PETITION TO LIST THE CHIRICAHUA DOCK

*Rumex orthoneurus*

AS A FEDERALLY ENDANGERED SPECIES

Southwest Forest Alliance
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May 5, 1996
prepared by
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SOUTHWEST CENTER FOR BIOLOGICAL DIVERSITY
ENDANGERED SPECIES PETITION NO. 34
May 5, 1996

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The Southwest Forest Alliance, the Southwest Center for Biological Diversity, Jamey Thompson, and David Hodges formally petition to list the Chiricahua Dock (Rumex orthoneurus) as endangered pursuant to the Endangered Species Act, 16 U.S.C. 1531 et seq. (hereafter referred to as "ESA"). This petition is filed under 5 U.S.C. 553(e) and 50 CFR 424.14 (1990) which grant interested parties the right to petition for issuance of a rule from the Secretary of the Interior.

Petitioners also request that Critical Habitat be designated concurrent with the listing, pursuant to 50 CFR 424.12, and pursuant to the Administrative Procedures Act (5 U.S.C. 553). Petitioners understand that this petition action sets in motion a specific process placing definite response requirements on the U.S. Fish and Wildlife Service and very specific time constraints upon those responses.

PETITIONERS

The Southwest Forest Alliance is a coalition of 51 environmental groups in Arizona and New Mexico with a combined membership of over 50,000. It is dedicated to the protection and restoration of the Southwest.

The Southwest Center for Biological Diversity is a non-profit public interest organization dedicated to protecting the diverse life forms of the American Southwest and northern Mexico.

Jamey Thompson holds an MS in Biology from New Mexico State University. He is a botanical consultant for the Southwest Center for Biological Diversity.

David Hodges is the Sky Islands Project Coordinator for the Southwest Center for Biological Diversity.
ABSTRACT

Chiricahua Dock (*Rumex orthoneurus*), a herbaceous perennial with large and broad, bright green leaves is confined to riparian stretches in southeastern and east central Arizona. Chiricahua Dock occurs within riparian habitats, primarily cienegas, between 6500 and 9100 feet. Cienegas are wetlands typically associated with low-gradient, low-energy portions of larger stream systems, and small headwater type in the Southwest. Cienegas are seen as oases of vegetation to ranchers and cattle alike and grazing pressure on cienegas has greatly reduced their historical occurrence. The Arizona Nature Conservancy estimates that only 15 of 50 Arizona cienegas described by early explorers still existed as of 1987 (Arizona Nature Conservancy, 1987). The remaining cienegas are far from pristine and often suffer damaging pressures that have caused the demise of many species and the decline of others.

Natural populations of Chiricahua Dock are small and very dependent on open canopies, moist soils, and the low frequency of periodic floods along these pristine mountain creeks. Natural and introduced populations in the Tonto and Coronado National Forest are both suffering from the effects of grazing by cows, periodic flooding and trampling by campers. Ten natural populations and twenty-seven introduced populations are known in Arizona. Of these, 13 have been extirpated recently. Of the remaining 25 populations, 9 had totals of less than 40 individuals in the most current surveys (Appendix A).

Management plans still lack a strong effort to maintain existing populations and plans for experimental populations suffer from low viability of introduced Chiricahua Dock. In addition, the agencies responsible for the implementation of these conservation measures have been woefully negligent in implementing even the most basic protective measures. A glaring example can be found at Lower Rustler Park, site of the only natural population that still exists in the Chiricahua Mountains where the Forest Service has refused year after year to build an adequate fence that will keep cattle out. The permittee knows that he is out of compliance with his grazing permit when his cattle are inside the enclosure or when he corrals his horses inside, yet the Forest Service consistently refuses to take action.

