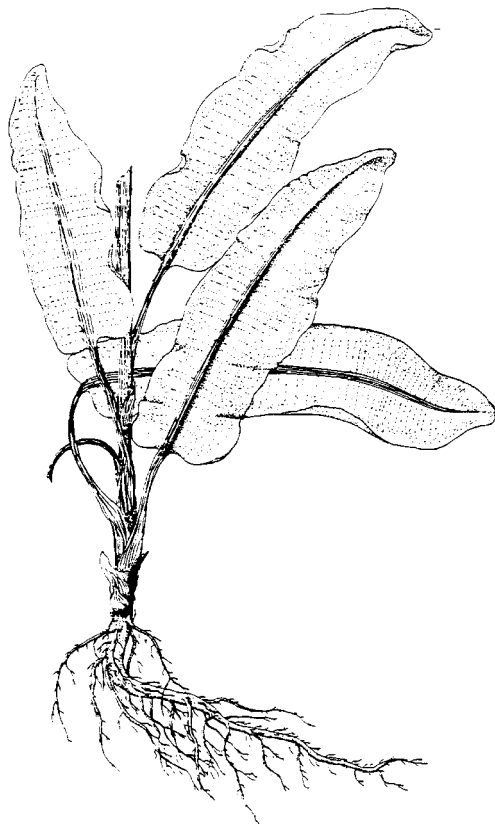


PETITION TO LIST THE CHIRICAHUA DOCK
Rumex orthoneurus
AS A FEDERALLY ENDANGERED SPECIES



19

Southwest Forest Alliance
P.O. Box 1948
Flagstaff, AZ 86002

May 5, 1996

prepared by
Jamey Thompson & David Hodges

**SOUTHWEST CENTER FOR BIOLOGICAL DIVERSITY
ENDANGERED SPECIES PETITION NO. 34**

May 5, 1996

Mr. Bruce Babbitt
Secretary of the Interior
Office of the Secretary
Department of the Interior
18th and "C" Street, NW
Washington, DC 20240

Mollie Beattie
Director
U.S. Fish and Wildlife Service
18th and "C" Street, NW
Washington, DC 20240

Nancy Kaufman
Director
U.S. Fish and Wildlife Service
Region 2
500 Gold Ave. SW
Albuquerque, NM 87102

Sam Spiller
Director
U.S. Fish and Wildlife Service
Arizona Field Office
2321 W. Royal Palm Rd., Suite 103
Phoenix, AZ 85021-4951

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 an endangered species under the Endangered Species Act, 16 USC 1531 et seq. (hereafter referred to as "ESA"). This petition is filed under 5 USC 556 and 50 CFR 424.190 which grant interested parties the right to petition for issuance of a rule from the Secretary of the Interior.

PETITIONERS

The *Southwest Forest Alliance* is a coalition of 51 environmental groups in Arizona and New Mexico with a combined membership of over 5000. It is dedicated to the protection and restoration of the South

Petitioners do request that the Fish and Wildlife Service concur with the listing pursuant to 50 CFR 424.12 and pursuant to the Antideficiency Act (5 USC 552). Petitioners understand that this petition does not seek in motion a specific process regarding the response requirements on the US Fish and Wildlife Service and very specific time constraints upon those responses.

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

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

David Hodges is the *Sky Islands Field 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

streams in the Southwest. Cienegas are seen as oases of vegetation to ranches and cattle and grazing pressure on cienegas has greatly reduced their habitat occurrence. The Arizona Nature Conservancy estimates that only 15 of 50 Arizona cienegas described by early explorers still exist as of 1997 (Arizona Nature Conservancy, 1997). The remaining cienegas are far from pristine and often suffer from grazing pressure that has caused the decline of many species and the decline of others.

Natural populations of Chiricahua Dock are small and very dependent on open areas not shaded by frequency of periodic floods along the pristine mountain creeks. Natural and introduced populations in the Tohono and Coronado National Forests are both suffering from the effects of grazing by cows, periodic flooding and trampling by campers. The natural populations and twenty-seven introduced populations are known in Arizona. Only three have been extirpated recently. Of the remaining 23 populations, 9 had totals of less than 40 individuals in the most current surveys (Appendix A).

Management plans should take a strong effort to maintain existing populations and plans for experimental populations suffer from the viability of introduced Chiricahua Dock. In addition, the agencies responsible for the implementation of the conservation measures have been woefully negligent in implementing even the most basic protective measures. A glaring example can be found at Lower Rader Park, site of the only natural population that still exists in the

Chiricahua Mountains. Here, the Forest Service has refused year after year to build an adequate enclosure that will keep cattle out of the public campsite. The permittee knows that he is out of compliance with his grazing permit when his cattle are inside the enclosure or when he cannot access his horse inside, yet the Forest Service consistently refuses to take action.

