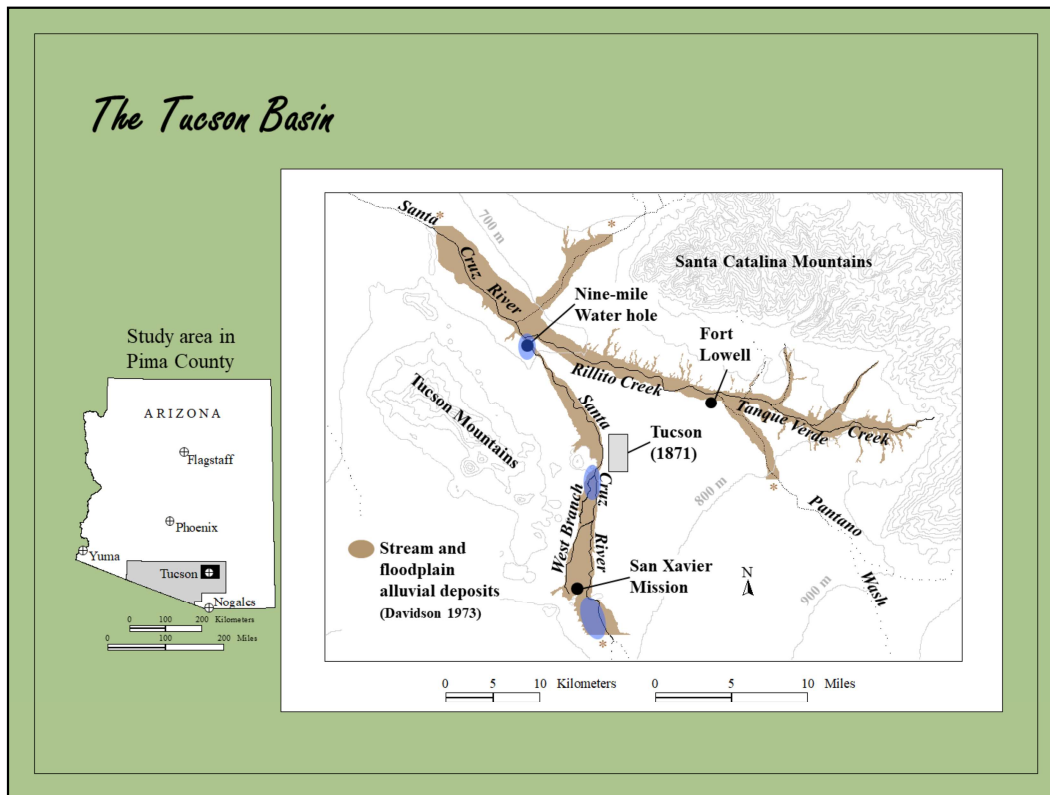


This talk was presented with voiceovers from audience members, delivering the words of historical and contemporary witnesses of the riparian environments of the Tucson Basin. Thanks to Peter Gierlach, Steve McLaughlin, and Michael Chamberland for their participation.

Note that animations have been removed for the PDF version.

The Tucson Basin



1. The Tucson Basin

This is the Tucson Basin, a topographically-defined hydrological area drained by two major channels, the Santa Cruz River and Rillito Creek and its tributaries, and supported historically by alluvial aquifers beneath these valleys.

The historic floodplain where overbank deposits exist (and in some places can be seen) indicate a formerly dynamic bottomland, shown in tan.

There were three locations known historically where there was permanent, live water at the surface and associated aquatic and riparian plant collections were made, indicated in blue.

Our Riparian Heritage



2. Our Riparian Heritage

You could think of these photos as a tale of three centuries.

We know about the historic environments of the Tucson Basin from a combination of sources, including the observations of explorers, travelers, and scientists.

(photo 1, left)

Edgar Mearns led the U.S. Mexican Boundary Survey between 1891 and 1896. He, personally, visited Tucson in 1885 and 1893, observing:

“The streams—Rillito Creek and the Santa Cruz River—are well wooded with screw bean, mesquite, cottonwood, willow, boxelder, and ash, groups of which are often converted into fragrant bowers by climbing grape and *Philibertella*, with spiny asters, showy daturas, and many flowering annuals beneath and around them.”