The Conservation Assessment for existing populations in the Tonto National Forest states "any further losses or declines in Priority I and II subpopulations could threaten the continued existence of this species." Since this plan was signed in 1992, these populations have declined dramatically from 451 to a current low of 127. Of these populations, more than 10 have declined. Nothing of these populations is a key component of the Tonto's management plan that is not being carried out. Introduced populations found on the Tonto National Forest have had marginal success. Half of these have been extirpated while only 4 of the remaining populations have more than 20 plants at present. In fact, the Conservation Assessment for the Tonto National Forest conveys just how much of a failure that introduction has been. It states, "This group of plants is expected to die out within the next 50 years."
Critical habitat preservation must occur quickly to insure the continued existence of the species.

TAXONOMY

SCIENTIFIC NAME: Rumex orthoneurus Rech. f

COMMON NAME: Blumer’s Dock or Chiricahua Dock

IDENTITY:
The identity of *R. orthoneurus* is often confused with the closely related *R. occidentalis* of Arizona (Fletcher, 1982). Both species are regarded as relics of a common species originating in the Pleistocene. The species have been isolated by climatic changes and have slowly undergone genetic drift.

In Dawson (1979) specimens from the White Mountains were identified as *R. orthoneurus*. He stated that the main taxonomic difference was the rooting system. Fletcher (1982) tentatively put the White Mountain population in the *R. orthoneurus* group on the basis of creeping rootstock among the White Mountain specimens.

The only apparent morphological difference between *R. orthoneurus* and *R. occidentalis* involves the angle of the lateral veins from the mid-vein of the leaves. *R. orthoneurus* has lateral veins at nearly right angles to the mid-vein, while *R. occidentalis* has angles which are more acute (Mount and Logan, 1992). However, many misidentifications have been made in the past on the basis of this trait. Some have claimed that *R. occidentalis* has a large taproot while *R. orthoneurus* has a creeping rootstock (Fletcher, 1982) but this trait is also misidentified. Morphological traits alone cannot differentiate these two species.

Mount and Logan (1992) using RAPD genetic markers and morphological data established a strong difference between *R. occidentalis* and *R. orthoneurus*. They collected populations from the Chiricahua, Huachuca, Sierra Ancha, and Pinaleno Mountains. The specimens from the Chiricahua and the Huachuca Mountains were considered as extremely similar *R. orthoneurus* populations because they shared many of the same genetic markers. The White Mountain population differed at 4 of 9 markers from these two populations and was classed as *R. occidentalis*.

They labeled the specimens from the Pinalenos (Hospital Flats) and the Sierra Anchas (Workman Creek) as *R. orthoneurus* while the plants differed at only 3 of 9 genetic markers from the Chiricahua and Huachuca specimens. They were also similar to the White Mountain specimens but these specimens had perpendicular angles of lateral veins to the mid-vein of the leaves compared to the White Mountain population (Malusa et al., 1991). On the basis of a combined genetic and morphological phylogenetic tree, Mount and Logan (1992) concluded that *R. orthoneurus* is a separate species from *R. occidentalis* and a unique entity.

They also concluded that the specimens collected from the White Mountains labeled as *R. orthoneurus* are actually *R. occidentalis*. By combining the morphological and genetic data, Mount and Logan have concluded that the collected specimens from the Chiricahua, Huachuca, and the Sierra Ancha represent the only known examples of *R. orthoneurus* (Mount and Logan, 1992).

DESCRIPTION

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TECHNICAL: Stems erect to 1m or more, leafy shoots absent; leaf blades 30-50 cm long, narrow, keeled, rounded at the apex, acuminate to acute at the base, up to 30 cm long and 20 cm broad leaves vary large at the base and growing smaller as the height increases, the major lateral veins dilated, straight, and arranged at an approximate right angle to the midrib borne on a dense panicle 30-90 cm long. Flowers perfect, valves oval and 4-5 mm wide, achenes brown, smooth, 2-3 mm long, callosities absent (Martin and Hutchins 1980, Kearney and Peebles 1960).

