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A BIOTIC SURVEY OF
BUEHMAN, ESPIRITU, YOUTCY AND ROBLE
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IN THE REDINGTON PASS REGION, ARIZONA

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Introduction

Bridging the Catalina and Rincon Mountains, Redington Pass is approximately 25 miles northeast of downtown Tucson. The lowest point of this "saddle" between the two mountain ranges is about 4000 feet (near "Government Tank"). The highest elevations in the Catalinas and Rincons are, respectively, 9157 and 8666 feet. The relatively high elevation of the mountains provides around 25 inches of precipitation yearly (Sellers and Hill, 1972). Much of this water finds its way down through the canyons of Redington Pass. The westside canyons of the pass ultimately drain into the Santa Cruz River; the eastside flow into the San Pedro.

This report summarizes a biological inventory of the riparian communities of four eastside canyons of Redington Pass. The study centers on Buehman Canyon, which with a watershed of 51.3 sq. mi (Zimmermann, 1969), is the largest and best watered of the eastside canyons. This canyon, along with Espiritu, Roble and Youtcy canyons, were surveyed by Jim Malusa and Mark Porter on 18-20 October 1990. In the lower reaches of Buehman and Espiritu Canyons are perennial pools with fish populations, while Youtcy and Roble canyons hold springs that probably flow during all but the most severe droughts (Zimmermann, 1969). All four canyons intersect limestone bedrock, a feature that distinguishes them from all other Sonoran desert riparian areas.

Plants were the focus of this study, in large part because of the ease of collection and identification. Even so, because many plant species can be identified to the species level with certainty when flowers and fruit are present, a moderate proportion of the native flora (i.e. spring and summer blooming species) could not be identified. This means that the species listed in Appendix 1 underrepresents the true number of plant species in the study area;

more would be found with more time spent in the canyons, particularly in the late spring.

Climate and Geology

Annual precipitation in the Redington Pass area varies from 12 to 18 inches annually, increasing as one climbs from an elevation of 3000 feet near the San Pedro River, to 5369 ft. at Aqua Caliente Hill (Zimmermann, 1969). Approximately 50% of the annual precipitation falls between July and October (Sellers and Hill, 1972), usually from localized convective storms releasing moisture from subtropical air masses from the Gulfs of Mexico and California. In contrast, the winter precipitation is from large Pacific cyclonic storms sweeping in from the west and northwest.

The geology of the area is complex. Along the San Pedro are valley-fill alluviums ranging from recent sands, clay, and silt, to Pliocene age (up to 5 mya = 5 million years ago) cemented or deformed gravels and cobbles (Montgomery, 1963). The lower reaches of the canyons visited were all characterized by these alluviums, with open, sandy watercourses and no permanent water (an exception is Soza (Espiritu) Canyon, which crosses bedrock near its confluence with the San Pedro).

Further up the drainages of the four canyons visited, the bedrock geology includes mid-Tertiary (15-38 mya), Cretaceous (65-140 mya), and Paleozoic (230-570 mya) sedimentary rocks (Reynolds, 1988), much of which exists as a band of limestone that trends northwest to southeast, intersecting all four of the canyons visited. Resistant to erosion, the limestone forms "narrows" in the canyons, which often results in perennial pools of water shaded by high canyon walls.

Further yet up the canyons the bedrock is primarily granitoid rocks and gneiss from 55 to 1400 mya (Reynolds, 1988).

Overview of Survey sites

In all, six areas were surveyed. Three are disjunct sections of Buehman Canyon, all of which are on deeded land held by the Bellota Ranch (Figure 1). Although there are no historical data on the flora and fauna of these sections, in an adjacent region (between Middle and Lower Buehman Canyon, T12S, R18E, Sect. 5, SW1/4 of the SW1/4), the U. S. D. I. Bureau of Land Management (BLM) has been monitoring the canyon as part of a riparian inventory.

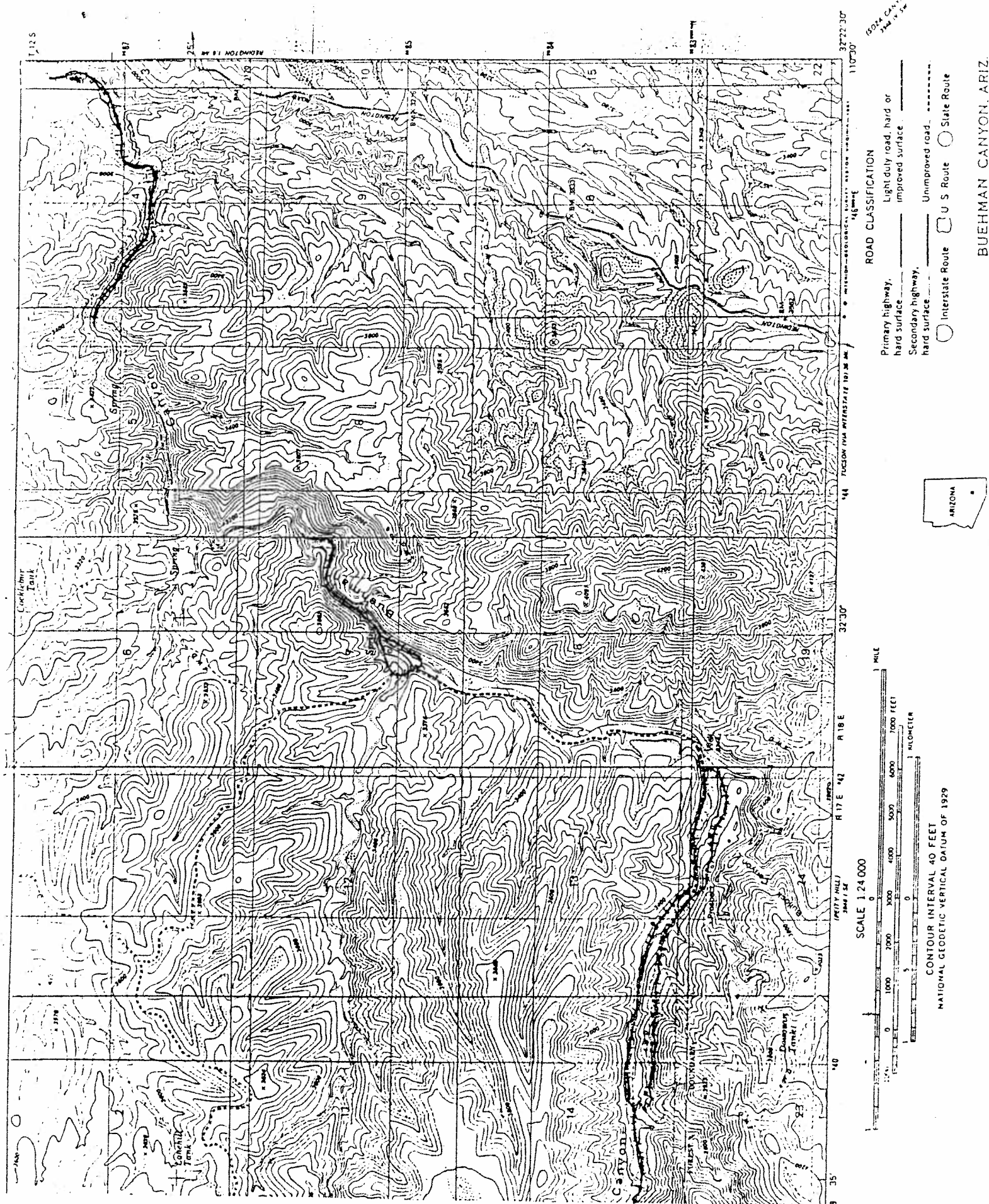


Figure 1. Survey routes along Lower, Middle, and Upper Beuhman Canyon.

Lower Beuhman

Near its confluence with the San Pedro at 2850 ft. (T11S, R18E, Sect. 34, SW1/4 of SW1/4; T12S, R18E, Sect. 3, NW1/4 and SW1/4 of the NW1/4 and Sect. 4), "Lower Beuhman" is broad and open, with a sandy bottom dominated mainly by burro bush (*Hymenoclea salsola*). Canyon sides vary from gentle slopes to 50 foot terraces of river valley fills, supporting mesquite (*Prosopis velutina*), palo verde (*Cercidium microphylla*) and saguaro (*Carnegiea gigantea*).

