IV

Draft Species Conditions for Cactus ferruginous pygmy owl (CFPO)
January 11, 2006

These conditions are intended to wholly replace the draft conditions presented to STAT November 29, 2005 by RECON. Pima County will contribute to the protection and conservation of the CFPO and its habitat by taking the following actions. The actions proposed include Habitat Protection and Management (1-5), Inventory, Monitoring, and Research (6-7), and Community Involvement (8-9).

1. Strictly enforce and implement the conservation targets identified by the in areas identified as CFPO Priority Conservation Areas (PCA's) or Special Species Management Areas.

2. Continue to acquire additional high value areas necessary to offset impacts of urbanization on CFPO. Acquisitions are defined as fee ownership and conservation easements of private or state lands. High value areas to be prioritized for acquisition are those areas that include one or more of the following with regard to CFPO:

    - Medium to high potential habitat values for CFPO breeding and dispersal, such as riparian and palo verde-saguaro plant communities, and
    - Are either inside or outside PCA, and
    - Sizeable enough to provide sustained conservation value, or
    - Have been identified by STAT as preferred locations for CFPO conservation, or
    - Provide/augment connectivity to existing reserves

3. If available, prioritize the acquisition of State Trust Lands in the Tortolita Fan in the 2008 bond package.

4. Continue to use the Riparian Protection Ordinance, the Floodplain Management Ordinance, and the Floodprone Lands Acquisition Program (FLAP) as tools to achieve conservation of the CFPO associated with public works projects and the development of private property.

5. Within the first 3 years following permit issuance, development-related regulations that require open space set-asides (e.g., NPPO, Conservation Subdivision Ordinance, Buffer Overlay Zone Ordinance, Cluster Development Option, etc.) will be evaluated, and revised where appropriate, to augment CFPO conservation. Revisions will be based on the best available science and will address:

    - Retention of natural open space;
    - Use of native, endemic plant species;

- Compatibility with nearby conservation lands, and;
- Connectivity of washes and other natural open space areas across the landscape.

6. Fund a proportional share of landscape-scale CFPO survey program to assess the status of the CFPO in Pima County and northern Sonora. Such a survey program should also meet the monitoring/adaptive management goals of the HCP.

7. Support and participate in scientific research and investigations for CFPO that are designed to increase knowledge about habitat/connectivity requirements and/or population dynamics. Pima County's support may extend to field surveys designed to monitor known populations of this species on a landscape-scale; experimentation/research approach to CFPO augmentation, including captive breeding and placement of cavity nest boxes within potential CFPO nesting habitat; and other science-based efforts supported by the USFWS, AGFD, and other entities. Support ongoing efforts to assess the status of the CFPO in Mexico.

    - 7A. Participate in multi-jurisdiction, multi-agency partnerships to implement a CFPO augmentation program being conceived by FWS and AGFD as a research experiment (include captive breeding and establishment of nest boxes).

    - 7B. Support monitoring and research efforts to keep track of the larger population in northern Mexico.

8. Support and participate in community education and advocacy for CFPO habitat conservation.

9. Encourage and cooperate in a combined effort with the City of Tucson, Town of Marana, Town of Sahuarita, and the State Land Department to develop a multi-jurisdictional approach to conservation of this species on lands subject to each respective jurisdiction.

V1

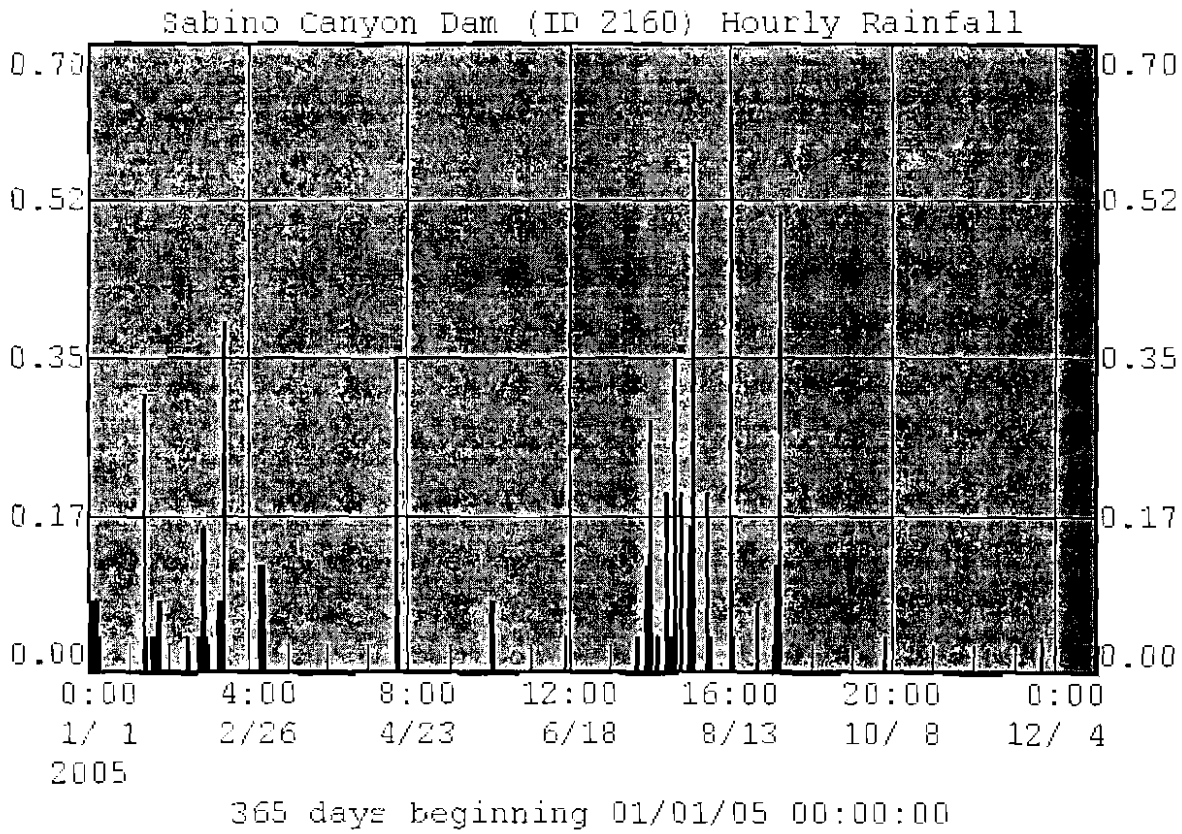
Sabino Canyon Dam precip (ID 2160)