The Conservation Assessment for existing populations in the Tohono National Forest states "any further loss or decline in Pinyon Juniper populations could threaten the continued existence of this species." Since this plan was signed in 1993, these populations have declined dramatically from 45% to a current level of 11%. Only 3 of the populations have more than 10 individuals. Most of the populations is a key component of the Tohono's management plan that is not being carried out. Introduced populations found on the Tohono 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 Tohono National Forest comes 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."

Chiricahua Dock is not currently in 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 related as parts of a common species originating in the Pacific. The species have been isolated by dramatic changes and have slowly undergone

In Dawson (199) specimens from the White Mountains were identified as *R. orthoneurus*. He stated that the main taxonomic character was the root system. Fletcher (1982) later accepted the White Mountain population in the *R. orthoneurus* group on the basis of creeping rootstock among the White Mountains

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 midvein, while *R. occidentalis* has angles which are more acute (Mount and Logan, 1992). However, many mistakes 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 not reliable. 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, Hachuapala, White Sierra, and White Mountains. The specimens from the Chiricahua and the Hachuapala Mountains were identified as *R. orthoneurus* and the White Sierra and White Mountain populations because they shared many of the same genetic markers. The White Mountain population had a 4 of 9 marker for the two populations and was classified as *R. occidentalis*.

They identified the specimens from the Hachuapala (Hospital Hill) and the Sierra Andreas (Workman Creek) as *R. orthoneurus* since their plants differed at only 3 of 9 genetic markers from the Chiricahua and Hachuapala specimens. They were also similar to the White Mountain specimens, but these specimens had prostrate angles of leaf veins to the midvein of the leaves compared to the White Mountain population (Mason and 1991). On the basis of a combined genetic and morphological phylogenetic analysis, Spear and Engler (1992) concluded that *R. orthoneurus* is a separate species from *R. occidentalis* and a unique entity.

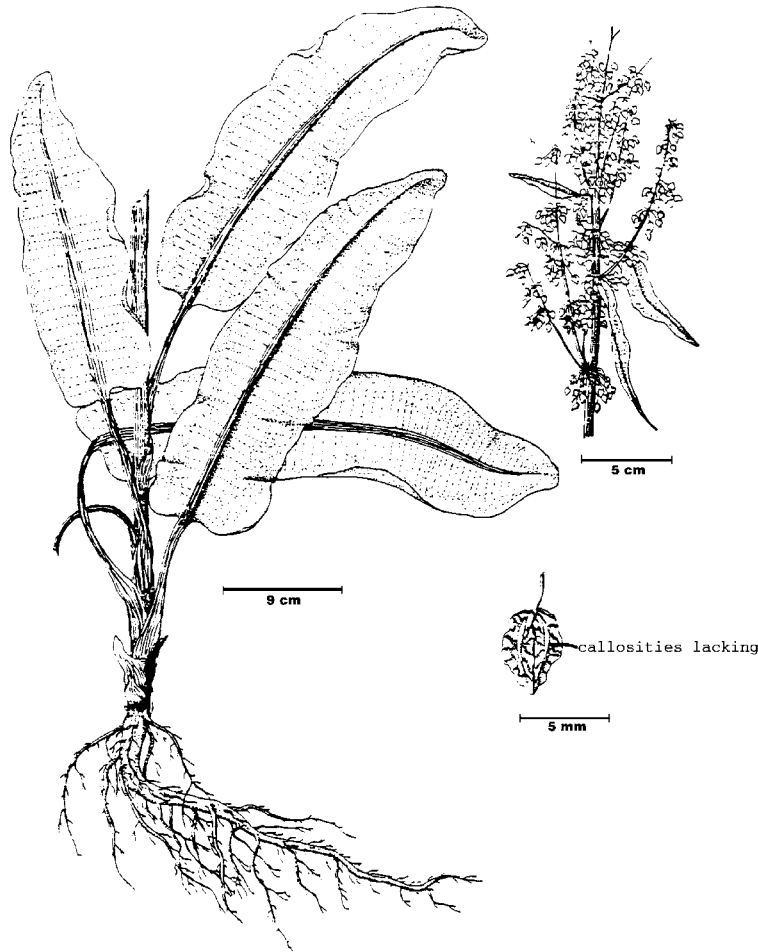
They also concluded that the specimens collected from the White Mountains labeled as *R. orthoneurus* are actually *R. occidentalis*. By combining the morphological and genetic data, Mount and Logan have concluded that the collected specimens from the Chiricahua, Hachuapala, White Sierra, and White Mountains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

