

Flora and Vegetation of the Saint David and Lewis Springs Cienegas, Cochise County, Arizona

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Abstract—In the Sky Island region, cienegas are rare marshlands amidst arid surroundings where ground-water perennially intersects the surface. Their unique physical properties give rise to a characteristic plant community dominated by wetland graminoids. Evaporation usually causes the water to be alkaline, and vegetation around a cienega commonly includes halophytes and other unusual species. Depending on their age and size, they may also harbor high levels of endemism. Cienegas are far from pristine, and like many wetlands and riparian areas, they have probably been exploited for millennia. In the American Southwest, these habitats are hypothesized to have been in severe decline over the past 150 years due to a variety of man-made factors. In light of their biological and cultural importance, it is important to learn as much as we can about their current condition and conservation potential.

Introduction

Cienegas, described by Hendrickson and Minckley (1985), are mid-elevation wetlands (3280–6560 ft.) characterized by permanent, scarcely fluctuating water sources amid arid surroundings. The aquifer dynamics, floral, and faunal characters of cienegas are unique and vary according to regional geomorphological and ecological constraints. Cienega-type marshes and wetlands form where layers of rock or impervious clay hold water at the surface or through the continuous upwelling of numerous small springs and seeps (USDI 2012). Cienegas can be very large and harbor high levels of endemism, such as Cuatro Cienegas in Coahuila, Mexico, with an area of approximately 208,000 acres (325 mi²); or small and cryptic <2 acres (0.003 mi²), such as the Lewis Springs Cienega in Cochise County, Arizona.

The soils of cienegas are typically finely textured, and highly organic. Moisture, salinity, and other abiotic factors are also important influences on species composition. The result is a characteristic suite of plants specially adapted to these conditions, a rare plant community dominated by wetland graminoids (monocots) in three main families: grasses (Poaceae), rushes (Juncaceae), and sedges (Cyperaceae).

Saint David Cienega

The San Pedro National Conservation Area (SPRNCA) is a narrow strip with approximately 40 miles of stream running from the Mexican border to the town of St. David, Arizona. Among the plant communities of the SPRNCA are two separate cienega habitats: the St. David

Cienega at the northern tip and a little known, much smaller wetland near the middle associated with the Lewis Springs and Government Draw drainages (fig. 1).

The St. David Cienega is a marshy flat of approximately 350 acres with a perimeter of 2.3 miles. Seasonality is an important factor, and cienegas can vary dramatically depending on time of year. The main portion of the wetland with permanent water is about 75 acres (figs. 2, 3).

Surrounding vegetation is a mixture of mesquite grasslands, bosques, and Chihuahuan desert scrub. Saint David Cienega would be completely vegetated with no visible surface water; however, there is currently active management (vegetation removal and earth moving) in a northwest portion to provide open water for native fish and frog habitat (Simms, personal communication). Figure 4 is a landscape schematic of the vegetation zones of the St. David Cienega. Species associations are influenced by a moisture gradient from perennially saturated soils in the middle, where the water intersects the surface, to a seasonally dry and increasingly saline periphery. *Schoenoplectus americanus* (chairmaker's bulrush) forms nearly impenetrable stands throughout the middle portion, associated with *Lythrum californicum* (California loosestrife), and *Berula erecta* (cutleaf water parsnip). This zone has ankle-deep water throughout with organic, black soils (fig. 5). Moving outward, dense clumps of *Carex praegracilis* (clustered field sedge) dominate along with *Eleocharis rostellata* (beaked spike rush) (fig. 6). A mix of *Muhlenbergia asperifolia* (alkali muhly), *Distichlis spicata* (salt grass), and *Juncus arcticus* var. *balticus* (Baltic rush) can be found in the "Juncus-Distichlis" zone; transitioning into an area of tall grasses such as *Sporobolus wrightii* (sacaton), *Panicum obtusum* (vine mesquite), and *Bothriochloa laguroides* ssp. *torreyana* (silver beardgrass). Mesquite (*Prosopis velutina*) and sacaton outline much of the perimeter of St. David Cienega.