Hourly Rainfall Amounts

12/31/2005	
2400	0.00
2300	0.00
2200	0.00
2100	0.00
2000	0.00
1900	0.00
1800	0.00
1700	0.00
1600	0.00

Raw Rainfall Data

12/31/2005 13:26:52	0.08
12/31/2005 01:26:52	0.08
12/30/2005 13:26:50	0.08
12/30/2005 01:26:49	0.08
12/29/2005 13:26:49	0.08
12/29/2005 01:26:48	0.08
12/28/2005 13:26:47	0.08
12/28/2005 01:26:46	0.08
12/27/2005 13:26:46	0.08
12/27/2005 01:26:45	0.08



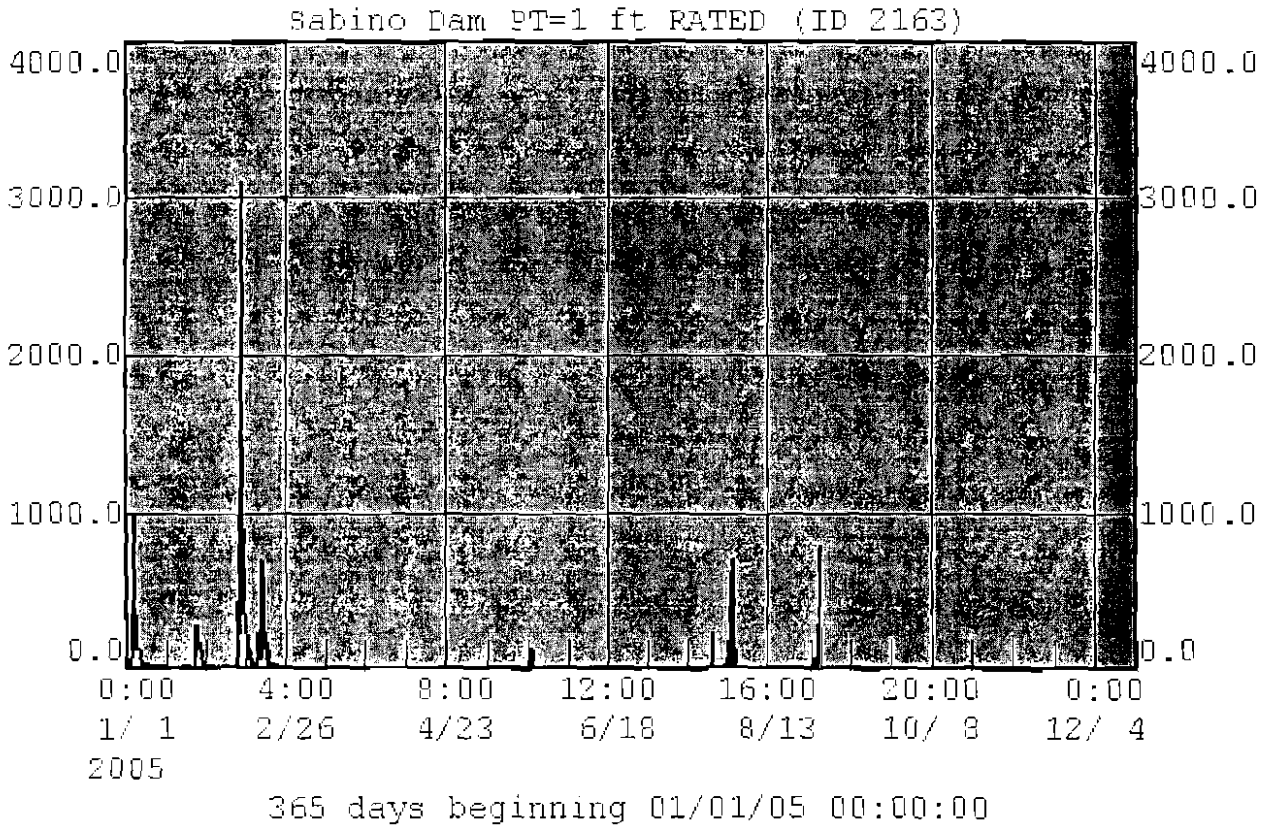
Sabino Dam PT=1 ft river (ID 2163R)