DESCRIPTION

TECHNA: Stems erect, to 1 m or more tall; they shoot
 out of beds 3-5 cm by narrow, rounded
 the axillary buds at the base, up to 5 cm by and
 20 cm broad leaves very large at the base and going smaller
 the height in cross; the major leaf veins, dark, stiff and
 arranged at approximately right angles to midrib, are more or a
 dense pile 3-9 cm by five-petaled, rounded at
 4-5 mm wide at the base, smooth, 2-3 mm by cells
 absent (Martin and Hutchins 1980, Kearney and Peebles 1960).

ages to the midrib, plants do have a creeping rootstock
 and are commonly 5 to 9 m tall but there are reports of
 individuals over 10 m tall. The flowers are born on a long (2
 m tall) stalk and produce small, light-colored seeds that have
 grainless valves.

NONTECHNA: A herbaceous perennial with large and broad bright
 green leaves. The leaves have a conspicuous head vein and light



GEOGRAPHIC DISTRIBUTION

This species is found in stream and estuary areas in the Chiricahua (Cochise County), Pinal (Graham County) and Sierra Ancha Mountains (Gila County).

NATURAL HISTORY

PHENOLOGY

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

HABITAT

R. orthoneurus occurs within riparian habitats, primarily creeks between 6500 and 9100 feet. Creeks are wetlands typically associated with low-gradient, low-energy portions of larger stream systems and small headwater streams.

orthoneurus appears to do best in creek habitats (Musa et al. 1991). Primary habitat is not binary, but a gradient between spring 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 above stream sites (Fisher 1988). We know populations do tend to occur in open meadows, but a causal relationship has not established. No large-scale dispersal of populations has been recorded with increasing shade. It should be noted that the more abundant portion of the population at Upper Hospital Campground is heavily shaded by conifers.

R. orthoneurus is apparently restricted to areas that are only slightly periodically flooded. Lower elevation sites do have increased chances of intense erosion of the stream-side habitat (Musa et al. 1991). Introduced populations at low elevations such as Bay Creek (6300), Duke Creek (6120), Ben Creek (6300), Tonto Fish Hatchery (6880), Tonto Creek (6000) and

White Deer Creek (5720) all have suffered local extirpations or extirpation due to increased flooding.

R. orthoneurus is typically found with the yellow (Neotoma arbutum) cow parsnip (Hedeoma pumilum) and a variety of sedges (Carex spp.) and rushes (Juncus spp.) with its primary habitat found in riparian meadows (Arizona Game and Fish Dept. 1990). It is typically part of the Madrean Steppe Grassland Meadows or the Interior Southwestern Riparian Deciduous Forest. On the west coast 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 23 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 Hualapai Mountain Preserve which has no management plans at all for *R. orthoneurus*. The remaining 33 known populations are on Forest Service land in Arizona. Management plans exist for the Grand 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 Grand National Forest plan should be a priority effort to protect and expand the remaining populations. However, the Grand National Forest management plan is mainly oriented towards maintaining two education sites at Buffalo Park and Rusty Spring. The education site at Rusty Spring has been heavily trampled every year that it has been in place (Rutman 1995). When a new Alternative Management Plan was developed for this area (Frey) cattle were excluded from the upper

redes of the north during the going season. This has not helped as the cattle grazing around and in the exclosures at trespass cattle from the Chaco Creek. About in April of 1995, cattle were observed both around and inside the exclosure (as observed in SWCB, 1995). This plan means nothing about the deer populations that are critical to noting. The deer populations do face serious pressures from direct grazing increased feeding caused by erosion from logging and grazing and wildfire. These concerns are not addressed by the Grand National Forest management plan (Galeano-Popp,

The Grand National Forest Assessment for the Tobacco National Forest is also mainly oriented toward existing populations and these populations continue to decline.

The threats to the *R. arthouneurus* populations in the National Forests are varied. Recreational pressures are increasing in all of the Southwestern National Forests. The increasing recreational use of the Piute Mountains in the Grand National Forest and the Tobacco National Forest are the most notable. While this increase in recreational use consists mainly of an increase in road building such as the proposed highway near the Chiricahua Creek populations. Although logging pressures while not directly threatening any *R. arthouneurus* populations, does threaten the upstream areas in several Southwestern National Forests. The danger for the *R. arthouneurus* is in increased erosion from more common logging activities due to logging. This type of erosion has damaged several populations in the past decade (Galeano-Popp, 1991).