There is no permanent water until the limestone bedrock is reached, upstream where the canyon narrows to steep walls up to 30 feet high, pitted with fissures and small caves (Figure 2). Here there are pools up to five feet in depth, fed by a flow estimated at 1 to 3 gallons per minute (Al Bammann, BLM, Safford office, pers. comm.). Longfin dace (a native fish, *Agosia chrysogaster*; Figure 3), Canyon tree frogs (*Hyla arenicolor*), leopard frogs (*Rana pipiens*), and black-necked garter snakes (*Thamnophis cyrtopsis*; Figure 4) are abundant. (Specific taxa of concern are listed in a separate section below; a complete list of identified plant and animal species are found in Appendices 1 and 2, respectively.) Less common fish included mosquito fish (*Gambusia affinis*) and sunfish (*Lepomis cyanellus*), both introduced species.

Vegetation along the stream was primarily young sycamore (*Platanus wrightii*) and ash (*Fraxinus velutina*), with few mature individuals. Because the canyon is so narrow it is likely that most large trees were eliminated by the October 1983 flood that affected most of Southern Arizona. The BLM inventory indicates that within their study area extensive flood damage occurred following the 1983 flood (BLM, unpublished), including removal of nearly 85% of the willow (*Salix gooddingii*), 75% of the sycamores, 67% of the ash and 90% of the walnut (*Juglans major*) trees. The extensive damage caused by flooding points out the importance of recruitment and the preservation of sources of recruitment. Recruitment appeared good, and cattle sign (cow droppings, grazed plants, cattle tracks or other evidence of trampling) was light.

Middle Beuhman

Approximately two miles further upstream (T12S, R18E, Sect.7) we surveyed "Middle Beuhman" (Figures 1 and 5). Here the canyon floor is broader, and it supports a continuous canopy of broadleaved deciduous trees, mostly sycamore but including ash, willow (*Salix gooddingii*), walnut (*Juglans major*), and cottonwood (*Populus fremontii*). Slopes were similar to Lower Beuhman, but with the addition of junipers on the north-facing slopes (*Juniperus*

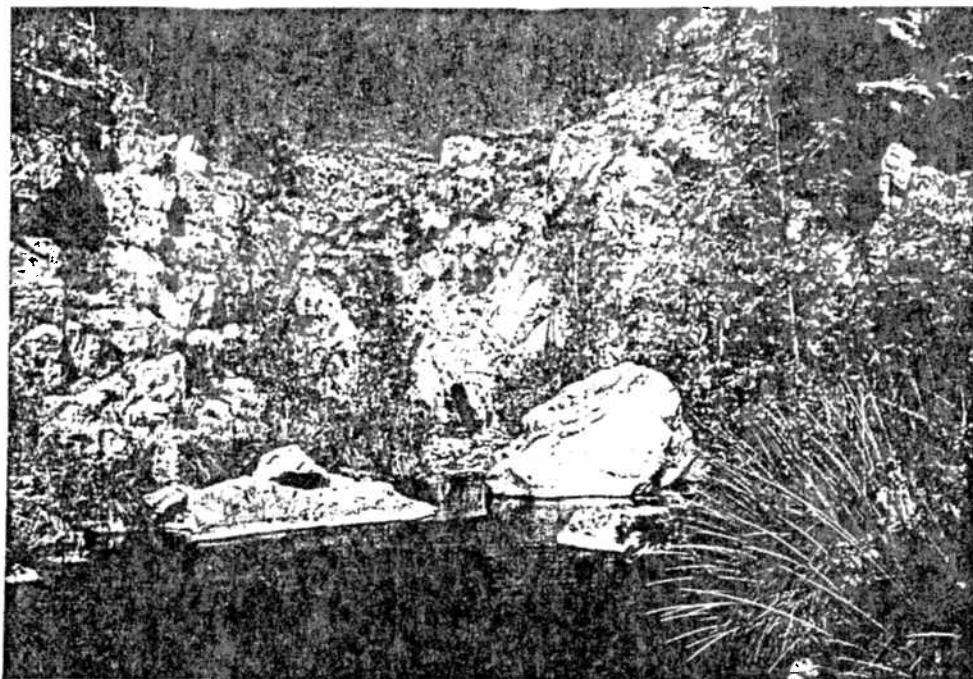


Figure 2. Lower Beuhman Canyon, facing west, upstream. Trees are young Sycamores.

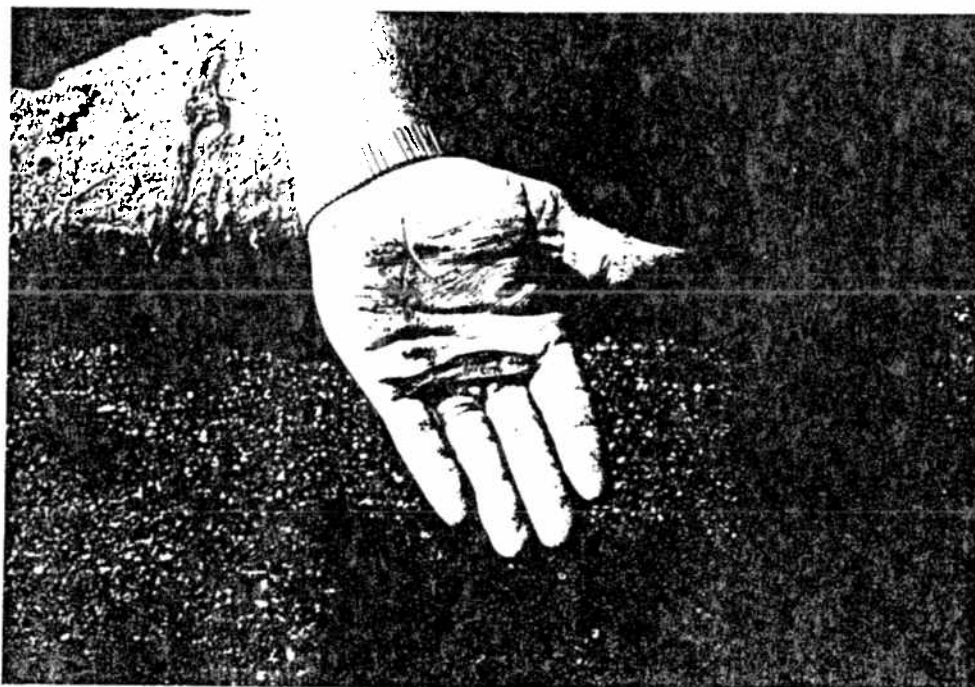


Figure 3. Longfin dace, *Agosia chrysogaster*, from Beuhman Canyon.

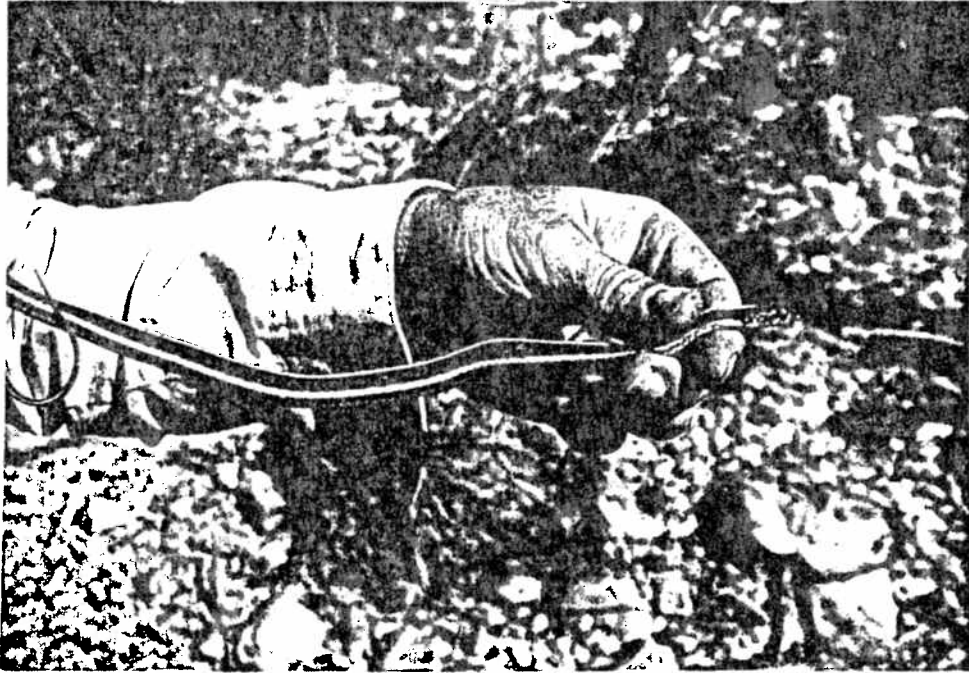


Figure 4: The black-necked garter snake (*Thamnophis cyrtopsis*) in Buehman Canyon.