There are naturally various species that can be patchy and locally abundant, such as *Anemopsis californica* (yerba mansa), *Asclepias subverticillata* (whorled milkweed) and *Helianthus annuus* (common sunflower). In the northwestern section of the cienega *Typhadomingensis*

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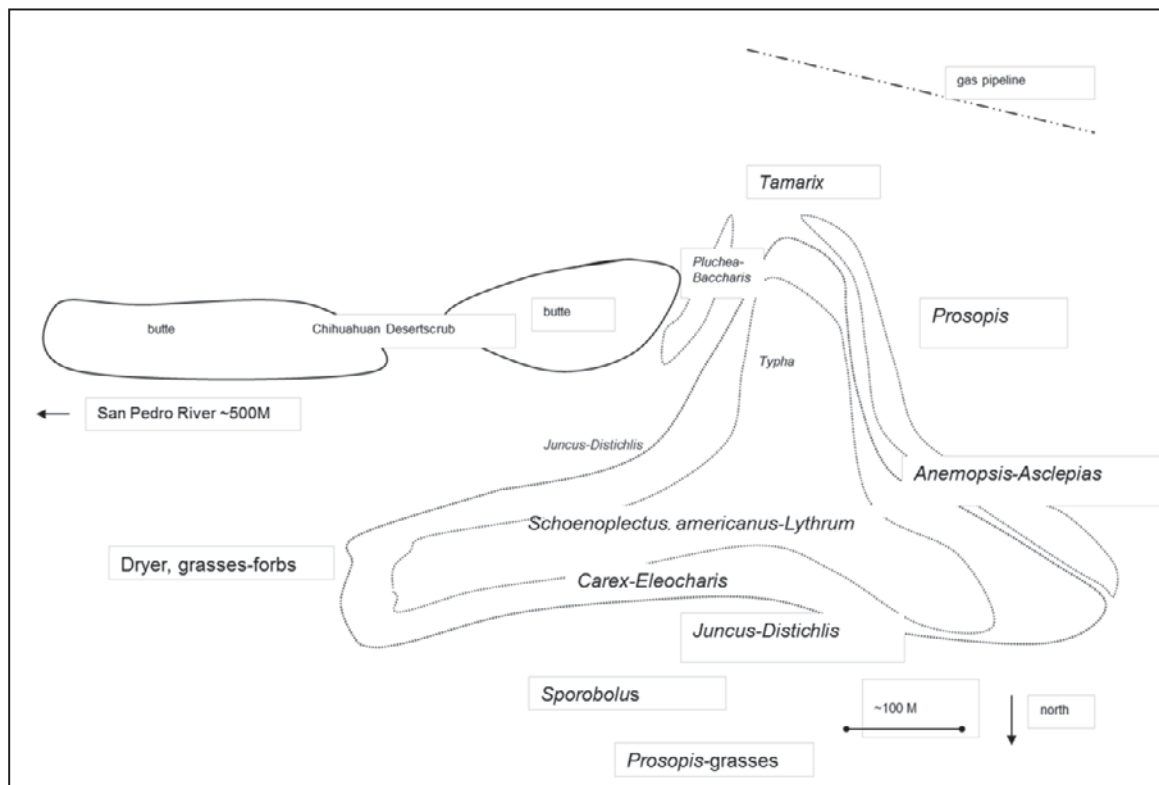


Figure 4—Schematic of St. David Cienega vegetation zones.



Figure 5—Nearly impenetrable stands of chairmaker's bulrush (*Schoenoplectus americanus*) in Middle portion of St. David Cienega.



Figure 6—Mats of clustered field sedge (*Carex praegracilis*) in the 'Carex-Eleocharis' zone of the St. David Cienega.

(southern cat-tail) replaces *S. americanus* as the dominant wetland graminoid.