Another major factor in the decline of the *R. arthouneurus* populations has been severe grazing effects by cows. This is one of the major threats and all of the 27 introduced populations exist on Grand National Forests maintained by the USFS. The heavy cow numbers over the past years grazing in these areas has significantly contributed to the decline in *R. arthouneurus* populations (Chaco Creek (extirpation), Chiricahua Creek (99% decrease in one year) and Cold Spring

Canyon (extirpation) (Gardner 1990). Cattle apparently consume *R. arthouneurus* preferentially when they find it. The Grand National Forest management plan mandated cattle exclosures to protect the Piute and Piute-Pak populations but the area and line again these exclosures collapsed and cattle damaged the populations.

As recent wildfire in the Southwest dramatically affected the populations. The wildfire burned a dry period and were 100% mortality by fire suppression and logging (SWCB 1995). The 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 on all fronts and logging have also contributed to the problem of large wildfire. Southwestern forests have been affected by all of these problems extensively in the past and consequently are subject to large wildfire like this past year. The small number and viability of the known populations of *R. arthouneurus* mean that even a small series of wildfire could wipe out the entire species.

HISTORICAL DECLINES AND CURRENT INSTABILITY

Populations in Piute-Pak, Piute Canyon, and Rose Canyon have all been extirpated due to grazing and road construction (Arizona Game and Fish Dept. 1990). Many populations have suffered wide variations in their numbers. Of the 33 known populations, 17 are extirpated or presumed extirpated and only 10 have more than 40 individuals. The population numbers are not enough for viable long-term existence of the species due to the loss of a population or species-wide basis. The age fluctuations in population number lead to genetic bottlenecks and eventually lead to a large number of vital losses in a population. These fluctuations can be seen at Piute Creek where the population went from 80 to 100 to 50 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 DISPERSION, MICHAN, OR CURVEMENT OF HABITAT OR RANGE

Increase and expansion of recreation fields also threaten the species. The Patito populations are facing increasing pressures from recreation use, especially around the upper campgrounds such as Hospital Hills Hospital Hills populations are part of large open meadows which are increasingly popular with tourists who unknowingly trample plants. Neither of the Hospital Hills populations (Upper and Lower) are impeded by the river in the stream) are protected from recreation impacts in the Grand National Forest Management Plan. An ison by the Southwest Center for Biological Diversity in June of 1995 noted that the Upper Hospital Hills 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 Saramon Campground represent the only potentially viable populations in this mountain drain and despite the fact that both exist within highly developed campgrounds' and are within 50 meters of roads, there are no exclosures within these areas.

Grazing has an increasing potential effect. The population in Lower Rader Spring has had its grazing exclosure knocked down recently (Arizona Game and Fish, 1990; Ruman, 1995). Other populations have been severely damaged by grazing from loss or trampling due to loss 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 ranches and cattle and grazing pressure on cienegas has greatly reduced their historical occurrence. The Arizona Nature Conservancy states 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 face severe 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: the

excessive forces of increased water flow and also the draining of cienegas for other uses. The increased water flow is due directly to increased upstream logging and wildfire. This effect severely decreased the populations at Bay Creek, Elton Creek, Dude Creek, Torino Creek, Torino Spring and Water 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 Cananave and Sierra Vista threaten to usurped 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.

UTILIZATION 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 tambling by campers. In the past cows have severely damaged wetlands such as Hot Spring, Cold Spring Canyon, and Chiricahua Dock (Galeano-Popp, 1991).

First damage has been solely by cows in some cases such as Hot Spring Canyon (Arizona Game and Fish Dept 1990). Campers tamble the delicate plants in areas with heavy traffic. The most habitat of the plants are in areas with heavy traffic areas near roads and trails. This has been a problem at Hot Spring where the evidence has been primarily in the past and loss has been severely grazed the population. On the plants are found among open meadows with an appealing campsites (Malusa et al.,

INADEQUACY OF EXISTING REGULATORY

Rumex orthoneurus is listed as a

Category 1 species by the US Fish and Wildlife Service with a focus on protection under the Endangered Species Act. It is listed as a Sensitive species in the Tobacco Control National Forest by the US Forest Service. A management plan has been developed for the species on the Tobacco Control National Forest but ongoing logging, fire suppression and recreational pressures are not being sufficiently addressed to insure the protection of *Rumex orthoneurus*. Populations on the Fort Huachuca May Reserve 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

Petition strongly recommends the designation of critical habitat for *Rumex orthoneurus* coincident with its high scenic and scientific value. Critical habitat should be designated in areas where it is currently located and in key unoccupied areas where restoration is necessary for the conservation of the species.