NONTECHNICAL: A herbaceous perennial with large and broad, bright green leaves. The leaves have a conspicuous midrib at right angles to the midrib plants also have a creeping rootstock and are commonly 50 to 90 cm tall. There are reports of individuals over 160 cm tall. The flowers are born on a 2-3 m tall stalk and produce small triangular seeds that have grainless valves.
GEOGRAPHIC DISTRIBUTION

This species is found in southeastern and east central Arizona in the Chiricahua ( Cochise County), Pinaleno (Graham County) and Sierra Ancha Mountains (Gila County).

NATURAL HISTORY

PHENOLOGY

The leaves emerge in early July and last until mid-August after which seeds set in late August.

HABITAT

*R. orthoneurus* occurs within riparian habitats, primarily between 6500 and 9100 feet. Ranges are with this typical associated with low-gradient, low-energy portions of larger stream systems and small headwater streams. *R. orthoneurus* appears to do best in cienega habitats (Malusa et al., 1991). Primary habitat is near Tonya soils adjacent to springs and open meadows near the head of running streams where the flow is slower.

*R. orthoneurus* has been reported to be intolerant of shade, requiring an open canopy along stream sides (Fetcher 1978). While known populations do tend to occur in open meadows, a causal relationship has not established. Nor has disappearance of populations been correlated with increasing shade. It should be noted that the more abundant portion of the population at Upper Hospital Flat Campground is heavily shaded by conifers.

*R. orthoneurus* is apparently restricted to areas that are lightly, periodically flooded. Lower elevation sites have increased chances of intense erosion of their stream side habitat (Malusa et al., 1991). Introduced populations at low elevations such as Bray Creek (562'), Dude Creek (532'), Helen Creek (531'), Tonto Fish Hatchery (561'), Tonto Creek (561'), and Webber Creek (562') have suffered severe loss of numbers or extirpation due to increased flooding.

*R. orthoneurus* is typically found with false-hellebore (Veratrum californicum), cow parsnip (Heracleum lanatum), and a variety of sedges (Carex spp.) and rushes (Juncus spp.) with Iris missouriensis found in neighboring meadows (Arizona Game and Fish Dept., 1990). It is typically part of the Madrean Subalpine Grassland Meadow or the Interior Southwestern Riparian Deciduous Forest. In these areas are surrounded by typical Madrean Montane Conifer Forest.

STATUS AND THREATS

Eleven natural populations and twenty-seven introduced populations are known in Arizona. Of these, 13 have been extirpated recently. Of the remaining 25 populations, 9 had populations of less than 40 individuals in the last survey (Appendix A).

The management plans for the species do not adequately protect the populations. One of the populations exists on the Huachuca Military Reservation which has no management plan at all for *R. orthoneurus*. The remaining 24 known populations are on Forest Service land in Arizona. A management plan exists for the Coronado National Forest, and a Conservation Assessment exists for the Tonto National Forest but both are inadequate.

As the only management plan for a declining species, the Coronado National Forest plan should be a proactive effort to protect and expand the remaining populations. However, the Coronado National Forest management plan is mainly oriented towards maintaining two exclosures at Barfoot Park and Rustler Spring. The exclosure at Rustler Spring has been breached by cattle every year that it has been in place (Rutman, 1995). When an new Allotment Management Plan was developed for this allotment (Rusty) cattle were excluded from the upper
reaches of the mountain during the growing season. This has not helped as the cattle grazing around and in the exclosure are trespass cattle from the Cave Creek Allotment. In April of 1995, cattle were observed both around and inside the exclosure (personal observation SWCBD 1995). This plan mentions nothing about the other populations other than continued monitoring. These other populations also face serious pressures from direct grazing increased flooding caused by erosion from logging and grazing and wildfire. These concerns are not addressed by the Coronado National Forest management plan (Galeano-Popp, 1991).

The Conservation Assessment for the Tonto National Forest is also mainly oriented surveying existing populations and these populations continue to decline.