Figure 5. Mature sycamores and saguaros at Middle Beuhman Canyon.

erythrocarpa). Intermittent pools were found above the spring indicated on map (above "Beuhman"); downstream of the spring there appears to be permanent water, with fish and frogs. A shaded seep (shortly before the canyon swings due north) supported maiden's hair fern (*Adiantum cappilus-veneris*) and golden columbine (*Aquilegia chrysantha*), plants that are normally found at much higher elevations than 3100 feet.

Cattle sign was heavier than in Lower Beuhman, but there still appeared to be good recruitment of young sycamores. There were the tracks of an off-road vehicle downstream from where the four-wheel drive "road" entered the canyon from the south.

Further downstream the land is now administered by the state of Arizona. It is in this section where the BLM riparian inventory took place.

Upper Beuhman

Beginning one and a half miles upstream of the Middle Beuhman survey (T12S, R17E, Sects.13, 14 and 24), we surveyed the canyon bottom up to the National Forest Boundary at 3400 feet (Figure 1). Throughout this stretch the canyon bottom is mostly cobbles with intermittent pools. There is a minor 'narrows' through a sandy limestone and conglomerate bedrock; here there are pools, the largest of which was 3 feet deep, with fish and leopard frogs. The fresh tracks of mountain lion (*Felis concolor*) were alongside one of the pools; these were photographed. We also saw cattle sign, one female mule deer, and bear scat holding juniper berries. Recruitment of young trees is good.

Ash and sycamore are the dominant trees; cottonwood, walnut and willow are also present. Overall, there appears to be fewer large trees here than in Middle Beuhman.

There is also a small population of wild pumpkin, evidently escapees from cultivation at an abandoned homestead upstream of the junction of Beuhman and Bullock Canyons. There are at least a dozen large plants scattered over an acre, some with pumpkins the size of basketballs. About 30 yards from this patch we encountered a large desert tortoise (*Xerobates agassizi*), with a shell 12 inches long. (Photo, Figure 6).

The north-facing slopes above the canyon hold mostly juniper, mesquite and shin-dagger (*Agave schottii*), while the south-facing slopes have saguaro and ocotillo. The north-facing slope also shows evidence of recent mineral exploration (a network of roads cut into the hillside; Figure 7) and of earlier mining (a rusted boiler, concrete foundations, tailings). Disturbed slopes showed only marginal



Figure 6. Desert Tortoise (*Xerobates agassizi*) at Upper Beuhman Canyon.

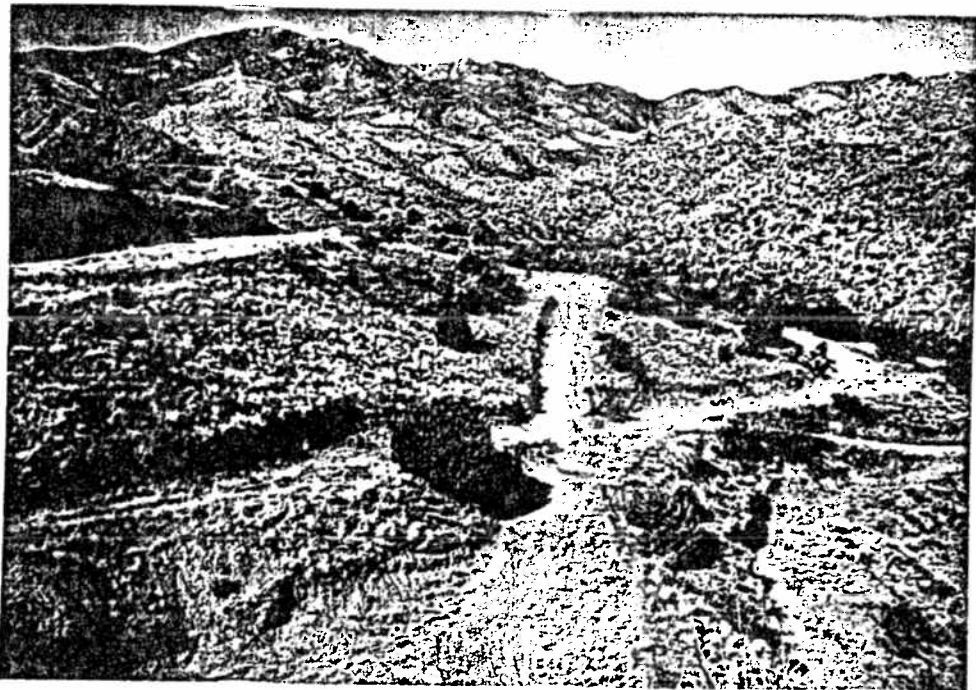


Figure 7. Mineral exploration. Upper Beuhman Canyon is at lower right. View is westward, with Catalina Mountains in background.

recovery and plant community structure has been greatly altered, with large areas characterized mainly by weeds such as *Solanum*.

Youtcy Canyon

We surveyed Youtcy Canyon (Figure 8) both up and downstream of the spring, indicated on USGS topographic maps (T12S, R18E, Sect. 33, SW1/2 of the SW1/4; T13S, R18E, Sect. 4, NW1/4 of the NW1/4). I estimated the flow of the spring at approximately one gallon per minute. Much of this portion of Youtcy Canyon is very narrow, entrenched in limestone, and scouring by floods probably prevents establishment of large trees. Water from the canyon is pumped to the rim for livestock; there was no sign of cattle along the canyon bottom.

Typical of the narrows are small ponds, to 18 inches deep, rimmed with cattails (*Typha domingensis*). There are leopard frogs and black-necked garter snakes, but no fish. Upstream of the spring are ephemeral pools separated by stretches of cobbles and gravel. In the broader reaches of the canyon floor, where flooding is less severe, there were mature cottonwoods, ash, walnut and willow.

The section we surveyed is state-owned. Just upstream of the survey site the land is deeded to the Bellota Ranch. Approximately two miles further upstream is the Coronado National Forest.

Espiritu Canyon

Espiritu Canyon (T13S, R18E, Sect. 11, W1/2 of SE1/4 and E1/2 of the SW1/4) has a geomorphology similar to Beuhman Canyon: a broad and sandy channel where the bedrock is submerged under river valley fill, and an abrupt change to a much narrower canyon when limestone bedrock is intersected. We surveyed a short stretch of Espiritu at this transition point, just upstream of the Bar L Y ranch (Figure 9). This is land deeded to the Bellota Ranch, until a point about 1/3 mile above the ranchhouse. The next three miles upstream are lands administered by the state; beyond this is the National Forest.

The broad canyon bottom above the ranch house supports much burro bush, desert broom (*Baccharis sarothroides*) and cocklebur (*Xanthium strumarium*). Surrounding hillsides are dominated by the jojoba bush (*Simmondsia chinensis*), along with mesquite, saguaro, and ocotillo.

The canyon narrows at the limestone boundary, and soon, if hiking upstream, pools of water appear, at first intermittent, then continuous, holding Longfin dace, Canyon tree frogs, and Black-necked garter snakes. Riparian vegetation includes ash, cottonwood

and walnut, but there is not a continuous canopy, probably because of flooding mortality. Also common along the canyon bottom is the large (up to 3 ft.) yellow composite *Bidens bipinnata* ("beggar's tick").