Respectfully submitted,

Peter Galvin
Campaign Coordinator
Southwest Forest Alliance
P.O. Box 1948
Flagstaff, AZ 86002

Kieran Suckling

Executive Director
Southwest Center for Biological Diversity
P.O. Box 17839
Tucson, AZ 85731

Jamey Thompson
3206 Oak Avenue #4
Las Cruces, NM 88005

David Hodges
P.O. Box 1891
Tucson, AZ 85702

LITERATURE CITED

Arizona Game and Fish Department. 1990. *Rumex orthoneurus*.
Arizona Nature Conservancy. 1987. Stream habitat survey. Tucson, AZ.
Catling, P. 1982. Breeding systems of native *Spiranthes*. Canadian Journal of Botany 60: 1397-1402.
Crosswhite, F.S. 1985. Editorial. Desert Plant Society News 1: 1-2.
Dawson, J.E. 1979. A biosystematic study of the genus *Rumex* (Celastraceae) in the United States. PhD dissertation, Carleton College.
Fletcher, R.A. 1982. June 21, 1982 letter to Peter Galvin. Service files, Albuquerque and Phoenix.
Friar, E., Nam, H. and Mount, D. 1994. Life history and distribution study. U.S. Fish and Wildlife Service file 1994-01-01.
Galvin, P. 1991. Draft Management Plan for *Rumex orthoneurus*. US Fish and Wildlife Service file 1991-01-01.

Galvin, P. 1991. Revised Management Plan For *Rumex*

orthoneurus on the Coronado National Monument (1991-1995) and photos of an endangered orchid, *Isoetes medeoloides*

Gardner, R. 1981. *Maintaining and restoring a natural history of the U.S.-Mexican borderlands*. Texas A&M Univ. Press, College Station.

Gardner, R. 1991. *Chiricahua Dock: A Rare Plant of the Tonto National Forest*. Report.

Gardner, R. 1990. *Botanical Survey of Tonto National Forest*. On File with Tonto National Forest.

Gay, G. 1993. *Herbaceous plants of the Sonoran Desert and management* (H.W. Pritchard, ed.).

Harris, D. and Gardner, R. 1993. *A Conservation Assessment for *Rumex orthoneurus* on the Tonto National Forest*.

Harrison, D. and W. M. Gray. 1995. *Grass-voicing dune communities of the American Southwest*. *Desert Plants* 6(3):131-175.

Ilg, O. and O. Tamm. 1988. *Survival of *perillata* V*. Patterns of flowering. *Oikos*, 51:203-219.

Kearney and Peebles. 1960. *Arizona Flora*. Stanford Univ. Press, Berkeley, CA. 1975. *The Native Plants of the United States and Canada* excluding Florida. The New York Botanical Garden, Bronx, NY.

Miller, J. D., C. R. Warren, and E. M. Ortega. 1992. *Photographic Studies of Sensitive Plants of the Coronado National Forest, Arizona*, 66pp.

Munz, P. H. 1971. *Notes on the Flora of Arizona - V*. *Arizona Acad. Sci.*, 6:33.

Munz, P. H. and R. H. Spongberg. 1990. *Atlas of New Mexico*. Stanford Univ. Press, Hirschberg, Germany.

Munz, P. H. and R. S. Spongberg. 1992. *Photographic Studies of *Spiranthes delitescens**. *Southwest Naturalist* 37(3):299-303.

Munz, P. H. 1989. *The Coronado National Forest*. Ecology, 70:783-786.

Munz, P. H. 1986. *Chiricahua Dock*. *Arizona Native Plant Society*. Payson RD, Tonto National Forest.

Munz, P. H. and R. S. Spongberg. 1992. *Conservation of *orthoneurus* and *R. occidentalis* by the RAPD Marker Technique*. Special Report.

Munz, P. H. 1993. *Letter to Secretary of the U.S. Fish and Wildlife Service, Washington DC*. *Arizona Native Plant Society*, Phoenix, AZ, 1993.

Newman, D. 1991. *Status report: *Spiranthes delitescens**. August 1991. Prepared by The Arizona Native Plant Society for the U.S. Fish and Wildlife Service, Phoenix AZ.

Phillips, M. D. and Gardner, R. 1997. *Maintaining *Rumex orthoneurus**. U.S. Fish and Wildlife Service, Albuquerque, Phoenix.

Rehinger, K.H. 1936. *Repert. Spec. Nov. R*.