Note that all of the plant species in this photo were collected historically in the Santa Cruz Valley near Tucson. This photo was taken in the Empire Valley in 2004.

(photo 2, center)

It was within that decade (the 1890s) that Tucson saw the entrenchment of its rivers. Desert laboratory scientist Burton Livingston described the state of the Santa Cruz Valley in 1909:

“Formerly the river spread over this plain in times of flood and made of it a marshy area or cienega, but deep gullying of the stream-channel has lowered its bed several meters and rendered the present flood-plain, where not irrigated, a parched and barren waste in dry seasons.”

This photo illustrates the broad, dry, entrenched channel of the Santa Cruz River near downtown Tucson in 1999, lined with plants characteristic of larger desert washes.

(photo 3, right)

Over the last few decades of the twentieth century (and ongoing), several projects are underway or planned to reintroduce wetland habitat in our urban valleys. As freshwater conservationist David Bayles recently wrote:

“We probably cannot live at peace with the landscape if within one generation we alter our places beyond recollection, making the one who remembers a stranger.”

At the same time, work continues to conserve remaining riparian and wetland habitats in the county and region. This photo was taken at the Sweetwater Wetlands water treatment basins in the Santa Cruz Valley near Tucson.

Many of the photos you'll see with plants in the following slides were taken in some of the riparian landscapes that have already been saved in southern Arizona.

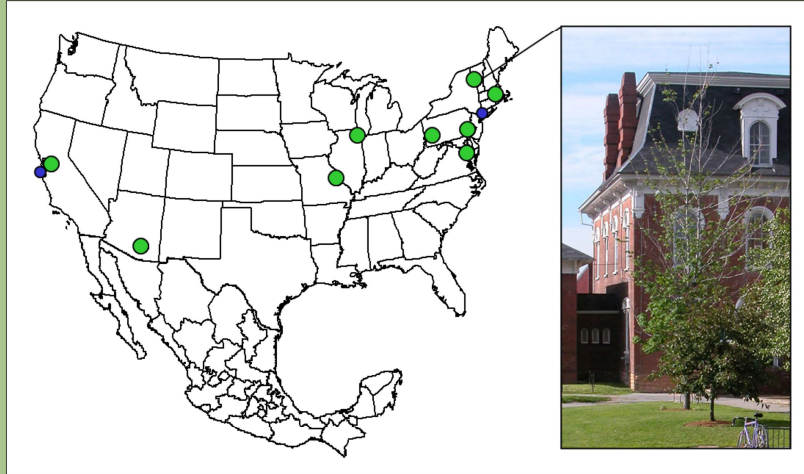


Where did our plants go?

3. Where did our plants go?

Over the course of a few decades, as erosion progressed, some of our plants must have gone downstream. As water was diverted and withdrawn for other uses, some eventually went up into the sky. But, many of them wound up in New England, and elsewhere.

Natural History Collections



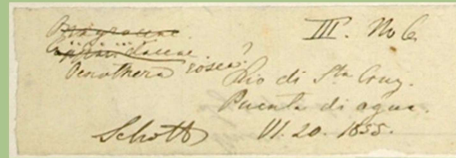
4. Natural History Collections

Institutions, most of them in the east, are the repositories for the plants that once grew here, especially for the oldest collections. Finding the plants involved a combination of intensive literature and archival work and, especially, searching through the stacks at each of these herbaria.