Hourly Data Values

12/31/2005	
2400	0
2300	0
2200	0
2100	0
2000	0
1900	0
1800	0
1700	0
1600	0

Raw Data Values

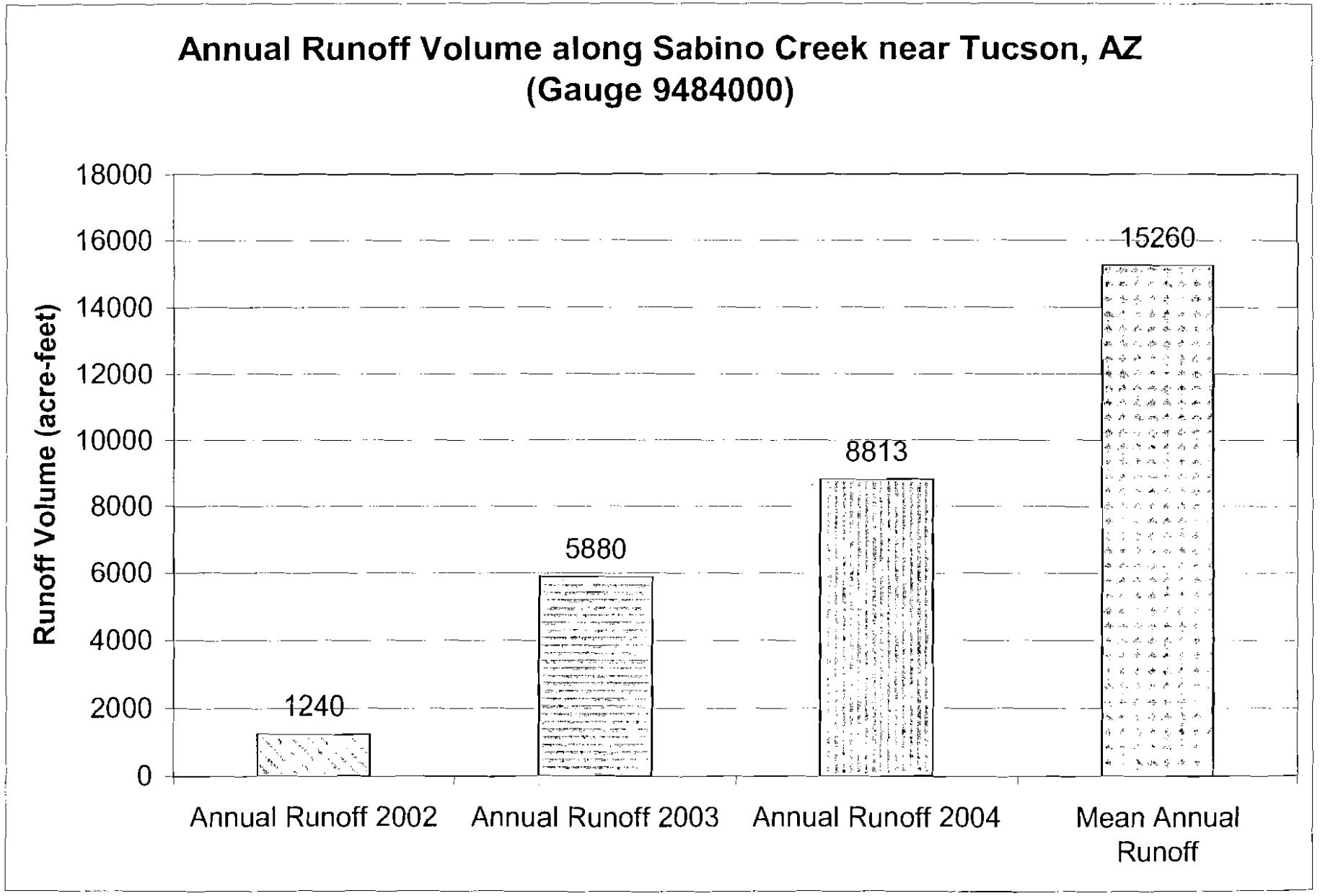
12/31/2005 13:26:52	0
12/31/2005 01:26:52	0
12/30/2005 13:26:50	0
12/30/2005 01:26:49	0
12/29/2005 13:26:48	0
12/29/2005 01:26:48	0
12/28/2005 13:26:47	0
12/28/2005 01:26:46	0
12/27/2005 13:26:45	0
12/27/2005 01:26:44	0