Rotman, S. 1995. *Letter to Forest Supervisor*.

Shultz, C. F. 1990. *Arizona *Spiranthes delitescens** for the cienegas of southernmost Arizona.

Shultz, C. F. and R. H. Spongberg. 1995. *Overgrazing and the decline of *Rumex orthoneurus**. *Southwestern Regional Forester*. May 1995.

Shultz, C. F. 1990. *Letter to Forest Supervisor, Coronado National Forest concerning field of *perillata* and *Rumex orthoneurus**. June 4, 1990.

Shultz, C. F. 1994. *Letter to Forest Supervisor, Coronado National Forest concerning field of *perillata* and *Rumex orthoneurus**. September 6, 1994.

Shultz, C. F., C. R. Warren, P. A. Munz, and R. S. Spongberg. 1994. *Conservation Strategy for *Rumex orthoneurus**. Report for the Coronado National Forest

Forest (1993–1997). 28pp.

Smith, V. 1991. *Woods in the White Mountains*.
Collins, London.

Sundt, P. and M. McClaran. 1988. *Spiranthes*
ganima at TNC preserve. The Nature Conservancy files
Tucson, AZ.

Went, F. and R. R. Reiche. 1991. *Sage Flat Survey of Fort*
Huachuca, Arizona. On file with USFWS in Phoenix.

Wells, T. C. E. 1967. Changes in a population of *Spiranthes*
spiralis (L.) Chevall at Knocking Hole Nature Preserve,
Bedfordshire, 1962–1965. J. Ecol., 55:83–89.

Wells, T. C. E. 1981. Population ecology of terrestrial orchids. Pp. 31–35
in *The biology and ecology of the orchids* (H. S. Gentry ed.)
John Wiley & Sons, New York.

Williams, L. 1951. The Orchidaceae of Mexico. Cieza 2:1–132.

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)

Between 820 and 400 individuals were reported in 1991. All adjacent areas were found to be unsuitable for *R. cuneata* due to the high light levels. The population may have been extirpated from the population at Lower Rustler (Off Magnet Park Road, National Forest 1991) Campground on USFS land.

Cave Creek (T18S, R30E, S28) PRESUMED EXTIRPATED

Elevation 9000 feet. Two specimens were collected here in 1991.

Pinaleno Mountains

Hospital Flat

In 1991 there were 27 *Rattus* by a high fork near a campsite. There was no other thought there was considerable damage from trampling by campers (Arizona Nature Conservancy, 1990).

Shannon Campground

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

Grant Creek

Presently associated with Mesa Park (Coronado National Forest) includes the same individuals as Grant Creek below Swift Trail. Current status is unknown.

Huachuca Mountains

Ramsey Canyon (T23S, R20E, S16) **EXTIRPATED**

Population 600. This is a local population from the 1800s that was apparently extirpated by mining activities sometime in the past (Gunzel, 1990).

Pat Scott Canyon

Around 300 *Rattus* were recorded here in 1991 along a stretch of creek. The habitat is similar to the habitat below Ruler Spring and is in the Chiricahua Mountains (spring creek with high flood frequency). Some effects of flooding appear to be recent but no history found (Mason et al 1992). Population on Ft. Huachuchua Military Reservation.

CORONADO NATIONAL FOREST - INTRODUCED POPULATIONS

Chiricahua Mountains

Barfoot Park (T17S-R30E,S33) **EXTIRPATED**

Population 20. *Birds* found here in 1991 include an *oreochelone*. In July 1991, all the plants were grazed to the root and 50 meters south of the *oreochelone* 3 plants were found also grazed to the root (Def. Management Plan for Coronado National Forest, 1991). Campground on USFS land.

Cima Creek (T18S, R30E, S16)

Population 800. 2 *tasmanian* individuals found here in 1991. Many were young (up to 17 meters tall) but the

Rhex was collected in a narrow alluvial gully partially by flood plain (Def Management Plan for Coronado National Forest, 1991). Chiricahua Mountains Wilderness Area.

Tub Spring (T18S, R30,S9)

Feb 90 Feb 21 3 tub spring in 1991. The population was not dug with only one plant being added or 1/2 meter. The population was noted to not be dug down to the creek (Def Management Plan for Coronado National Forest, 1991). Chiricahua

East Turkey Creek

A number of rhizomes were planted in 1981. 2 tub spring in 1991. None of the plants were more than 40 cm tall and none had flowering stalks.