Botanical Specimens



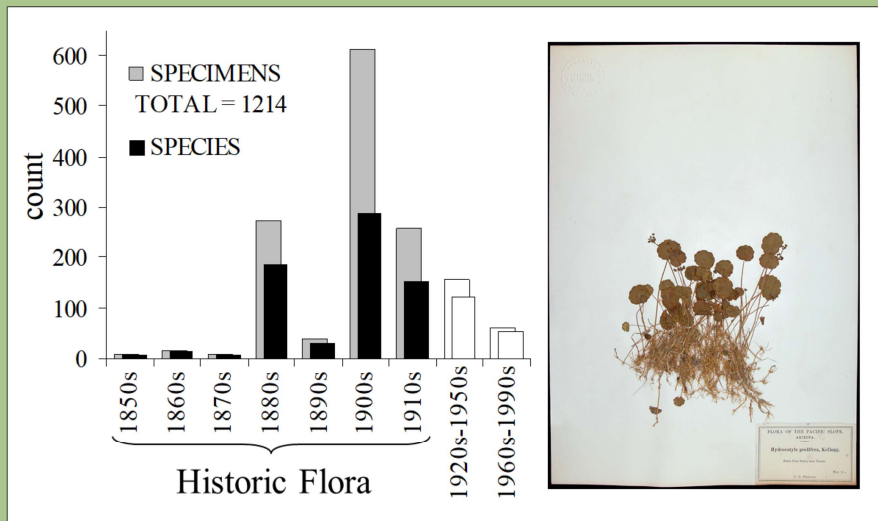
Oenothera rosea
Rio di Sta. Cruz, Punta di Agua,
Arthur Schott, 20 Jun 1855



5. Botanical Specimens

This is one example of a botanical specimen from the Santa Cruz Valley. In 1855, Boundary Survey member Arthur Schott collected *Oenothera rosea* at Punta de Agua, near San Xavier. This is one of the earliest collections from the Tucson Basin, but there are regrettably few from this early time frame.

The Riparian Record

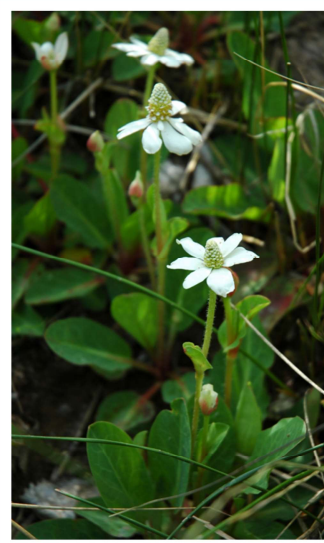


6. The Riparian Record

To-date, there are just over 1200 specimens contributing data for the historic riparian flora. Note that collection has been uneven over time. Also notice that the 1880s are better represented than the 1910s, and even better than the remaining 80 years of the 20th century combined. Nearly all of the material of the 19th century was found at other herbaria, while most of the material of the 20th century was found here at the UA herbarium. There are 43 collectors represented among the known specimens.

The Historic Flora

- 395 species in 73 families
- 45 introduced species (11% of flora)
- 21 nomenclatural type specimens
- 29% of the species (representing 32% of the families) are *usually* or *always* associated with wetland conditions



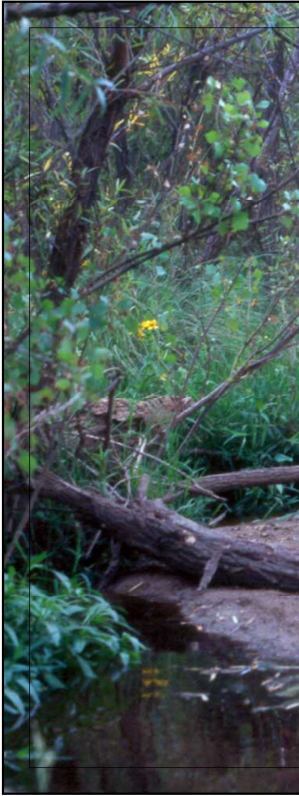
7. The Historic Flora

(see bullet list)

The composition of the flora as a whole reflects Tucson's location at the transition between three biomes and among the Madrean mountain ranges of southern Arizona.

For the nineteenth century, 344 specimens document 208 species, or just over half of the total flora.

Within the historic landscape the notes of travelers and the plant species themselves document a variety of bottomland habitats...



Channels & Pools

8. Channels and pools

To begin with, there were several miles of perennial stream channel and pools...