Just before the canyon swings south (and land ownership changes to the state), there are a series of small waterfalls and plunge pools. Above these we found no fish, apparently because of the barrier formed by the falls.

There was no observed cattle sign in the canyon. Elevation at survey site is 3300 feet.

Roble Spring

This perennial spring (T13S, R18E, Sect. 30, SW1/4 of SW1/4) has an estimated flow of 1/2 gallon per minute (A. Bammann, pers. comm.). We surveyed the immediate area of the spring, which is located along a series of limestone conglomerate bluffs that form a barrier across Roble Canyon (map, Figure 9). Above and below these "falls" the canyon holds vegetation typical of an intermittently flowing wash vegetation, with an occasional cottonwood or ash in the wash bottom, and hillsides with saguaro, prickly pear, and juniper.

The spring water descends down the limestone bluffs, stepwise, alternately forming pools surrounded by cattails, then dripping down a cliff 10 to 20 feet to the next pool. We did not observe any fish or frogs in the pools, but the seeps support an exceptional growth of maiden's hair ferns (Figure 10).



Figure 10. Maiden's hair fern (*Adiantum capillus-veneris*) at Roble Spring.

There are large ash and cottonwood near the spring, but no walnut. We observed a Great Horned Owl about 50 yards downstream of the spring.

There was no observed cow sign in the area. The road to the spring has been recently improved, and there are abandoned mine workings only 100 feet to the north of the spring (some of the tailings descend to the waters edge). Elevation at the spring is 3780 feet.

Species of special concern

The U. S. Fish and Wildlife Service (USFWS) has classified rare plant and animal species according to potential vulnerability, utilizing alpha-numeric codes to denote the status of the plants. Those used in this report are defined as follows: E- Taxa listed as endangered and without assistance faces extinction; T- Taxa listed as threatened and although not in danger of extinction currently, are potentially facing extinction; 1- Taxa for which the USFWS has on file substantial information on biological vulnerability and threats to support the listing of these taxa as an endangered or threatened species; 2- Taxa for which information now in possession of the USFWS indicates the possible appropriateness for the listing of these taxa as endangered or threatened species, but for which substantial information on biological vulnerability and threats is not currently available; 3- Taxa are no longer being considered for listing as endangered or threatened species, (3C) because they have proven to be more abundant or widespread than was previously believed and/or are not subject to any identifiable threat. It should be noted, however, that these status assessments are based on information currently available to USFWS and they are subject to change.

Species of limited abundance and species that are closely linked to surface water are of special concern because they are the most likely to be effected by future habitat changes. Before initiating this study we examined the Heritage Data Base, a computer catalog managed by Arizona Game and Fish (AGF) and The Nature Conservancy that lists all rare and/or endangered species that have been observed in a particular area of the state. Some of these "target" species were found in our survey, e.g., *Polygonum fusiforme* ("smartweed" or "lady's thumb"), while others, e.g., *Manihot davisae*, were not observed. Species that were not found are not necessarily absent from the study area; we simply may not have encountered them during our limited time in the field, or, in the case of plants, they were not identifiable during the season in which the survey was conducted. Species that are not federally protected, yet are listed on

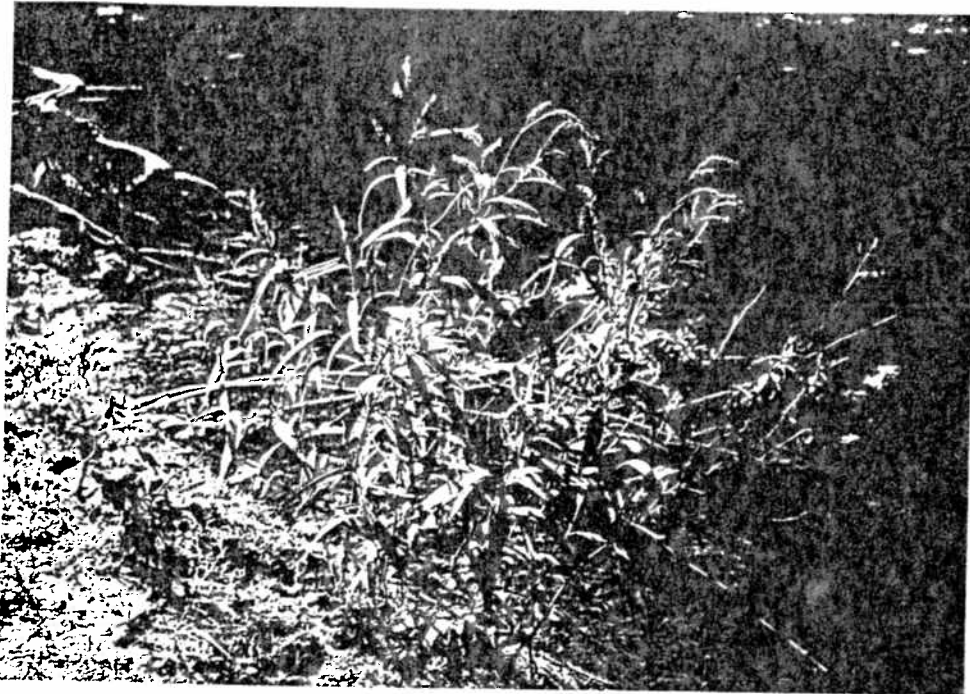


Figure 11. *Polygonum fusiforme* at Buehman Creek. Plant is about 20 inches tall.



Figure 12. *Neolloydia erectocentrus* on slope above Upper Beuhman. On limestones, here growing with the yellow composite *Dyssodia pentachaeta*.

the Heritage Data Base are species that biologists are monitoring because they are either endemic (their distribution is restricted) to Arizona, locally rare (for example, it is possible the species is more abundant in Mexico, but the information may be lacking), or because the species lives in an uncommon or endangered habitat.

Below is a listing of those species of plant and animal species on the federal lists and/or on the Heritage Data Base that are known or expected within the study area. The list includes scientific name, common name, current federal status (if the species has federal status) and a few comments on location and population size.

Rare or Unique Plant Species

Polygonum fusiforme; Smartweed, or Lady's thumb
Category 3

Found along creek in Lower, Middle and Upper Beuhman; estimated total population of 30 to 50 "clumps". (Figure 1). A pink flowered perennial that grows in saturated fine soils, sand and mud close to water's edge. Has been collected in Sabino Canyon and Rincon Creek. Photo, Figure 11.

Neolloydia erectocentrus = (*Echinomastus erectocentrus*)

Heritage Data Base

Found only in Arizona, on limestone. This cactus was common on top of the hills to the south of the Upper Beuhman survey (see Figure 1), on limestone, associated with *Mortonia scabrella* (sandpaper bush) and *Dyssodia pentachaeta* (a small yellow composite), approximately 1/2 mile east of the mining roads in Figure 4. Although this cactus is locally common here (we found 18 adults and 2 juveniles in an area 25 yards square), it is found only in Southeastern Arizona on limestone. Photo, Figure 12.

Manihot davisae; Arizona cassava

Category 3

Not observed. Has been collected in Catalina and Santa Rita Mountains, on limestone hills, a habitat type not intensively sampled during this survey. See Appendix III for xerox of herbarium specimen.

Abutilon parishii; Indian mallow

Heritage Data Base

Not observed, although we did find *Abutilon* that was not identifiable because it lacked flowers (*Abutilon* typically flowers in late spring).

Has been collected in Tucson and Ragged Top Mts. See Appendix III for xerox of herbarium specimen.

Abutilon reventum; Yellow indian mallow

Heritage Data Base

Not observed. Bright yellow petals and leaves up to six inches broad. Has been collected along streams in Sabino and Molino Canyons, Santa Catalinas. See Appendix III for xerox of herbarium specimen.

Notholeana lemmoni; Lemmon's cloak fern

Category 2

Not observed. Has been collected in Bear and Sabino Canyons in Catalinas. See Appendix III for xerox of herbarium specimen.