Ojo Aqua Fria Spring (T18S, R30) ~~EXTIRPATED~~

In 1981 4 seeds were planted in 2 feet of test bank in 1991 only two tub spring were found. None of the day being stalks. A party to copy and to sign to the board of directors to go. Both plants showed some insect herbivory (Galeano-Popp, 1991).

Booger Spring
EXTIRPATED

3 seeds were sown in 1985 in 1991 only two tub spring were found. None of the day being stalks. Both were planted in rather poor soils for R. orthoneurus.

Huachuca Mountains

Clark Spring (T23S, R20E, ~~PRESUMED~~ EXTIRPATED

Elevation 6050 feet. 44 rhizomes were planted here in 1981

TONTO NATIONAL FOREST - NATURAL POPULATIONS

Sierra Ancha Mountains

Workman Creek (6N-14E-13)

Feb 50 Feb 10 in 1991. The population was not dug with only one plant being added or 1/2 meter. The population was noted to not be dug down to the creek (Def Management Plan for Coronado National Forest, 1991). Chiricahua

being 1/3 (Graz 190) A survey in 191 found 27 pits (Gob) though a 1991 survey indicated a population of only 10 individuals less than 3% being Campground on USFS and Armer Mountain Allotment A portion of the Wolman Creek shed is on the Sierra Ancha Allotment.

Reynolds Creek (6N-14E-17,18)

Population 620 feet A decrease in the population from 86 individuals in 1986 to 10 in 1989 and then back up to 50+ individuals in 1990 due primarily to increased food source availability (Graz 190) 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 *R. leucurus* but does not have the ideal conditions of the creek banks Recreation area on USFS land. Armer Mountain and A-Cross Allotments.

Rose Creek (T6N, R13E, S25)

Population 500 feet Population first recorded in 1929 here 1989 survey found no pits, most likely due to the death of the creek by population depletion by road construction (Armer Game and Fish Dept 1990) 1991 survey found 14 individuals and 1992 found 18 Population decline of 1994 survey was only 3 with only 1 pit that set seed A-Cross Grazing Allotment on USFS land.

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

PRESUMED EXTIRPATED

Population 520 feet 8 pits were surveyed in 1985 and in 1990 and the area was dead due to the grazing (Graz 190) Remains observed by Seaman in 1990 (Seaman 1992) No census in 1985 Great Mountain Grazing Allotment on USFS land.

TONTO NATIONAL FOREST – INTRODUCED POPULATIONS: PRIORITY II

Canyon Creek Spring (T11N,R14E,S35)

Population 600 feet A slow increase from 3 introduced individuals in 1985 to 26 in 1990 (Graz 190) and 27 in 1991 (Gobar) Young Grazing Allotment on USFS land.

Horton Spring (T11N,R12E,S3)

Population 600 feet 4 pits were introduced in 1985 After the area was enclosed in 1986 the population increased to 9 in a 1990 survey However, due to grazing by cows was 1 found (Graz 190) 1991 survey found 16 pits (Gob)

1991) 1995 surveys show a decrease in population, down to 9

See Canyon (T11N,R13E,S18)

Ellinwood Dock was recorded in 1955 in 197 and 1990 surveys. The population was down to 10 plants for haystack (Graz 1991) A 1991 survey found 3 (Graz 1995) surveys indicate that the population has further declined to 62 plants. Ellinwood

TONTO NATIONAL FOREST – INTRODUCED POPULATIONS: PRIORITY

According to the Tonto National Forest Conservation Assessment, Holy Island poplars are the remaining plants below the Rn. This group as a whole has declined since they were transplanted. Lack of success is attributable to a variety of impacts due to poor habitat suitability and little or no reproduction. This group of plants

Bray Creek (T12N,R10E,S19) EXTIRPATED

~~Eight~~ 60 feet 5 plants were introduced in 1987, but the individuals were lost to logging by the time of a 1990 survey (Gunzel, 1990). 1995 surveys show a population of

Canyon Creek (T10.5N,R15E,S27) PRESUMED EXTIRPATED

~~Eight~~ 60 feet 10 plants were introduced in 1987 with 2 plants confirmed in 1990. The site has not been surveyed since then. O.W. Grazing Allotment on USFS land.

Chase Creek (T12N,R10E,S21) PRESUMED EXTIRPATED

4 plants were introduced in 1981 and 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 (Gunzel 1990) though grazing impacts were noted. Surveys in 1991 noted 33 plants. Cross V Grazing Allotment on USFS land.