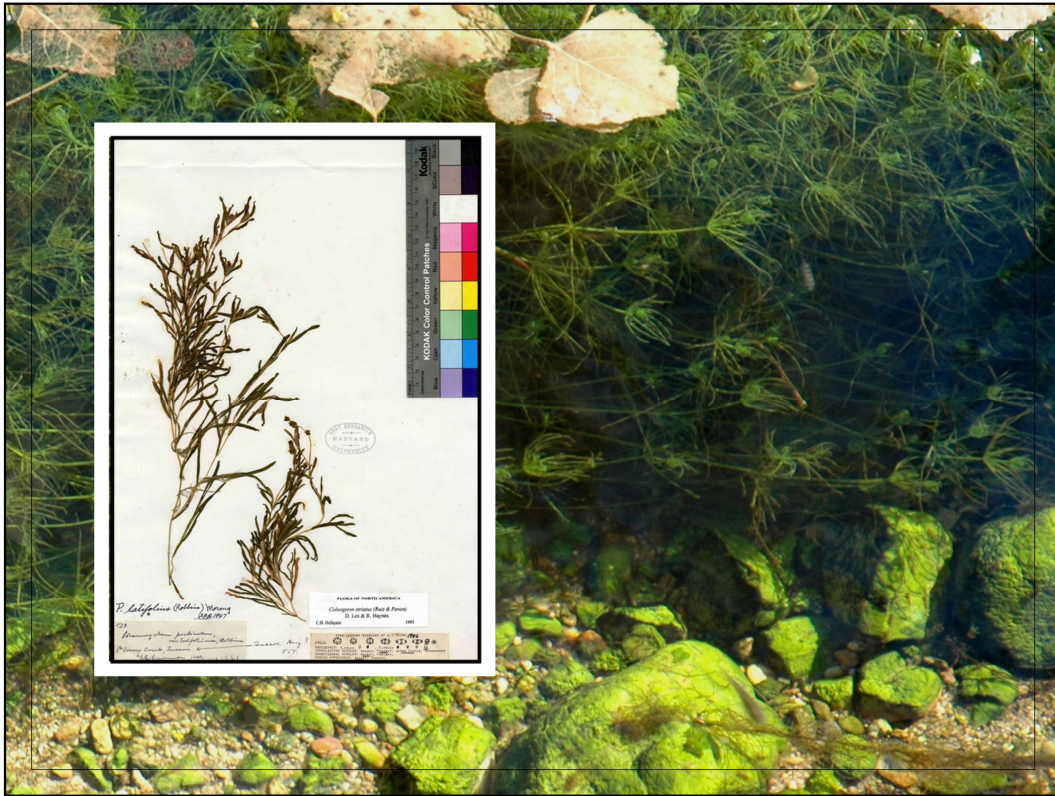
(Channels and pools)

8a.

South of Sentinel Peak in 1854, German traveler Julius Froebel found the Santa Cruz River:

“A rapid brook, clear as crystal, and full of aquatic plants, fish, and tortoises of various kinds, flowed through a small meadow covered with shrubs.”

(background, *Chara*; specimen, *Najas marina*)



(Channels and pools)

8a.

South of Sentinel Peak in 1854, German traveler Julius Froebel found the Santa Cruz River:

“A rapid brook, clear as crystal, and full of aquatic plants, fish, and tortoises of various kinds, flowed through a small meadow covered with shrubs.”

(background, *Chara*; specimen, *Coleogeton striatus*)



(Channels and pools)

8b.

On the Santa Cruz River near Tucson in 1880, naturalist Joseph James observed:

“Along the banks of the stream is a little Hydrocotyle, a Ligusticum, *Eleocharis palustris* and other plants loving damp localities...”

(background, *Hydrocotyle ranunculoides*; specimen, *Samolus floribundus*)