Cycles of saturation and evaporation tend to make soils alkaline, and vegetation in cienegas almost always includes halophytes and other specialized plants. The St. David Cienega has numerous examples of species with high fidelity to cienegas—their vernacular often indicating salt tolerance e.g., *Almutaster pauciflorus* (alkali marsh aster), *Distichlis spicata* (salt grass), *Muhlenbergia asperifolia*, *Pluchea odorata* (saltmarsh fleabane), *Symphyotrichum subulatum* var. *ligulatum* (salt marsh aster), *Suaeda moquinii* (seablight), etc.

A floristic inventory was conducted during the early 2000's of the SPRNCA and 625 taxa were vouchered from that study (Makings 2006). Table 1 is a list of 23 of those from the St. David and Lewis Springs Cienegas that were found nowhere else but in these two habitats. Some, no doubt, can be dismissed as simply rare and/or overlooked in the greater SPRNCA, but others might be considered true cienega indicators. For example, in Cochise County, *Almutaster pauciflorus*, *Ammannia coccinea*, and *Muhlenbergia asperifolia* have only been collected from cienegas of the region. Using biodiversity occurrence data accessed through the Southwest Environmental Information

Table 1—Species found only in cienega habitats within SPRNCA.

Species	Cienega location
<i>Almutaster pauciflorus</i> ^a	St. David / Lewis Springs
<i>Ammannia coccinea</i> ^a	St. David
<i>Anemopsis californica</i> ^a	St. David / Lewis Springs
<i>Berula erecta</i> ^a	St. David
<i>Calystegia sepium</i> ^{a,b}	St. David
<i>Carex praegracilis</i> ^a	St. David
<i>Chamaesyce prostrata</i>	St. David
<i>Cirsium vulgare</i>	St. David
<i>Cyperus spectabilis</i>	St. David
<i>Distichlis spicata</i> ^a	St. David
<i>Eleocharis rostellata</i> ^a	St. David
<i>Elymus trachycaulus</i> ^a	St. David
<i>Epilobium ciliatum</i> ^a	St. David
<i>Eryngium sparganophyllum</i> ^a	Lewis Springs
<i>Leptochloa fusca</i> ssp. <i>fascicularis</i> ^a	St. David
<i>Lobelia cardinalis</i>	Lewis Springs
<i>Lythrum californicum</i> ^a	St. David / Lewis Springs
<i>Mentha spicata</i> ^a	St. David / Lewis Springs
<i>Muhlenbergia asperifolia</i> ^a	St. David / Lewis Springs
<i>Pluchea odorata</i> ^a	St. David
<i>Pluchea sericea</i>	St. David
<i>Samolus valerandi</i> ssp. <i>parviflorus</i>	St. David
<i>Sisyrinchium demissum</i>	St. David

^aHigh fidelity to cienegas and similar wetlands.

^bState record.

Network (SEINet 2012), this overlapping distribution pattern is consistent with many other taxa in table 1. In addition to the cienegas of the San Pedro, they regionally tend to be found in such places as Empire Cienega in Las Cienegas National Conservation Area (Pima County), O'Donnell Cienega in the Canelo Hills (Santa Cruz Co.), San Rafael State Natural Area (Santa Cruz County), Hooker Cienega (Cochise County), and Pipe Springs Cienega in the San Bernardino National Wildlife Refuge (Cochise County).

Lewis Springs Cienega

The Lewis Springs Cienega is approximately 1300 ft. east of the San Pedro River and just south of the Lewis Springs/Government Draw drainage. It is an unlikely wetland situated on the side of a small slope, probably maintained by gravity-driven subterranean flow from surrounding uplands. The margins of the wetland are abrupt and the contrast of desert vs. wetland vegetation is especially evident in the dryer months (fig. 7).

The Lewis Springs Cienega is a little less than 2 acres, but has yielded several species of interest, including ones that appear to be limited to this tiny wetland. For example, *Lobelia cardinalis* (cardinalflower), an obligate wetland species, is only known from this isolated population at Lewis Springs, and nowhere else along the SPRNCA floodplain. Also notable, is *Andropogon glomeratus* (bushy bluestem), a tall perennial grass that is rare regionally, but abundant here. 'Cienega indicators' such as *Almutaster pauciflorus*, *Anemopsis californica*, *Lythrum californicum*, *Mentha spicata* (spearmint), and *Muhlenbergia asperifolia* are also only present here or in the St. David Cienega, and not in the greater SPRNCA.