Eryngium sparganophyllum; Button-snakeroot

Heritage Data Base

Not observed. Herbarium records show flowering times of March through August. Has been collected from Aqua Caliente Canyon, Redington Pass. See Appendix III for xerox of herbarium specimen.

Mammillaria mainae; Pincushion cactus

Heritage Data Base

Not observed. Has been collected from Sabino and Peppersauce Canyons, Catalina Mts.

Aster pauciflorus; Marsh alkalai aster

Heritage Data Base

Not observed. A purple-rayed composite that has been collected from cienegas in southeastern Arizona. See Appendix III for xerox of herbarium specimen.

Rare or Unique Animal Species

Agosia chrysogaster; Longfin dace

Heritage Data Base

A native fish common in some sections of both Buehman and Espiritu Canyons. Abundant in the shallow waters over gravel bars. Photo, Figure 3.

Cyprinodon macularis; Desert Pupfish

Category E.

Not observed. On 20 July 1989, Pupfish were introduced by AGF and USFWS to Beuhman Canyon (R12S, T18E, Section 5). This section is on state land, between our Lower and Middle Beuhman sites, and was not surveyed by us. As of this report (19 Nov 1990), the condition of the population is not know (Matt Brown, AGF, pers. comm.)

Poeciliopsis occidentalis; Gila Topminnow

Category E.

Not Observed. On 16 June 1982, Gila Topminnow were introduced by AGF and USFWS to Beuhman Canyon (R12S, T17E, Sections 4,5,6). These sites are upstream of our study sites. The fish have not been observed by government agencies since the topminnow's introduction (Matt Brown, AGF, pers. comm.).

Rana pipiens; Leopard frog

Heritage Data Base

Present in pools in Beuhman and Youtcy Canyons. Very common in Beuhman canyon; I quit counting after 20 frogs.

Xerobates agassizi; Sonoran Desert Tortoise

Category 1.

We encountered a large desert tortoise in Upper Beuhman Canyon. The shell was 12.0 inches by 7.5 inches. The estimated age of this individual was 32 years. On the rear of the shell (carapace) we tagged this individual with a water-proof felt-tip marker with the alpha-numeric code B-01 (for Beuhman Canyon number 1). It was released where it was found. Photo, Figure 6.

Conclusions

In the arid southwest, riparian habitat with perennial surface flow is an increasingly rare habitat. The quality and quantity of water, and the biota it supports, are in some instances being modified by poor grazing methods (in particular, overgrazing of juvenile riparian vegetation), groundwater overdraft, and upstream developments that introduce toxics or sediments. These disturbances interact with cycles of flood and drought to significantly alter the appearance and biota of riparian areas. Cyclic floods periodically remove much of the stream bottom vegetation and fauna. Following removal of vegetation, recruitment of both plants and animals is imperative for the maintenance of stable community structure. Any

actions which impede recruitment (i.e. impacts to sources of recruitment, alteration of soil or water chemistry, etc.) could greatly alter the presence or abundance of plant and animal species in these riparian areas.

All of the riparian zones surveyed here have been modified by human use, but the changes thus far have been relatively small. The Bellota Ranch grazes their deeded land (and holds the grazing leases to the adjacent public lands). Judging from the recruitment of riparian plants in the areas surveyed, the management has done an good job of protecting the riparian habitat. Most of the areas surveyed showed little or no obvious cow sign; however, it is possible that summer floods removed animal sign.

Mining poses a more serious potential threat, particularly to Beuhman Canyon, where recent activity is directly above the stream bottom. Although fish were found in Beuhman Canyon, the diversity of fish species decreased in the regions closest to previous mining activity. Moreover, at Roble Spring, where mining activity has left tailings to the waters edge, no fish or amphibians were found (although Sonoran mud turtle has been reported). Unfortunately, historical information on the abundance of fish and amphibians at Roble Spring is lacking, so it is difficult to attribute the lack of these animals directly to mining. In spite of this it is evident that changes in water chemistry, resulting from mining activity, can eliminate fish and amphibians from streams.

Because of its exceptional riparian community and perennial water, Beuhman Canyon has been classified by Arizona Game and Fish as Category 1 habitat, meaning it is the most critical to wildlife (Will Hayes, AG&F, pers. comm.). We concur with the Arizona Game and Fish: Beuhman Canyon is one of the most significant remaining riparian habitats in the San Pedro River Valley. In only two days we saw evidence of deer, bear, mountain lion, desert tortoise, native fish, and leopard frogs. It is even more unusual in that this is one of the few if not the only occurrence of limestone at a Sonoran desert stream, thus distinguishing it from places like Redfield, Sabino and Aravaipa Canyons. Limestone is more typical of the Chihuahuan desert of northeastern Mexico and southern Texas and New Mexico. Because of this unusual rock, we expected, and found, some plants that are locally rare, like the cactus *Neolloydia erectocentrus*. Other rare species associated with limestone which were not observed, such as *Manihot davisae*, are still expected to be found in this area.

Also, because caves form in limestone (a cave is indicated in Youtcy Canyon on the 15 minute "Bellota Ranch" quadrangle), it is possible there are maternity colonies and roosts of bats. Because of

time limits, this possibility was not examined. However, it remains likely that bats such as Sanborn's long-nosed bat (*Leptocyteris curassae*), an endangered species (Category E), utilizes roosts in the area. Small caves and fissures were observed in all of the canyons examined for this study.

In conclusion, the field survey has resulted in the documentation of Sonoran desert tortoise (federal candidate 1), Longfin dace and Leopard frog within the study site. The last two taxa, although not on the federal lists, are native species and are considered to be sensitive to changes in the environment. The sites of reintroduction of Desert pupfish (endangered) and Gila topminnow (endangered) were outside of the study area and their populations were not assessed. Of the rare plants sought, only *Polygonum fusiforme* (3C) and *Neolloydia erectocentrus* (Arizona endemic) were identified; however, it is possible that other rare taxa were present but could not be identified at this time of year. In addition, raptors such as Great Horned Owl, Red-tailed Hawk and Cooper's Hawk have been documented from the study canyons.

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Appendix I

Following is a list of plant species identified, grouped by family, following the format in *Flora and Vegetation of the Rincon Mountains, Pima County, Arizona* (Bowers and McLaughlin, 1987). Each entry is in the following format:

Species, Common Name; Where found (C=common, B=Buehman, Y=Youtcy, E=Espiritu, R=Roble). Comments.

Ferns

Adiantaceae

Notholaena cochinsensis; Cochise cloak fern. B, Y.

N. sinuata; cloak fern. B.

Pellaea limitanea; cliffbrake; B

P. longimucronata; cliffbrake; B

P. wrightiana; cliffbrake; B

Gymnosperms

Cupressaceae

Juniperus erythrocarpa; juniper; C

Flowering Plants-Dicotyledons

Acanthaceae

Anisacanthus thurberi; chuperosa; C. Shrub up to 8 feet high, with red/orange tubular flowers. Along canyon bottoms and slopes.

Amaranthaceae

Alternanthera repens; B.

Amaranthus hybridus; Pigweed. E.

Anacardiaceae

Toxicodendron rydbergii; Poison-Ivy. B.

Apocynaceae

Haplophyton crooksii; Hierba de la Cucaracha; B. Related to the oleander, its dried leaves is sometimes used as an insect poison. Showy yellow tubular flowers and lance-shaped leaves.

Aristolochiaceae

Aristolochia watsonii; Indian root. B. A climbing vine.

Asteraceae

- Artemisia ludoviciana*; Sagebrush.
Baccharis glutinosa; Seep willow, or Batamote. C.
B. sarothroides; Desert broom. C.
Baileya multiradiata; Desert marigold. C.
Bidens bipinnata; Beggar's tick. E.
Brickellia baccharidea; B.
Conyza canadensis; B.
Dyssodia pentachaeta; C.
Ericameria laricifolia; Turpentine bush. C.
Eupatorium pycnocephalum; Thoroughwort; B.
Gutierrezia microcephala; Snakeweed. C.
Hymanoclea salsola; Burrobush. B, E.
Machaeranthera gracilis; B.
Melampodium leucanthum; B.
Psilotrophe cooperi; Paperflower; C.
Solidago missouriensis; Goldenrod. B, R.
Trixis californica; B,E,R.
Xanthium strumarium; Cocklebur. C.