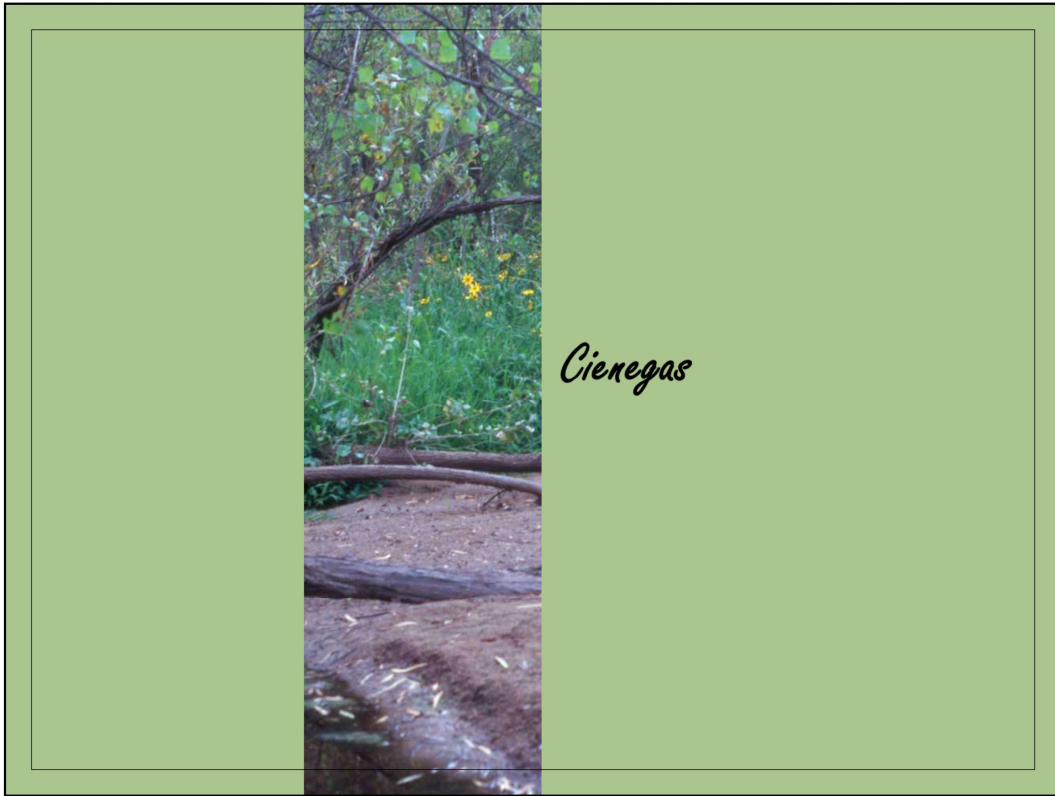
(Channels and pools)

8b.

On the Santa Cruz River near Tucson in 1880, naturalist Joseph James observed:

“Along the banks of the stream is a little Hydrocotyle, a Ligusticum, *Eleocharis palustris* and other plants loving damp localities...”

(background, *Hydrocotyle ranunculoides*; specimen, *Berula erecta*)



Cienegas

9. Cienegas

Also in the valleys, there were at least three well-known marshes, or cienegas...



(Cienegas)

9a.

One party of forty-niners described the valley near Sentinel Peak:

“The road from San Xavier to camp, 1 mile short of Tucson, was very level, running through mesquite, etc. We encamped in a grassy bottom much covered with saline efflorescence.”

(background, *Bidens laevis*; specimen, *Muhlenbergia asperifolia*)



(Cienegas)

9a.

One party of forty-niners described the valley near Sentinel Peak:

“The road from San Xavier to camp, 1 mile short of Tucson, was very level, running through mesquite, etc. We encamped in a grassy bottom much covered with saline efflorescence.”

(background, *Bidens laevis*; specimen, *Paspalum distichum*)



(Cienegas)

9b.

Some decades later, Solomon Warner wrote about his home-grown lake at the base of Sentinel Peak in 1884:
“...Tullies and water grasses grow on all the land the pond covers with the exception of three or four acres on the south & east side.”

(background, *Scirpus*; specimen, *Cyperus odoratus*)



(Cienegas)

9b.

Some decades later, Solomon Warner wrote about his home-grown lake at the base of Sentinel Peak in 1884:
“...Tullies and water grasses grow on all the land the pond covers with the exception of three or four acres on the south & east side.”

(background, *Scirpus*; specimen, *Lilaeopsis schaffneriana* subsp. *recurva*)



10. Forests

Valley forests included extensive mesquite bosque and galleries of broad-leafed trees along the wetter sections of stream...



(Forests)

10a.

Boundary Survey commissioner John Russell Bartlett described the Santa Cruz Valley at Tucson in 1853:

“The bottom-lands are here about a mile in width. Through them run irrigating canals in every direction, the lines of which are marked by rows of cottonwoods and willows, presenting an agreeable landscape.”