ANNUAL RUNOFF VOLUMES ALONG MAJOR WATERCOURSES IN PIMA COUNTY, ARIZONA

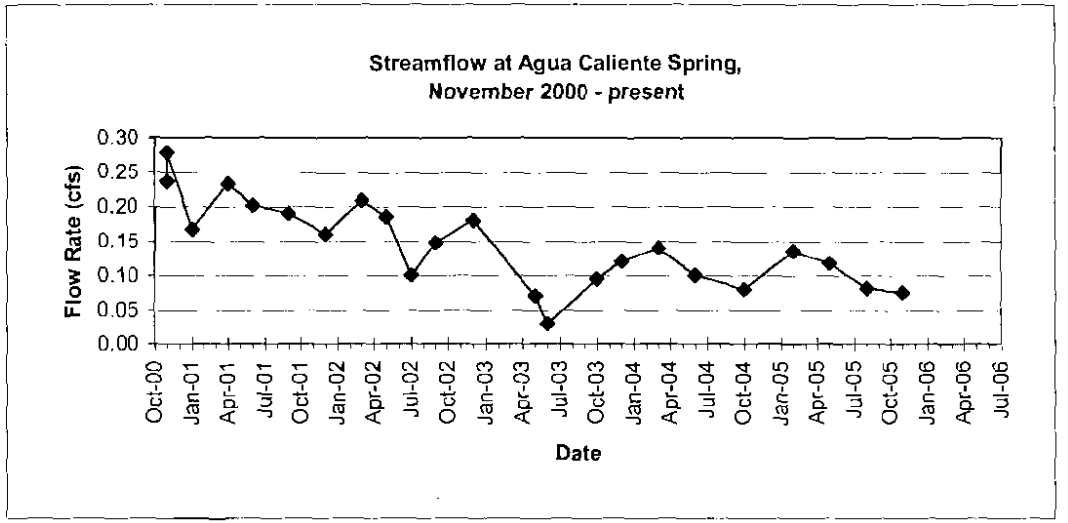
U.S.G.S. WATER RESOURCES DATA

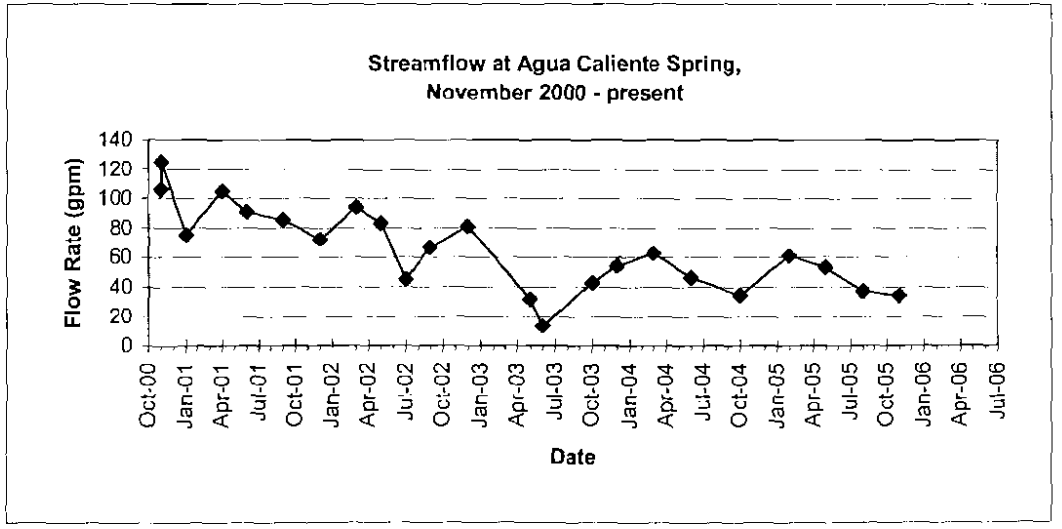
Map #	Gauge #	Watercourse	Location	Annual Runoff 2002	Annual Runoff 2003	Annual Runoff 2004	Mean Annual Runoff	Water Years of Record
1	9472050	San Pedro River	Redington Bridge near Redington, AZ	2340	8980	4590	15270	1998-2004
2	9482000	Santa Cruz River	Continental Rd., AZ	385	1400	1105	17050	1941-2004
3	9482500	Santa Cruz River	at Tucson, AZ	3350	4480	2881	8690	1997-2004
4	9484000	Sabino Creek	near Tucson, AZ	1240	5880	8813	15260	1988-2004
5	9484500	Tanque Verde Creek	at Tucson, AZ	12	3680	8061	16050	1941-2004
6	9484600	Pantano Wash	near Vail, AZ	1540	1630	2048	4380	1960-2004
7	9485000	Rincon Creek	near Tucson, AZ	197	622	2021	4450	1953-2004
8	9485450	Pantano Wash	at Broadway Blvd., Tucson, AZ	299	338	822	2160	1998-2004
9	9485700	Rillito Creek	at Dodge Blvd., Tucson, AZ	1620	3530	5546	20770	1991-2004
	9486055	Rillito Creek	at La Cholla Blvd., Tucson, AZ	NA	NA	NA	NA	1996-2004
	9486350	Canada Del Oro	Below Ina Rd. near Tucson, AZ	NA	NA	NA	NA	1996-2004
10	9486500	Santa Cruz River	at Cortaro, AZ	55880	68230	60730	41630	1940-2004
11	9486520	Santa Cruz River	at Trico Rd., Marana, AZ	23770	29570	35800	29450	1990-2004
12a	9486580[a]	Arivaca Creek	at Arivaca, AZ	226	226	212	226	Oct 1996-Apr 2002
12b	9486590[b]	Arivaca Creek	near Arivaca, AZ	110	134	141	137	2002-2004
13	9486800	Altar Wash	near Three Points, AZ	522	3190	1274	4020	1967-2004
14	9487000	Brawley Wash	near Three Points, AZ	174	2480	773	3510	1993-2004


Annual Runoff Volume along Sabino Creek near Tucson, AZ
(Gauge 9484000)
Runoff Volume (acre-feet)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1240
5880
8813
15260
Annual Runoff 2002
Annual Runoff 2003
Annual Runoff 2004
Mean Annual Runoff

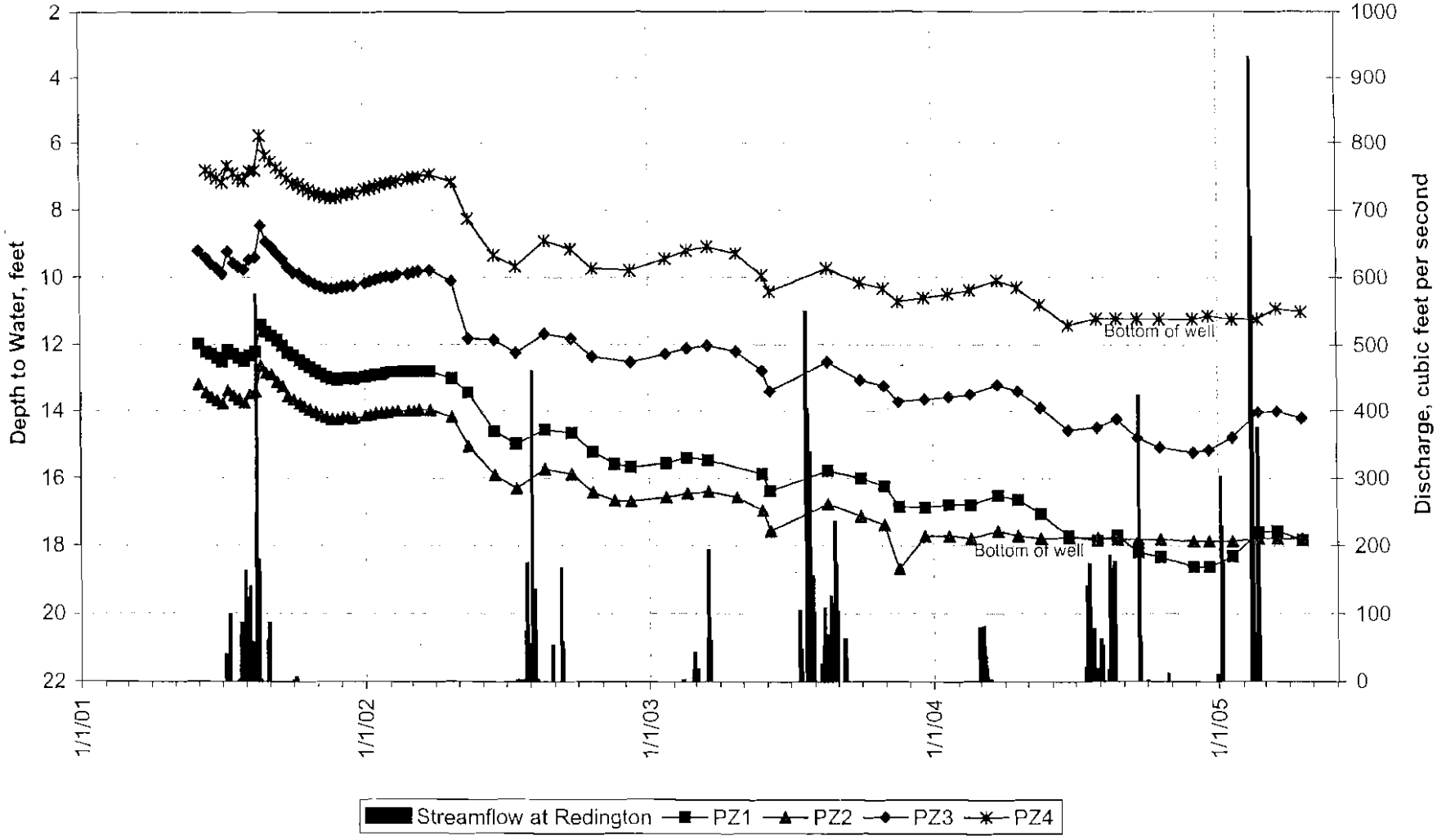
Agua Caliente Spring
Roy Drachman-Agua Caliente Park
Measurements by PAG.
Measurements taken with USGS Pygmy Flow Meter or Free Flow V-Notch Trapazoidal Flume.
1 cfs = 448.83 gpm