Buxaceae

- Simmondsia chinensis*; Jojoba bush. B,E.

Cactaceae

- Carnegiea gigantea*; Saguaro. C.
Ferrocactus wislizenii; Barrel Cactus. C.
Neolloydia erectocentrus (= *Echinomastus erectcentrus*); B.
Opuntia leptocaulis; Christmas Cholla. B.
O. phaeacantha; Prickly Pear. C.
O. versicolor; Staghorn Cholla. C.

Celastraceae

- Mortonia sempervirens*; Sandpaper bush. B,Y. Stiff shrub that prefers limestone.

Chenopodiaceae

- Atriplex canescens*; Four-winged saltbush. R.
Salsola iberica; Russian thistle, or tumbleweed. B.

Convolvulaceae

Evolvulus arizonicus; Morning glory. B.

Ipomoea barbatisepala; B.

I. coccinea; B, E. A morning glory with small, bright red flowers.

I. costellata. E.

Cucubitaceae

Cucurbita digitata; Coyote melon; B.

Euphorbiaceae

Acalypha neomexicana; B.

Euphorbia heterophylla; Spurge; B.

E. hirta; B.

E. revoluta; B.

E. supina; B.

Fabaceae

Acacia constricta; Whitethorn acacia; C.

A. greggii; Catclaw acacia; C.

Astragalus allochrous; Milk-vetch. B.

A. arizonicus; B.

Calliandra eriophylla; Fairyduster; B.

Cassia leptocarpax; B.

Cercidium microphyllum; PaloVerde; C.

Erythrina orthocarpa; Coral-bean; E,R.

Mimosa biuncifera; "wait-a-minute" catclaw; C. Small recurved thorns on seed pods distinguish this from *Acacia greggi*.

Prosopis velutina; Velvet mesquite; C.

Fagaceae

Quercus arizonica; Arizona white oak. B.

Fouquieriaceae

Fouquieria splendens; Ocotillo; C.

Juglandaceae

Juglans major; Walnut, or nogale. B,Y, E.

Krameriaceae

Krameria parviflora; Range ratany; B.

Lamiaceae

Agastache wrightii; Horsemint. B.
Hedeoma nanum; Pennyroyal. B.
H. oblongifolia; B.
Marrubium vulgare; Hoarhound. B.
Stachys coccinea; Betony. B.

Loacaceae

Mentzelia multiflora; Stickleaf; B.

Malvaceae

Gossypium thurberi; Wild Cotton. C.
Hibiscus coulteri; R.
Sida procumbens; B.
Sphaeralcea laxa; Globe-Mallow; B.

Nyctaginaceae

Allionia incarnata; C.

Oleaceae

Fraxinus velutina; Velvet Ash; C.

Onagraceae

Zauschneria californica latifolia; Hummingbird Trumpet; Y.

Oxalidaceae

Oxalis albicans; Wood-Sorrel; B.

Phytolaccaceae

Rivina humilis; Pigeon Berry; C. Usually in shade, along canyon bottoms. Bright red berries in September, October.

Platanaceae

Platanus wrightii; Sycamore; B.

Polygalaceae

Polygala macradenia; Milkwort; B.

Polygonaceae

Eriogonum wrightii; Wild Buckwheat; B,E.
Polygonum fusiformae; Smartweed, or lady's slipper; B. In wet soils along creek.
Rumex hymenosepalus; Dock; B,Y.

Portulacaceae

Talinum paniculatum; B.

Ranunculaceae

Aquilegia chrysantha; Golden columbine; B.

Clematis sp.; B.

Rhamnaceae

Condalia warnockii; Gray Thorn; B.

Ziziphus obtusifolia; B.

Rubiaceae

Cephalanthus occidentalis; Button Willow; Y, E.

Salicaceae

Populus fremontii; Cottonwood; C.

Salix goodingii; Gooding's Willow; B, Y, R.

Scrophulariaceae

Cordylanthus laxiflora; Birdsbeak; B. Found only in Arizona.

Flowers similar to Indian Paintbrush, but yellow instead of red.

Maurandya antirriniflora; Snapdragon; B. With red flowers, it is conspicuous hanging on the limestone cliffs in Lower Beuhman.

Stemodia durantifolia; E.

Solanaceae

Datura meteloides; Jimsonweed, Sacred Datura; C. Very large, white-lavender trumpet-shaped flowers open at night. Often grows in disturbed areas near washes.

Lycium andersonii; Tomatillo; B.

L. berlandieri; Tomatillo; E.

Nicotiana trigonophylla; Tobacco; C.

Tamaricaceae

Tamarix aralensis; Tamarisk, or salt cedar; B. Not abundant.

Ulmaceae

Celtis pallida; Hackberry bush; C.

C. reticulata; Hackberry tree; C.

Verbenaceae

Aloysia wrightii; C.

Verbena neomexicana; Vervain; B.

Vitaceae

Vitis arizonica; Canyon Grape; C. A vine common on riparian trees.

Zygophyllaceae

Kallstroemia hirsutissima; Hairy Summer Poppy; E.

Larrea tridentata; Creosote; C.

Flowering Plants - Monocotyledons

Agavaceae

Agave schottii; Shindagger, or Amole. C.

Dasyilirion wheeleri; Sotol, or Desert Spoon. C.

Nolina microcarpa; Beargrass; C.

Yucca elata; Soap-tree yucca; B.

Y. schottii; Hoary yucca; B.

Poaceae (Grasses)

Aristida adscensionis; Six-weeks three awn; C. Annual.

A. glauca; three awn; B. Perennial.

Bothriochloa barbinodis; Blue-stem, or cane-beardgrass; B. Perennial.

Bouteloua chondrosioides; Spruce-top grama; B. Perennial.

B. curtipendula; Sideoats grama; C. Perennial.

B. eriopoda; Black grama; B. Perennial.

B. rothrockii; Rothrock grama; C. Perennial.

Dichanthelium oligosanthes var *scribnerianum*; Panicgrass; B. Perennial.

Echinochloa colona; Barnyard grass; Y. Annual.

Eragrostis curvula var *conferta*; Lovegrass; B. Perennial.

E. lehmanniana; Lehman's Lovegrass; C. Perennial.

Heteropogon contortus; Tanglehead; B. Perennial.

Hilaria belangeri; Curly-mesquite; C. Perennial.

Leptochloa cognatum; Fall witch grass; B. Perennial.

Muhlenbergia sp.; Muhly; E.

Rhynchelytrum repens; Natal grass; B. Perennial, with pink heads.

Typhaceae

Typha domingensis; Cattail; C.

Appendix II

Following is a list of animal species identified during this field survey, or documented by BLM within the study canyons over the last decade (BLM unpublished riparian inventory, A. Bamman, *et. al*, BLM, Safford, AZ.).

Fish

Agosia chrysogaster; Longfin Dace; B,E.
Gambusia affinis; Mosquitofish; B.
Lepomis cyanellus; Sunfish, Bluegill; B.

Reptiles and Amphibians

Rana pipiens; Leopard Frog; B, Y.
Hyla arenicolor; Canyon Tree Frog; B,Y,E.
Thamnophis cryopsis; Black-necked Garter Snake; B,Y,E.
Kinosteron sonriense; Sonoran Mud Turtle; R.

Mammals

Felis concolor; Mountain Lion; B.
Ursus americanus; Black Bear; B.
Odocoileus hemionus; Mule Deer; B.
Canis latrans; Coyote; C.
Lepus californicus; Black-tailed Jackrabbit; C.
Mephitis sp; Skunk; B.
Pecari angulatus; Javelina; B,R.