The most noteworthy species in the Lewis Springs Cienega is *Eryngium sparganophyllum* (Arizona eryngo), an unusual dicot in the Apiaceae. *Eryngium sparganophyllum* is a perennial herb with a basal rosette of long, parallel-veined leaves. The flowers are cream and clustered in dense heads at the end of the branching, scapose inflorescences (fig. 8). *Eryngium sparganophyllum* is a rare, regional endemic that occurs in marshes and other riparian habitats. SEINet data shows only 15 collections of vouchered material from the region—In Arizona, from Pima and Cochise Counties; In Mexico, one locality each from Sonora, Coahuila, and south to Durango (fig. 9). Other biodiversity data such as NatureServe (2012) report the global range to include Zacatecas and Jalisco, which would be slightly farther south, but regardless of its distributional limits, the scant number of collections suggests a rare life history strategy for this species. *Eryngium sparganophyllum* can reach a height of >5 ft. and is conspicuous when flowering, and therefore, it is hard to imagine that this plant is overlooked in the field. In fact, there are



Figure 7—Lewis Springs Cienega looking northeast. Most abundant species are *Juncus arcticus* var. *balticus* and *lythrum californicum* (California loosestrife) (post-monsoon photo taken in October 2011). Grass along perimeter is mostly alkali sacaton (*Sporobolus airoides*).



Figure 8—*Eryngium sparganophyllum* (Arizona eryngo).



Figure 9—Distribution of *Eryngium sparganophyllum* with locality (collector and date).

anecdotal comments on several labels noting its localized abundance (e.g., Yatskievych in 1982: “dominant in marshy meadow”; Reina in 2003: “very common herbaceous perennial”; Wiens in 2008: “locally common herbaceous perennial...”). The limited distribution, coupled with such narrow ecological parameters, also make *E. sparganophyllum* especially susceptible to local extinction, earning its status as “critically imperiled” in Arizona, and “possibly extirpated” in New Mexico (NatureServe 2012). Indeed, Wootton and Standley, in their treatment of the New Mexico flora in 1915, note the only collection of *E. sparganophyllum*, a Charles Wright type specimen from “Las Playas Springs, near the Sierra de las Animas, New Mexico,” probably the present day Playas Valley east of the Animas Mountains in the New Mexico “Bootheel” (Wootton and Standley 1915). In addition to this population, probably many others have been extirpated due to dewatering of wetlands in the region.

Discussion

Cienegas and their environs have been inhabited for millennia and have great archaeological and biological value. However, the future of cienegas is uncertain, having been greatly reduced over the last 150 years mainly due to the influences of humans. Cienegas may be one of the most endangered habitats in the American Southwest and northwestern Mexico, many only remnants of their historical condition.

Hendrickson and Minckley (1985) estimate habitat loss of cienegas to be upwards of 95%, making them aquatic islands in an arid matrix. Frank Crosswhite, editor of *Desert Plants* at the time, noted, “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). Cattle grazing, development, and associated water extraction (groundwater pumping, draining, diverting, impounding, etc.) continue to be problems and have increasingly placed pressures on the ecological integrity of many cienegas, including those along the San Pedro River valley.

Cienegas are relatively small ecosystems with important roles on the landscape, yet ironically, poorly understood. In order to assess their importance and conservation potential, better knowledge regarding proper functioning of these sites is critical, including investigation of their extent, ecology, and abiotic parameters, as well as monitoring their trends. The survival of the St. David Cienega, Lewis Springs Cienega, and other rare wetlands of the region will ultimately depend on (1) a demand for thoughtful choices about where and how much groundwater is pumped, (2) greater emphasis on research, and (3) our support of efforts to protect and restore them.

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