The threats to the *R. orthoneurus* populations in the National Forests are varied. Recreational pressures are increasing in all of the Southwestern National Forests. The increasing recreational use of the Pinaleno Mountains in the Coronado National Forest and the Tonto National Forest are the most notable. With this increase in recreational use comes an increase in road building such as the proposed highway near the Chipifer Creek populations. Also, grazing pressures while not directly threatening any *R. orthoneurus* populations, does threaten the upstream areas in several Southwestern National Forests. The danger for the *R. orthoneurus* is increased erosion from more common flooding events due to beigh. This type of erosion has claimed several populations in the past decade (Galeano-Popp, 1991).

Another major factor in the decline of the *R. orthoneurus* populations has been severe grazing effects by cows. Thirty-one of thirty-eight total and all of the 27 introduced populations exist on Grazing Allotments maintained by the USFS. There have been numerous events in the past where grazing in these areas has significantly contributed to the decline in *R. orthoneurus* populations (Chase Creek (extirpation), Chipifer Creek (90% decrease in one year) and Cold Spring Canyon (extirpation) (1990)). Cattle apparently consume *R. orthoneurus* preferentially when they find it. The Coronado National Forest management plan mandated cattle exclosures to protect the Barfoot and Rustler Park populations but time and time again these exclosures collapsed and cattle damaged the populations.

An increase in wildfire in the Southwest dramatically affected the populations. These wildfires have been a dry period and were compounded by increased logging and grazing (SWCBD 1995). These fires have ranged from small to extremely large fires that can easily get out of control and threaten large tracts of forest. Past programs of logging and grazing and beigh have also contributed to the problem of large wildfires. Southwestern forests have been affected by all of these problems extensively in the past and consequently are subject to wildfire this past year. The small number and viability of the known populations of *R. orthoneurus* mean that even a small series of wildfires could wipe out the entire species.

**HISTORICAL DECLINES AND CURRENT INSTABILITY**

Populations in Barfoot Park, Ramsey Canyon, and Reese Canyon have also been eliminated due to grazing and road construction (Arizona Game and Fish Dept., 1990). Many populations have suffered wide variations in their numbers. Of the 38 known populations, 17 are extirpated or presumed extirpated and only 10 have more than 40 individuals. These population numbers are not enough for viable long-term existence of the species either on a population or species wide basis. The large fluctuations in population number led to genetic bottlenecks and eventually to a large number of virtual clones in a population. These fluctuations can be seen at Reynolds Creek where the population went from 800 to 100 to 300 in the course of two years (Galeano-Popp, 1991). This indicates a highly unstable situation where one bad year could be disastrous. Other populations are in
PRESENT OR THREATENED DESTRUCTION, MODIFICATION, OR CURTAILMENT OF HABITAT OR RANGE

Increased use and expansion of recreation facilities also threaten the species. The Pinaleno populations are facing increasing pressures from increased use, especially around the upper campgrounds such as Hospital Flats. The Hospital Flats populations are part of large, open meadows which are increasingly popular with tourists who unknowingly trample plants. Neither of the Hospital Flats populations (Upper and Lower are lumped together in the surveys) are protected from recreational impacts in the Coronado National Forest Management Plan. An inspection by the Southwest Center for Biological Diversity in June of 1995 revealed that the Upper Hospital Flat camping area was being used by a Boy Scout Troop. In one area of the creek they had built a dam and destroyed numerous plants. These populations and the one found at Shannon Campground represent the only potentially viable populations in this mountain chain and despite the fact that both exist within "Highly developed campgrounds" and are all within 50 meters of roads, there are no exclosures within these areas.

Grazing has an increasingly powerful effect. The population in Lower Rustler Spring has had its grazing exclosure knocked down repeatedly (Arizona Game and Fish, 1990) (Rutman, 1995). Other populations have been severely damaged by grazing from horses or trampling due to horses in high traffic camping areas adjacent to R. orthoneurus habitat (Galeano-Popp, 1991).