Birds

Bubo virginianus; Great Horned Owl; B,R.
Buteo jamaicensis; Red-tailed Hawk; B,E,R.
Accipiter cooperii; Cooper's Hawk; B. The riparian canopy and prey fauna at Buehman makes it likely habitat for Zone-tailed, Black, and Gray Hawk. The latter would be at the extreme northern edge of its range.
Zenaida macroura; Mourning Dove; C.
Z. asiatica; White-winged Dove; C.
Picoides scalaris; Ladder-backed Woodpecker; R.

Melanerpes uropygialis; Gila Woodpecker; C.
Myiarchus tyrannulus; Brown-crested Flycatcher; B,R.
Sayornis nigricans; Black Phoebe; B,R.
Progne subis; Purple Martin; R.
Corvus corax; Raven; C.
Thryomanes bewickii; Bewick's Wren; B.
Catherpes mexicanus; Canyon Wren; B,R.
Salpinctes obsoletus; Rock Wren; R.
Vireo solitarius; Solitary Vireo; R.
Guiraca caerulea; Blue Grosbeak; R.
Amphispiza bilineata; Black-throated Sparrow; R.
Molothrus ater; Brown-headed cowbird; R.
Icterus galbula; Northern Oriole; R.
I. cucullatus; Hooded Oriole; R. Female feeding young.
Piranga rubra; Summer Tanager; R.
Carpodacus mexicanus; House Finch; B,R.

Appendix III

Herbarium sheet reproductions of rare and unusual species
not observed during the field survey.



65% Reduction

4 cm

PLANTS OF SOUTHERN ARIZONA

Baboquivari Canyon

Monograph of Manihot (Euphorbiaceae)

Manihot davisiae Croizat

Rogers, D. L. & S. G. Appun, taxon no. 8

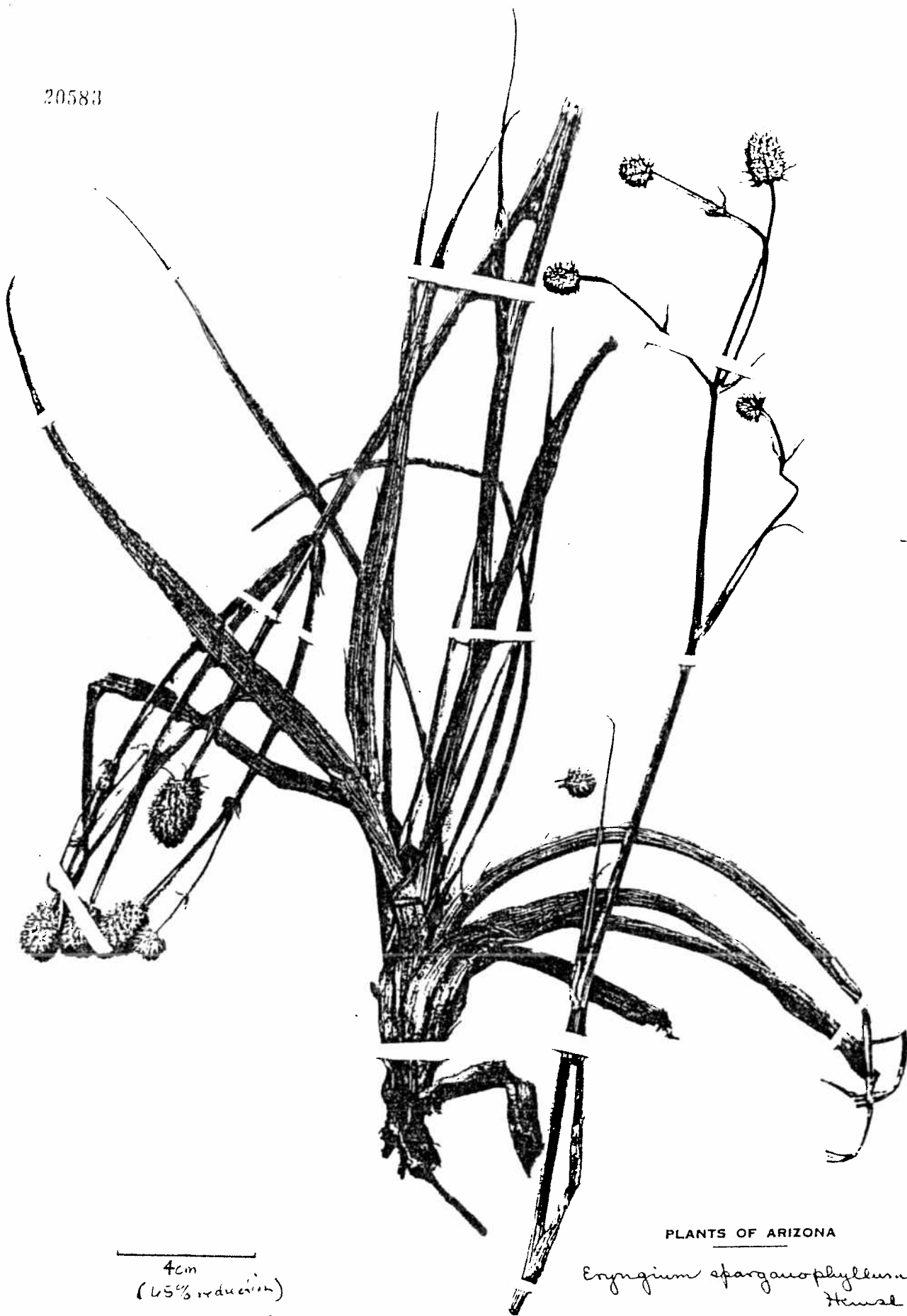
in *Flora Neotropica Monograph* No. 13

Annotated June, 1971

No. 8796 R. H. Peabody, Collected Aug. 3, 1961

MANIHOT DAVISIAE
CROIZAT
1971

20583



PLANTS OF ARIZONA

Eryngium sparganophyllum
Hemsl.

Marshy grounds
Loc. Agua Caliente Ranch
Alt. 2900 ft
Date Aug. 1906 FORREST SHREVE

Herbarium of the University of California

Det.

Date

90478



65% reduction



4cm

UNIVERSITY OF ARIZONA HERBARIUM

PLANTS OF ARIZONA

Hermannia pauciflora Wats.

Prostrate perennial; flowers orange. Rocky soil; mesquite, palo verde, brittle bush association; 2 miles north of Tucson, on Campbell Avenue; 2,700 feet elevation. K

Pima County

April 20, 1952

K. F. Parker 8012a



Hermania pauciflora
(actual size)