Christopher Creek (T11N,R12E,S30) EXTIRPATED

~~Eight~~ 50 feet 8 plants were introduced in 1989 and a 1990 survey of 8 remained and the weeds and fire for grazing and site recovery (Gunzel 1990). A new highway was near this population. Road cuts have damaged the poplars (Cowan Margaret Ph 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)

~~Eight~~ 60 feet 10 plants were introduced in 1987. 5 were found dead by 1989 but may have been

~~found in 190 (Gunzel 1990) A 1991 survey found 3 plants but by 1995 only 4 plants remained Cross V Grazing Allotment on USFS land.~~

Ellison Creek (T12N,R11E,S34)

EXTIRPATED

~~Found 600 feet 3 plants were introduced in 1986 and were still in a nice bed in 1990 (Gunzel 1990) The population was very low and on the Deerhead table it is now listed as (No Management Plan) 1995 surveys show 0 plants. Cross V Grazing Allotment on USFS land.~~

Haigler Creek (T10N,R13E,S12)

~~Found 600 feet 10 plants were introduced in 1987 1992 surveys indicated that 9 had survived Haigler Creek Grazing Allotment on USFS land.~~

Lower East Verde River (T12N,R10E,S14)

~~Found 500 feet 16 plants were found in a 1989 survey but in a 1990 survey only 2 plants were found at the same site (Gunzel, 1990). Cross V Grazing Allotment on USFS land.~~

Nappa Spring (T11N,R13E,S13)

EXTIRPATED

~~Found 600 feet 10 plants were introduced between 1981 and 1984 but by 1986 all the plants were dead (Gunzel 1990) 1995 surveys found no plants. Ellinwood Grazing Allotment on~~

Pine Creek (T12N,R9E,S8 &18)

~~Found 500 feet A increase from 51 stalks to 100 stalks in 1986 to up to 300 stalks which may be very large stalks (Gunzel, 1990). 1995 surveys show a large drop in population~~

Tonto Fish Hatchery (T12N,R12E,S33)**EXTIRPATED**

~~Found 600 feet 3 plants were introduced in 1985 and the population decreased in every survey until the remaining individuals (10) were lost in floods in 1990 (Gunzel, 1990). In~~

Tonto Creek (T11N,R12E,S4)

~~Found 600 feet 4 plants were introduced in 1985 8 were introduced in 1987 and 12 in 1988 but all were lost by 1989 to hay grazing by cows. Some evidence of the beds was seen at the site in 1990 (Gunzel 1990) 2 plants were~~

~~but~~ ad grazing and flood damage from the Duff fire was observed in 1991 (Gobar 1991). 1995 surveys found 5 plants
Indian Gardens Grazing Allotment on USFS land.

Upper East Verde River (T12N, R10E, S21)

EXTIRPATED

~~but~~ 60 feet 2 plants were introduced in 1981. Survey in 1990 found no plants but hay grazing was evident. Payson
Grazing Allotment on USFS land.

Washington Park (T12N,R10E,S14)

EXTIRPATED

~~but~~ 60 feet 2 plants were introduced in 1981. Survey in 1990 found no plants but hay grazing was evident. Payson
Grazing Allotment on USFS land.

Several sites were checked in 1985, 1986, 1987, and 1988 but have been
unsuccessful (Gunzel, 1990). 1995 surveys found no plants. P

Webber Creek (T12N,R9E,S23)

PRESUMED EXTIRPATED

~~but~~ 50 feet 10 plants were introduced in 1987 but in a 1990 survey only 5 remained. In the fall of 1990
survey found only 8 individuals and in the fall of 1991. A 1991 survey found only 2
individuals and noted Grazing and Flood damage (Gobar 1991)

Pueblo Creek (T6N, R14E, S23)

EXTIRPATED

~~but~~ 40 feet 2 plants were introduced in 1987. A 1990 survey found no individuals (Dr. Margaret Pan for
Grand National Forest, 1991). This site is probably too dry for recovery to be successful. The most recent survey (Gobar
1991) found no individuals but noted grazing impacts to several plants. Clear Mountain Grazing Allotment on
USFS land.

APPENDIX B
KNOWLEDGEABLE PERSONS

Reggie Fletcher
Regional Botanist
U.S. Forest Service, Southwestern Region
Albuquerque, NM 87102

David Mount
Dept of Molecular and Cellular Biology
University of Arizona
Tucson, AZ 85721

Sue Rutman
P.O. Box 26
Ajo, AZ 85321

Richard Spellenberg
Dept. of Biology
New Mexico State University
Las Cruces, NM 88003-0001

Jamey Thompson
3206 Oak Ave #4
Las Cruces, NM 88005

Peter Warren
The Arizona Nature Conservancy
300 E. University Blvd #230
Tucson, AZ 85705 602-622-3861