Also, R. orthoneurus is very much an inhabitant of cienegas, a severely endangered habitat type in the Southwest. Cienegas are seen as oases of vegetation to ranchers and cattle alike and grazing pressure on cienegas has greatly reduced their historical occurrence. The Arizona Nature Conservancy estimates that only 15 of 50 Arizona cienegas described by early explorers still exist as of 1987 (Arizona Nature Conservancy, 1987). The remaining cienegas are far from pristine and suffer damaging pressures that have caused the demise of many species and the decline of others. Two factors are primarily responsible for the loss of cienegas: increased water flow and also the clearing of cienegas for other uses. The increased water flow is directly to increased upstream logging and wildfire. This effect severely decreased the populations at Bray Creek, Bim Creek, Dude Creek, Tobo Creek, Tobo Sping and Weber Creek (Arizona Game and Fish, 1990).

Water supplies have greatly diminished in the Santa Cruz, San Pedro, Ojo de Agua, and every other river basin in southeastern Arizona and northern Sonora (Warren et al. 1991, Hendrickson and Minckley 1984). Growing urban areas such as Cananae and Sierra Vista threaten to usurp even more water in the coming decade (Warren et al. 1991, Ibarra 1993).

Cienegas may be the most endangered habitat in the American Southwest and northern Mexico. While always restricted in distribution and extent, they have all but disappeared since the invasion of North America by European invaders. Frank Crosswhite, editor of Desert Plants:
"Cienega sites were the first to be usurped by land-hungry Hispanics and Anglos alike who developed large herds of cattle to devour the vegetation and drink the water. Overgrazing made the cienega locations among the most mistreated sites on earth. A variety of misfortunes brought about either knowingly or unconsciously by man have resulted in drainage, arroyo cutting and general destruction of these unique habitats" (Crosswhite 1985).

The Arizona Nature Conservancy estimates that only 15 of 50 Arizona cienegas described by early explorers still existed as of 1987 (Arizona Nature Conservancy, 1987). This 70% reduction in number is less than the total habitat loss as it does not consider the reduced size and degraded condition of those cienegas that have survived.

The most extensive study documenting the loss of cienegas in southeast Arizona, where they previously reached their highest numbers, was done by Hendrickson and Minckley (1985) and published as a special issue of Desert Plants entitled "Cienegas-Vanishing Climax Communities of the American Southwest." That entire document is incorporated here by reference. Comparing their watershed maps showing historic and current cienegas, we estimate cienega habitat loss to be upwards of 95%.

In addition to grazing pressures, draining, groundwater pumping, surface water diversion, and impoundments have resulted in the disappearance of cienegas and marshy habitats.

Warren et al. (1991) documented the decline or complete disappearance of populations due to flooding and dredging.

OVERUTILIZATION FOR COMMERCIAL, RECREATIONAL, SCIENTIFIC, OR EDUCATIONAL PURPOSES

This is not currently known to be

DISEASE OR PREDATION

The greatest threat to $R. orthoneurus$ at this time is grazing by cows and trampling by campers. In the past, cows have severely damaged several populations such as Horton Spring, Cold Spring Canyon, and Christopher Creek (Galeano-Popp, 1991).

Insect damage has been spotty but severe in some cases such as See Canyon (Arizona Game and Fish Dep. 1990). Campers trample the delicate plant in areas with heavy traffic. The moist habitat of the plants are often along high traffic areas near meadows and creeks. This has been a problem at Rucker Spring where the exclosure has been poorly maintained in the past and horses have severely grazed the population. Other populations are found among open meadows which are appealing campsites (Malusa et al,

INADEQUACY OF EXISTING REGULATORS

$Rumex orthoneurus$ is listed as a
Category 1 species by the U.S. Fish and Wildlife Service which affords it no protection under the Endangered Species Act. It is listed as a Sensitive species in the Tonto and Coronado National Forests by the U.S. Forest Service. A management plan has been developed for the species on the Tonto and Coronado National Forests but grazing, fire suppression, and recreational pressures are not been sufficiently addressed to insure the protection of *R. orthoneurus*. Populations on the Fort Huachuca Military Reservation are not protected by any specific management plan. The State of Arizona has instituted no effective measures to protect *Rumex orthoneurus* under the Arizona Native Plant Law. The State of New Mexico has no effective measures to protect *R. orthoneurus*.