Date	Discharge (cfs)	Discharge (gpm)	Method
11/21/00	0.24	106	flow meter
11/28/00	0.28	125	flow meter
1/31/01	0.17	75	flow meter
4/9/01	0.23	105	flow meter
6/14/01	0.20	91	flow meter
9/25/01	0.19	85	flow meter
12/20/01	0.16	72	flow meter
3/27/02	0.21	94	flow meter
5/23/02	0.19	83	flow meter
7/11/02	0.10	45	flow meter
9/10/02	0.15	66	flow meter
12/30/02	0.18	81	flow meter
5/1/03	0.07	31	flow meter
6/9/03	0.03	13	flume
10/3/03	0.10	43	flume
12/31/03	0.12	54	flume
3/26/04	0.14	63	flume
6/18/04	0.10	46	flume
10/25/04	0.08	34	flume
2/17/05	0.14	61	flume
5/20/05	0.12	53	flume
8/10/05	0.08	37	flume
11/17/05	0.08	34	flume
Mean	**0.14**	**65**	





Depth to Water at H&E and Streamflow at Redington Gage
Lower San Pedro River



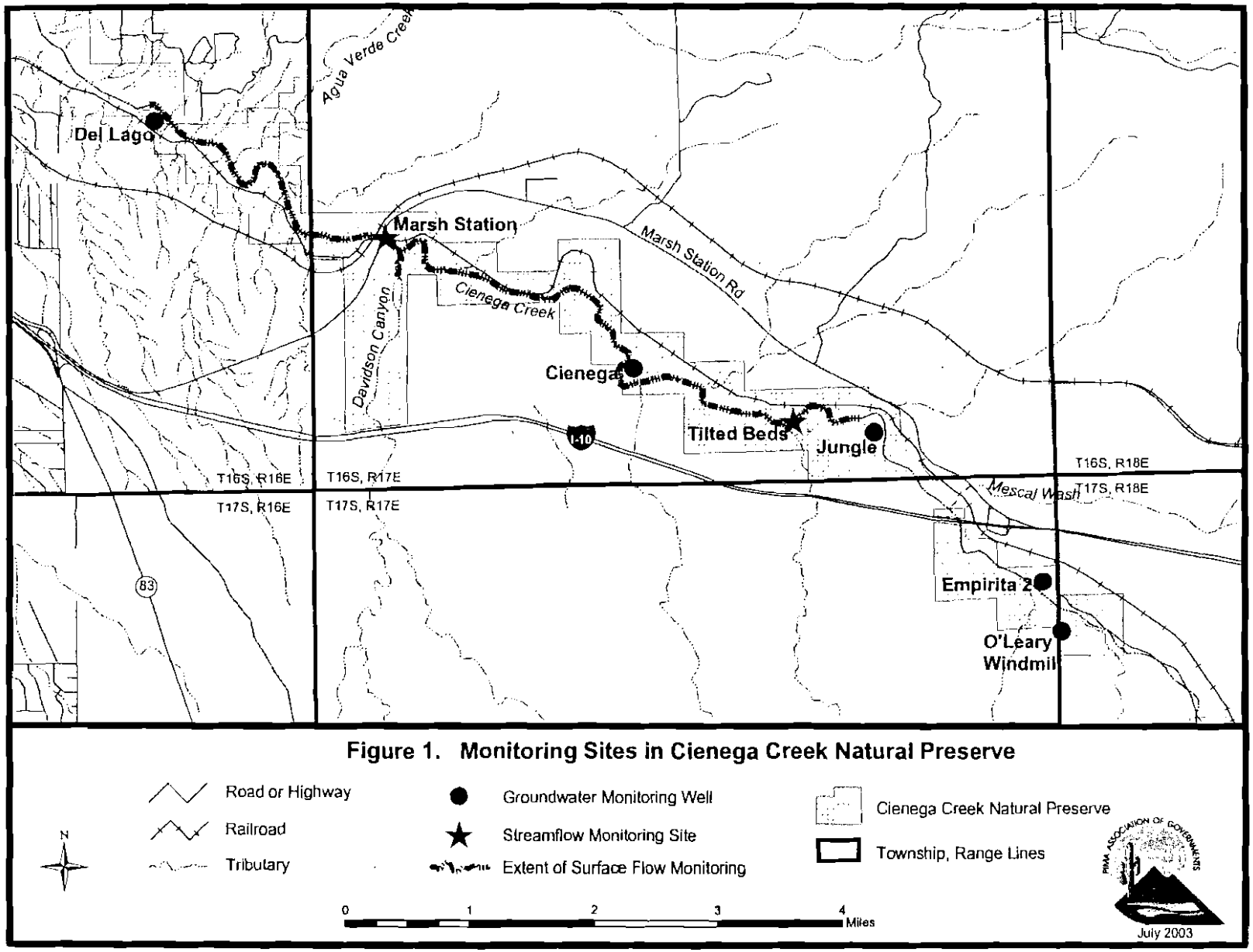


Figure 1. Monitoring Sites in Cienega Creek Natural Preserve

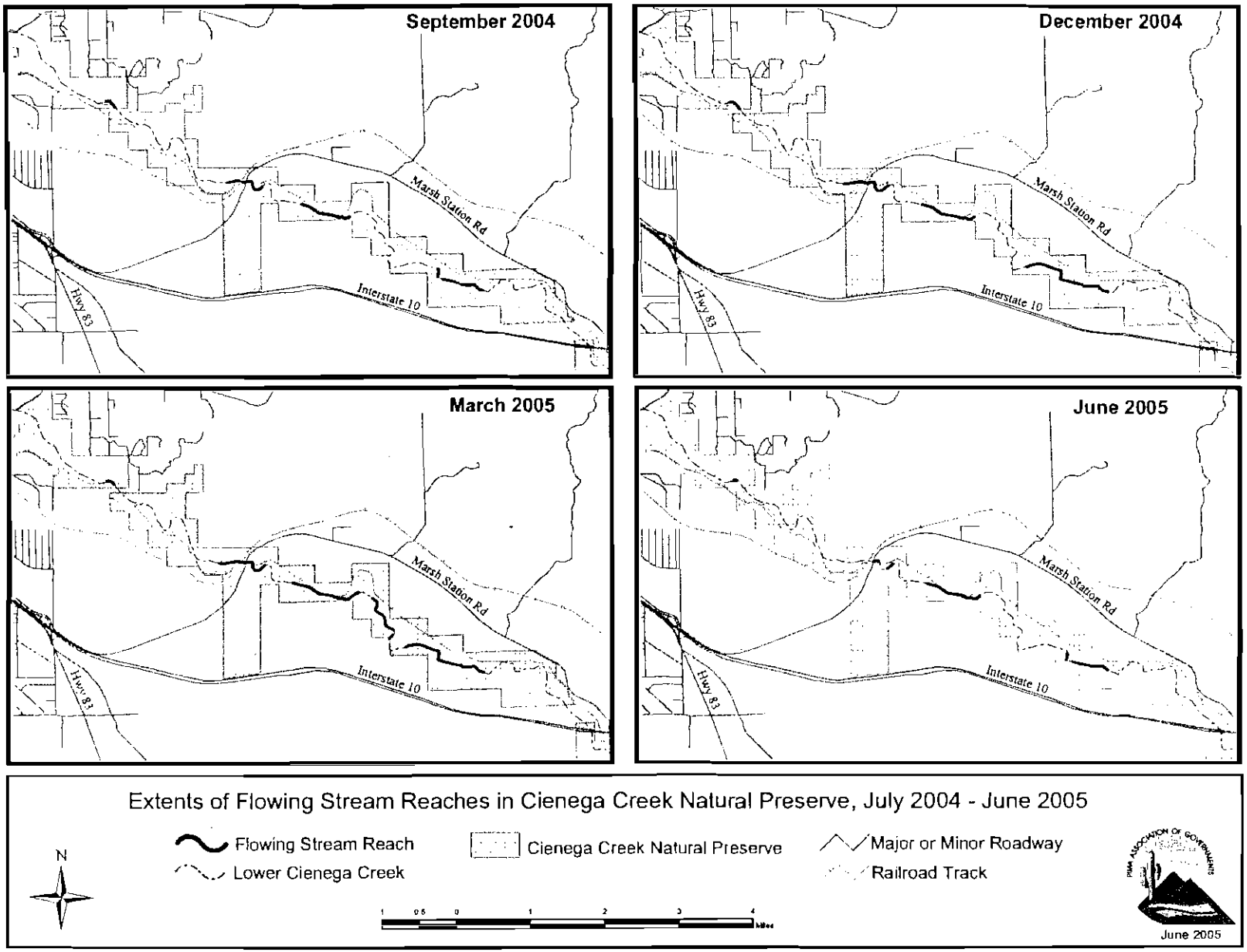


Figure 6. Extents of Flowing Stream Reaches in Cienega Creek Natural Preserve, July 2004 – June 2005.

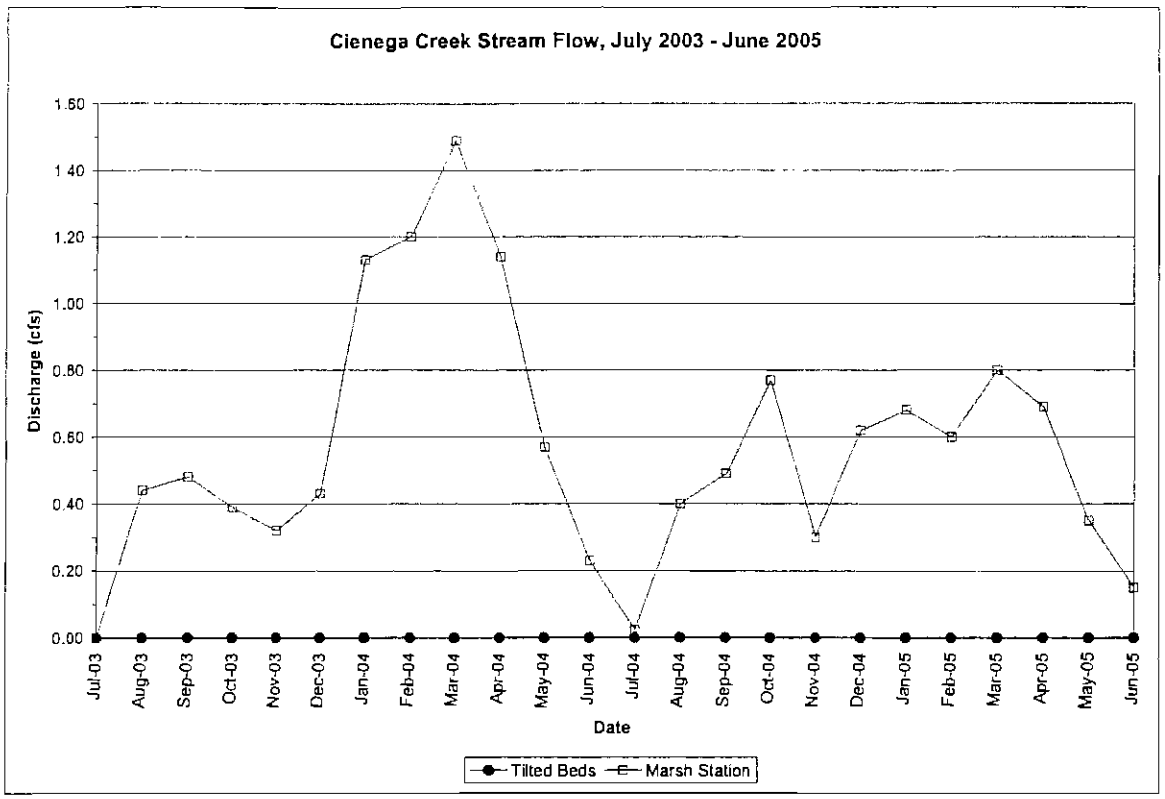


Figure 2. Cienega Creek Streamflow, July 2003 – June 2005.