(background, *Populus fremontii* with *Phoradendron serotinum* subsp. *macrophyllum*; specimen, *Populus fremontii*)



(Forests)

10a.

Boundary Survey commissioner John Russell Bartlett described the Santa Cruz Valley at Tucson in 1853:

“The bottom-lands are here about a mile in width. Through them run irrigating canals in every direction, the lines of which are marked by rows of cottonwoods and willows, presenting an agreeable landscape.”

(background, *Populus fremontii* with *Phoradendron serotinum* subsp. *macrophyllum*; specimen, *Sambucus mexicana*)



(Forests)

10b.

Desert Lab scientist Volney Spalding described the mesquite forests of the Santa Cruz Valley in the first decade of the twentieth century:

“Such trees grow thickly on the bottom-land near the old mission of San Xavier, forming the fine forest that stretches for miles up the river, in the shade of which grows a rank vegetation similar to that of eastern mesophytic forests in luxuriance.”

(background, *Prosopis velutina*; specimen, *Ipomoea coccinea*)



(Forests)

10b.

Desert Lab scientist Volney Spalding described the mesquite forests of the Santa Cruz Valley in the first decade of the twentieth century:

“Such trees grow thickly on the bottom-land near the old mission of San Xavier, forming the fine forest that stretches for miles up the river, in the shade of which grows a rank vegetation similar to that of eastern mesophytic forests in luxuriance.”

(background, *Prosopis velutina*; specimen, *Anemopsis californica*)



11. Floodplains

The floodplains were the most extensive landform in the valleys, in some places more than a mile wide. These areas had been cultivated for decades to centuries, and were increasingly devoted to agriculture over the historic time frame.



(Floodplains)

11a.

As he saw it in the 1860s, Army Surgeon Charles Smart portrayed the Santa Cruz River as an example of the streams of the region:

“...often dry during the greater part of the year, but in the rainy season overflowing their banks, and flooding the various strips of bottom land through which they travel, and which, in consequence of the annual overflow, bear a luxuriant vegetation during the remainder of the year.”

(background, *Chloris virgata*; specimen, *Tessaria sericea*)



(Floodplains)

11a.

As he saw it in the 1860s, Army Surgeon Charles Smart portrayed the Santa Cruz River as an example of the streams of the region:

“...often dry during the greater part of the year, but in the rainy season overflowing their banks, and flooding the various strips of bottom land through which they travel, and which, in consequence of the annual overflow, bear a luxuriant vegetation during the remainder of the year.”

(background, *Chloris virgata*; specimen, *Cuscuta salina* parasitic on *Suaeda*)



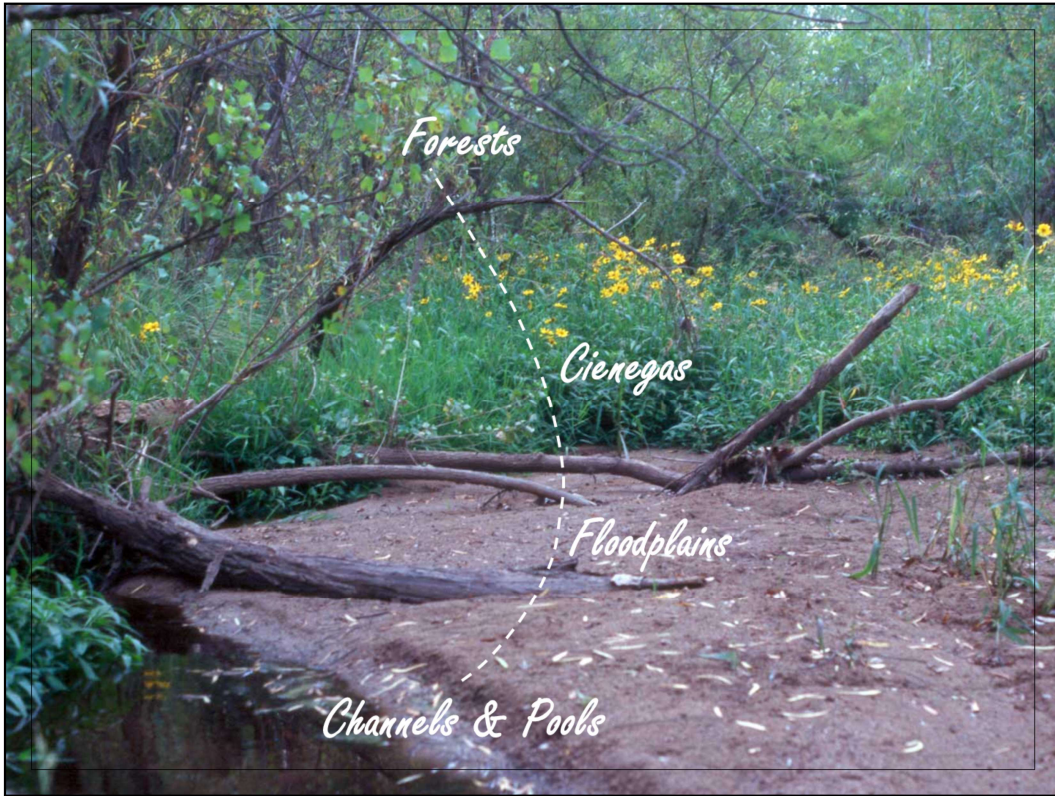
(Floodplains)