**CRITICAL HABITAT DESIGNATION RECOMMENDED**

Petitioners strongly recommend the designation of critical habitat for *Rumex orthoneurus* coincident with its listing. Critical habitat is defined as those sections of its cienega habitat. Critical habitat should be designated in all areas where it is currently located and in key unoccupied areas where restoration is necessary for its conservation.

Respectfully submitted,

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**LITERATURE CITED**

Arizona Game and Fish Department. 1990. *R. orthoneurus*.


orthoneurus on the Coronado National Forest.


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APPENDIX A

NATURAL, INTRODUCED AND EXTIRPATED POPULATIONS

I. CORONADO NATIONAL FOREST — NATURAL POPULATIONS

Chiricahua Mountains

Lower Rustler Park and Upper Rustler Spring (T17S, R30E, S33)

Elevation 8220 feet. 400 individuals existed below the upper spring enclosure in 1991. All but one plant was found. This habitat is unusual for Rustlers due to the intense flooding but the population may have been repeatedly recolized from the population at the lower Rustler enclosure (Draft Management Plan for Coronado National Forest, 1991) Campground on USFS land.

Cave Creek (T18S, R30E, S28)  PRESUMED EXTIRPATED

Elevation 9000 feet. Two specimens were collected here in 1993.

Pinaleno Mountains

Hospital Flat
In 1991 there were 247 *R. orthoneurus* along a stretch of creek near a campsite here. There was no evidence of herbivory, but there was considerable damage from trampling by campers (Arizona Nature Conservancy, 1990).

Shannon Campground

As of 1991, approximately 100 *R. orthoneurus* existed here. The plants are not enclosed and are often trampled by campers (Arizona Nature Conservancy, 1990).

Grant Creek

Personal conservation with Mima Faul (Coronado National Forest) indicates that some individuals exist along Grant Creek below Swift Trail. Current status is unknown.

**Huachuca Mountains**

Ramsey Canyon (T23S, R20E, S16)  EXTIRPATED

Around 300 *R. orthoneurus* were rediscovered here in 1991 along a stretch of creek. The habitat is similar to the habitat below Rustler Spring enclosure in the Chiricahua Mountains (sloping creek with high flooding frequency). Some effects of flooding apparently due to recent fires, but no herbivory found (Malusa et al, 1992). Portion of population on Ft. Huachuchua Military Reservation.

**CORONADO NATIONAL FOREST - INTRODUCED POPULATIONS**

**Chiricahua Mountains**

Barfoot Park (T17S-R30E,S33)  EXTIRPATED

280 *R. orthoneurus* exist here in an enclosure. In 1991, all the plants were grazed to the root level 50 meters south of the enclosure. Some plants were grazed to root level (Draft Management Plan for Coronado National Forest, 1991). Campground on USFS land.

Cima Creek (T18S, R30E, S16)

300 *R. orthoneurus* exist here in 1991. Many were grazed (up to 17 inches) but the...
Rumex was confined to a narrow altitudinal gradient probably by flood intensity (Draft Management Plan for Coronado National Forest, 1991). Chiricahua Mountains Wilderness Area.

**Tub Spring (T18S, R30,S9)**

Elevation 9120 feet. 28 transplanted individuals found here in 1991. The population was not doing well with only one plant flowering and none over 1/2 meter tall. The population was restricted to moist soils leading down to Cave Creek (Draft Management Plan for Coronado National Forest, 1991). Chiricahua Mountains Wilderness Area.

**East Turkey Creek**

An unknown number of rhizomes were planted here in 1981. 24 transplanted individuals found here in 1991. None of the plants were more than 40 cm tall and none had flowering stalks.

**Ojo Aqua Fria Spring (T18S, R30S)**

EXTIRPATED

In 1981 41 seedlings were planted within 2 feet of the stream bottom. In 1991 only two individuals were found here. Neither one had any flowering stalks. Apparently the canopy around the spring is too dense to allow plants to grow. Both plants showed some insect herbivory (Galeano-Popp, 1991).