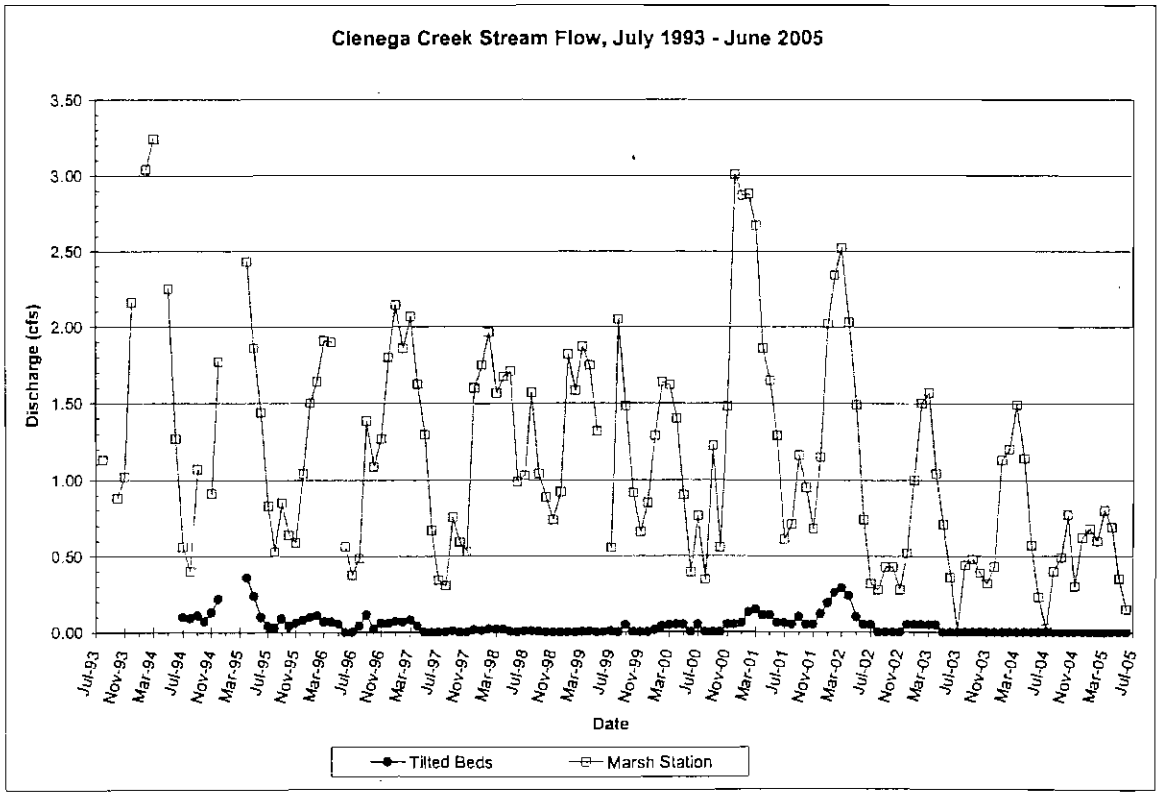


Figure 3. Cienega Creek Streamflow, July 1993 – June 2005.

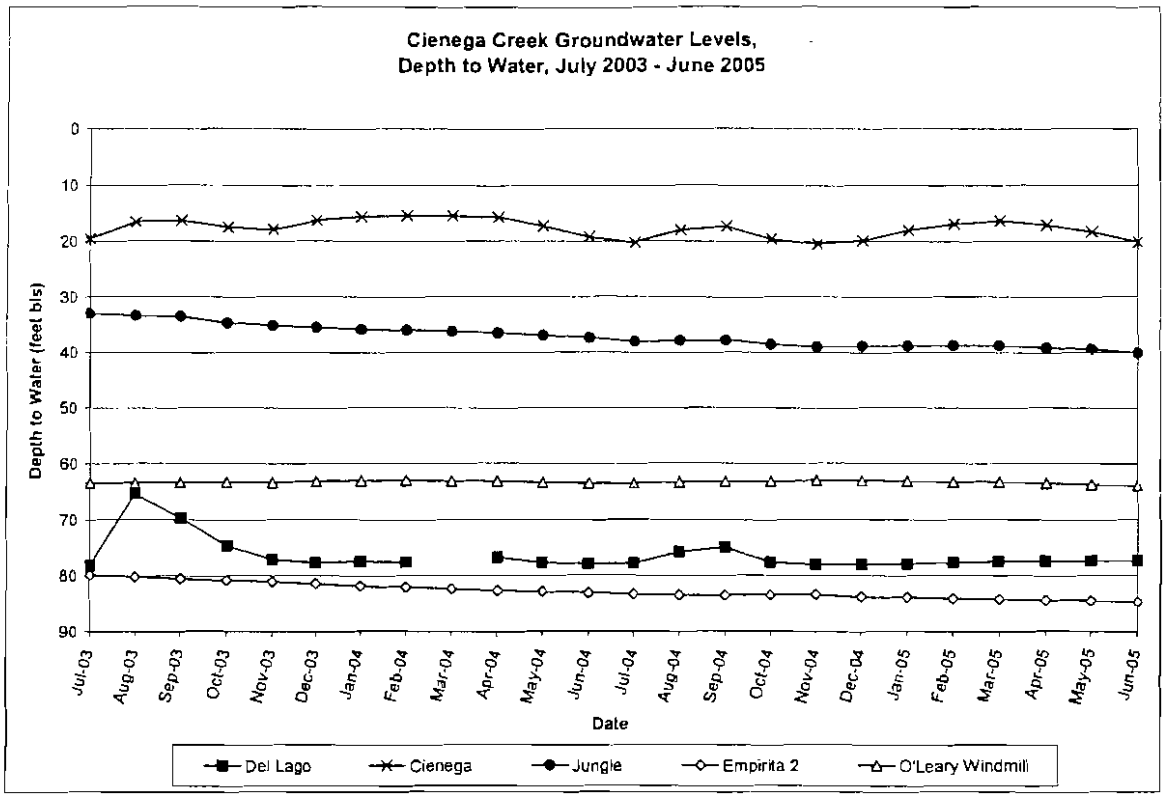


Figure 4. Depths to Groundwater in Cienega Creek Natural Preserve, July 2003 – June 2005.