4 cm

fruit is
papery winged
capsule, with
serrate margins

55175



65% reduction

4cm

Notholaena lemmonii

EX HERBARIUM
ARIZONAE HERBARIUM

Flora of Arizona

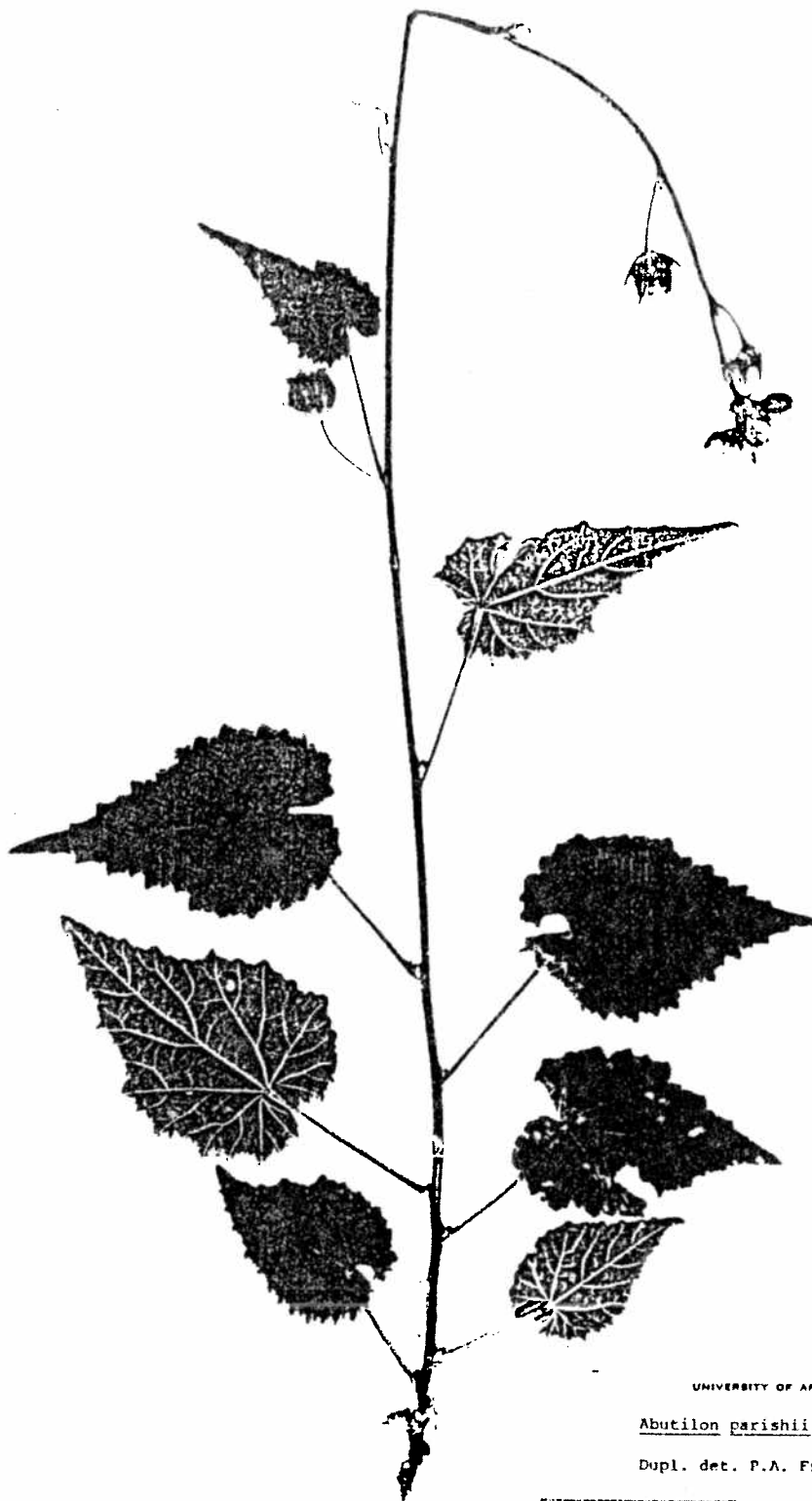
Distributed by the Herbarium of the University of Arizona

Notholaena lemmonii L. J. W. C.

Sancti Jacobi Mountains, Santa
Barbara, California. April 20, 1900.

1900. J. J. Thompson

6-11



65% reduction

4 cm

UNIVERSITY OF ARIZONA ANNOTATION LABEL

Abutilon parishii S. Wats.

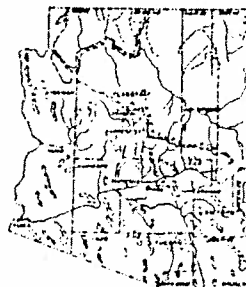
Dupl. det. P.A. Fryxell 1988

UNIVERSITY OF ARIZONA HERBARIUM
PLANTS OF ARIZONA

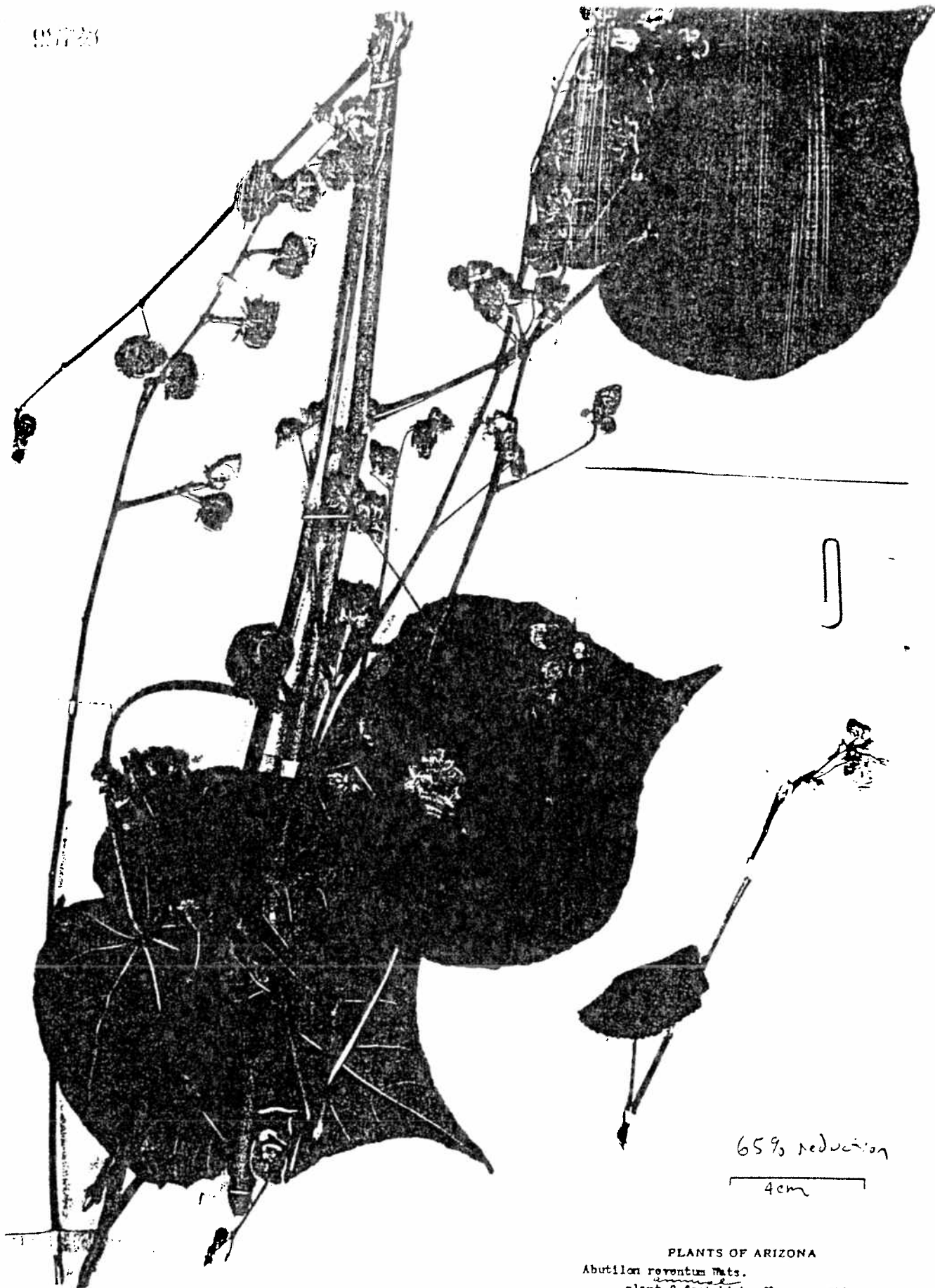
Abutilon

Tucson Mountains: crest of Gates
Pass: T14S R12E S10, SW4. Two
plants on steep west-facing cliff at
3300 feet elevation. Perennial from
tufted base, flower pale orange.

T.R. Van Devender Pima County
88-543 30 August 1988



14933



65% reduction
4cm

PLANTS OF ARIZONA

Abutilon reventum Wats.
plant 8 feet high, flowers yellow

South Canyon, Baboquivari Mts., Pima County.
Alt. 3600-4000 ft.

No. 14933 T. H. KEARNEY } August 31, 1941
H. H. PIPPLES }



4 cm
65%
reduction

Aster pauciflorus Nuttall
det. Scott Gwinnberg 11/5
THE UNIVERSITY OF TEXAS HERBARIUM



UNIVERSITY OF ARIZONA HERBARIUM
PLANTS OF ARIZONA
Aster pauciflorus Nutt.
0.5 meter herb in wet meadow; rays
purple. Babocomari Cienega, River
and Ranch, S¹/₂ of S1. T215 R10E.
T.R. Van Devender Cochise County
D.G. Koppinger 10 September 1977