**Booger Spring**

EXTIRPATED

30 seeds were sown here in 1985. In 1991 only two transplanted rhizomes were found here. Neither one had any flowering stalks. Both were planted in rather poor soils for *R. orthoneurus*.

**Huachuca Mountains**

Clark Spring (T23S, R20E, S14)

**PRESUMED EXTIRPATED**

Elevation 6050 feet. 44 rhizomes were planted here in 1981. Chiricahua Mountains Wilderness Area.

**Sierra Ancha Mountains**

Workman Creek (6N-14E-13)

Elevation 5200 feet. Population in decline due to broad maintenance and camping by campers (Arizona Game and Fish Dept 1980). A decrease was noted in the natural population from 30 in 1981 to 10+ in 1991 survey. Many of these had
being tall (ind 90) A survey in 1990 found 27 plants (ind 90) though a 1994 survey indicated a population of only 16 plants with less than 3% flowering. Campground on USFS land. Armer Mountain Allotment. A portion of the Workman Creek shed is on the Sierra Ancha Allotment.

Reynolds Creek (6N–14E–17,18)

Reynolds (6N–14E–17,18) 1990 B. ace. A decrease in the natural population from 366 individuals in 1986 to 100 in 1989 and then back up to 500+ individuals in 1990 due primarily to increased flood scouring and herbivory (ind 90). A 1991 survey indicated a population of 305 though a follow up survey in 1994 the population had decreased to 85. This site is good habitat for B. ace. B. ace. demonstrates the extreme fluctuations due to severe action of the creek banks. Recreation area on USFS land. Armer Mountain and A–Cross Allotments.

Rose Creek (T6N, R13E, S25)


Cold Spring Canyon (T6N,R14E,S25 & 26)


TONTO NATIONAL FOREST — INTRODUCED POPULATIONS: PRIORITY II

Canyon Creek Spring (T11N,R14E,S35)

Canyon Creek Spring (T11N,R14E,S35) 1990 B. ace. An increase from 3 introduced individuals in 1985 to 26 in 1990 (ind 90) and 27 in 1991 (Gobar) Young Grazing Allotment on USFS land.

Horton Spring (T11N,R12E,S3)

Horton Spring (T11N,R12E,S3) 1990 B. ace. A slow increase from 3 introduced individuals in 1985 to 26 in 1990 (ind 90) and 27 in 1991 (Gobar) Young Grazing Allotment on USFS land.
1991) 1995 surveys show a decrease in population, down to 9

See Canyon (T11N,R13E,S18)

4000' feet. 79 plants were introd in 1985, 107 in 1987 and 10 in 1989. A 1990 survey the population was down to 10 and suffering from heavy herbivory (Gunzel, 1990). A 1991 survey found 20 plants. 1995 surveys indicate that the population has further declined to 62 plants. Ellinw
According to the Tonto National Forest Conservation Assessment, Priority I subpopulations are the remaining transplants below the Pinaleno gap as a whole has declined since they were transplanted. The lack of success is assumed to be caused by a variety of impacts at the site: poor habitat suitability and little or no reproduction. This group of plants...

Bray Creek (T12N,R10E,S19)  
Elevation 6260 feet. 50 plants were introduced in 1987, but all these individuals were lost to flood scouring by the time of a 1990 survey (Gunzel, 1990). 1995 surveys show a population of 10.

Canyon Creek (T10.5N,R15E,S27)  
Elevation 6360 feet. 100 plants were introduced in 1987 with 25 plants confirmed in 1990. The site has not been surveyed since then. O.W. Grazing Allotment on USFS land.

Chase Creek (T12N,R10E,S21)  
14 plants were introduced in 1981 and all had been lost to grazing in 1982. The area was fenced to prevent grazing and 6 individuals were reintroduced. No plants were found in 1990 and 1991. Surveys in 1991 noted 33 plants. Cross V Grazing Allotment on USFS land.

