change centered around exotic weedy species in adjacent disturbed habitats. There is now a fairly good preliminary handle on that situation, although monitoring and exploration need to be followed through and continued. The potential impact from that source seems secondary to the threat posed by continued introduction of arid-adapted old world grasses by the USDA Soil Conservation Service (see Tucson Plant Materials Center, 1988). The stated goal of this governmental agency is the introduction and "improvement" of such grasses as Eragrostis *lehmanniana, Pennisetum ciliare*, and *P. setaceum*. Due to their efforts the vegetation and flora of the Sonoran Desert have been forever altered. New drought-tolerant introductions---increasingly more threatening to the native vegetation and flora--are purposely being selected to be capable of successfully competing with the native vegetation.

Negative impact on the monument is not a species-numbers game. For management, the total number of non-native species seems secondary or almost academic. :Introduction of additional arid-adapted grasses capable of becoming truly invading-establishing in natural habitats--and replacing native species needs to be a serious concern. Prevention would seem more efficient than any attempt at eradication which will always be costly and very likely not feasible. Dialogue with Soil Conservation Service needs to be initiated (see Discussion).

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