11b.

Southeast of the San Xavier Mission was about a half square mile of “pasturage,” described in the 1851 Rancho de Martinez land claim as:

“...covered with mesquite woods and sacaton grass, which from the earliest times has served as pasture grounds for stock...”

(background and specimen, *Sporobolus wrightii*)



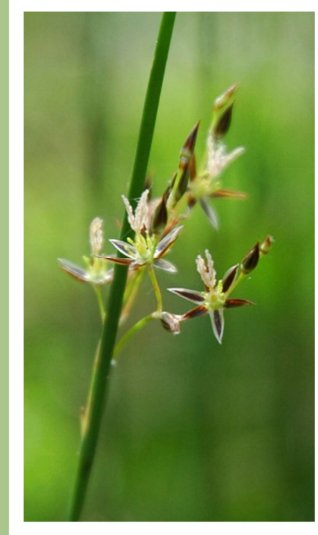
12. Riparian Habitats, concluded

This underlying heterogeneity, and the landscape gradients between these habitats, contributed to the total diversity documented by plant specimens.

By the way, all of the plant species visible in the background were collected on the Santa Cruz River at Tucson in the 1880s.

In Conclusion...

- The flora represented a substantial sample of *regional* floristic richness.
- Plant biodiversity reflected seasonal *variation* and edaphic *heterogeneity*.
- There are limitations to these data for the analysis of historic *communities* and historic *change*.
- The flora area was likely the best-collected riparian setting in the Sonoran Desert region during the historic time frame.



13. Conclusion

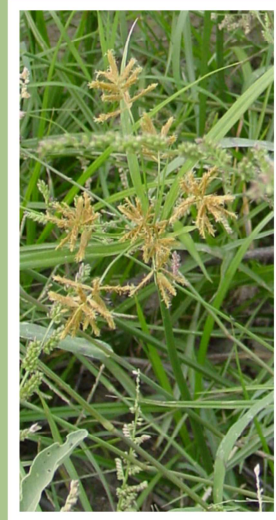
The historical riparian flora of the Tucson Basin was substantial in numbers of species, genera, and families represented. It included many true wetland species, and the breadth of the flora is indicative of a varied riparian environment that was both stable and dynamic.

Credits & Gratitude

Deacon Bell Memorial Scholarship, Orchid Society of Arizona
National Garden Club Scholarship
Office of Arid Land Studies, University of Arizona
Arizona Archaeological & Historical Society
Visiting scholarship, Field Museum of Natural History
Research travel scholarship, Carnegie Museum of Natural History

University of Arizona Herbarium
Pringle Herbarium at University of Vermont
Missouri Botanical Garden
Harvard University Herbaria
University of California Herbarium at Berkeley
United States National Herbarium at the Smithsonian Institution
Academy of Natural Sciences of Philadelphia
Field Museum of Natural History
Carnegie Museum of Natural History
New York Botanical Garden
California Academy of Sciences

Arizona Historical Society Library
University of Vermont Archives
University of Arizona Libraries Special Collections



14. Credits & Gratitude