Christopher Creek (T11N,R12E,S30)  
Elevation 5720 feet. 80 plants were introduced in 1989 and in a 1990 survey only 8 remained and these were suffering from grazing and insect herbivory (Gunzel, 1990). A new highway which passes near this population has damaged other populations (Coronado Management Plan, 1991). A 1991 survey found 9 individuals and by 1995 surveys showed no plants remaining. Ellinwood Grazing Allotment on USFS land.

Double Cienega  
Several hundred individuals were found in a large cienega here.

Dude Creek (T12N,R11E,S19)  
Elevation 6120 feet. 100 plants were introduced in 1987. 50 were found alive and flowering in 1989 but many were lost to...
Ellison Creek (T12N,R11E,S34)  
**EXTIRPATED**  
Elevation 6300 feet. 35 plants were introduced in 1986 and all were lost in an intense flood in 1990 (Gunzel, 1990). By 1995 only 4 plants remained. Cross V Grazing Allotment on USFS land.

Haigler Creek (T10N,R13E,S12)  
Elevation 6360 feet. 110 plants were introduced in 1987. By 1992 surveys indicated that 19 had survived. Haigler Creek Grazing Allotment on USFS land.

Lower East Verde River (T12N,R10E,S14)  
Elevation 5980 feet. 160 plants were found in a 1989 survey but in a 1990 survey only 20 juveniles were found at the same site (Gunzel, 1990). Cross V Grazing Allotment on USFS land.

Nappa Spring (T11N,R13E,S13)  
**EXTIRPATED**  
Elevation 6620 feet. 10 plants were introduced between 1981 and 1984 but by 1986 all the plants were dead (Gunzel, 1990). In 1995 surveys found no plants. Ellinwood Grazing Allotment on USFS land.

Pine Creek (T12N,R9E,S8 & 18)  
Elevation 5740 feet. An increase from 54 transplanted individuals in 1986 to upwards of 380 individuals with many flowering stalks (Gunzel, 1990). In 1995 surveys show a large drop in population.

Tonto Fish Hatchery (T12N,R12E,S33)  
**EXTIRPATED**  
Elevation 6480 feet. 30 plants were introduced in 1985 and the population decreased in every survey until all the remaining individuals (10) were lost in floods in 1990 (Gunzel, 1990). In 1995 surveys show a large drop in population.

Tonto Creek (T11N,R12E,S4)  
Elevation 6060 feet. 4 plants were introduced in 1985 that were lost by 1989 to heavy grazing by cows. Strong evidence of intense flooding was seen at the site in 1990 (Gunzel, 1990). In 1995 surveys show a large drop in population.
located and grazing and flood damage from the Dade Fire was observed in 1991 (Gobar 1991). 1995 surveys found 15 plants.

Upper East Verde River (T12N, R10E, S21) EXTIRPATED

Elevation 6020 feet. 20 plants introduced in 1981. Survey in 1990 found no plants but heavy grazing was evident. Payson Grazing Allotment on USFS land.

Washington Park (T12N,R10E,S14) EXTIRPATED

Significant efforts to revegetate this area (32 plants in 1985, 35 plants in 1986, 40 plants in 1987 and 142 in 1988) have been unsuccessful (Gunzel, 1990). 1995 surveys found no plants.

Webber Creek (T12N,R9E,S23) PRESUMED EXTIRPATED

Elevation 5720 feet. 100 plants were introduced in 1987, but in a 1989 survey only about 5 remained after intense flooding. A 1990 survey found only 3 individuals after another intense flooding event (Gubar 1990). A 1991 survey found only 2 individuals and noted grazing and flood damage (Gobar 1991).

Pueblo Creek (T6N, R14E, S23) EXTIRPATED

Elevation 4600 feet. 20 plants were introduced in 1988. A 1990 survey found no live individuals. (Draft Management Plan for Coronado National Forest, 1991). This site is probably too low for Rumex to be successful. The most recent survey (Gobar 1991) found no R. orthoneurus but noted grazing impacts to resident riparian plants Center Martin Grazing Allotment on USFS land.
APPENDIX B

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