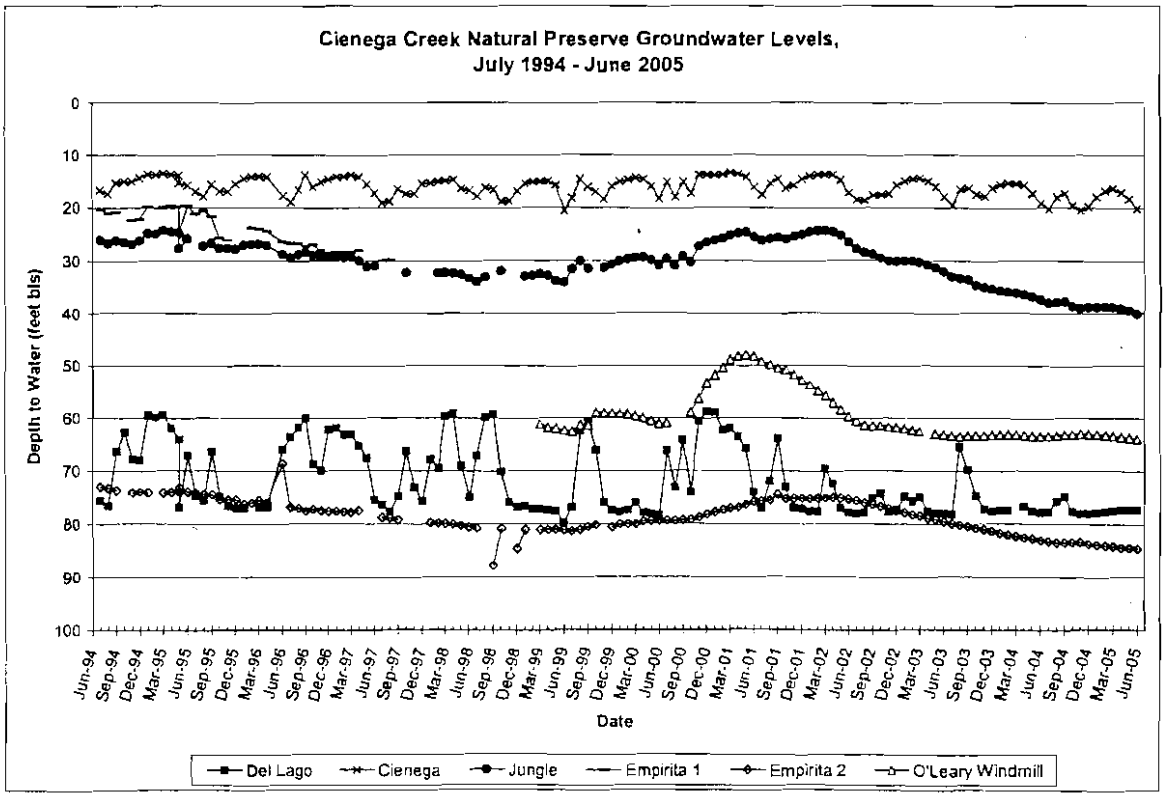


Figure 5. Depths to Groundwater in Cienega Creek Natural Preserve, July 1994 – June 2005.

VII

Proposed Guidelines for Use of Effluent and Reclaimed Water
Adopted by the Science Technical Advisory Team (STAT), June 23, 2000

The guidelines below are intended to assist evaluation of the biological benefits of the use of effluent and reclaimed water for the Sonoran Desert Conservation Plan. The STAT recognizes that on a site basis, decision-makers will need to weigh biological benefits with constraints such as presence of landfills and lack of infrastructure, as well as a diverse range of other economic and land use issues.

Overall, the STAT prioritizes protecting existing self-sustaining riparian and aquatic ecosystems over the creation of new or enhanced areas of riparian and aquatic life which depend on continuing inputs of water, energy and materials. This principle is embodied in the guidelines below:

1. **Protect systems that are self-sustaining over those that need continual inputs.** Based on this belief, the STAT prioritizes substitution of renewable water supplies for groundwater and surface water diversions in areas where high-quality aquatic and riparian ecosystems still exist and where diversion of water is a primary stressor of those systems. For example, previous work has identified the Tanque Verde Valley as an example of an important riparian resource that has been degraded by groundwater pumping. Substitution of reclaimed water for land uses which are diverting water from the aquatic and riparian ecosystems will help relieve this source of biologic stress.

2. **Restore or enhance native riparian and aquatic ecosystems by releasing water to restore local aquifer conditions.** Where ground water pumping is limited and favorable hydrogeologic conditions exist, reclaimed water and secondary effluent can be released to in an area in a manner that restores local aquifer conditions. The STAT believes that where hydrogeologic conditions are suitable, restoring localized shallow groundwater systems and floodplain dynamics will have a greater likelihood of success in creating a sustainable system than construction of artificial wetlands and container plantings or seedings of riparian vegetation.

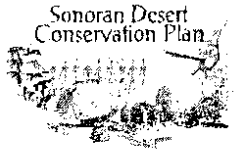
3. **If plantings are to be used: a) revegetation is favored in areas where perpetual irrigation will not be needed;** Ideally, these projects will be designed to avoid disturbance of existing vegetation and minimize the need for perpetual irrigation and maintenance. Placement in areas where hydrologic conditions are suitable can provide the necessary water. **b) conflicts with other social objectives should be minimized;** Revegetation sites should be chosen to minimize future conflicts with aesthetic, recreation, or public safety considerations. These other social demands can reduce the value of the plantings for self-perpetuation and for wildlife use. For instance, pruning and eradication of the understory reduces the utility of areas for most forms of wildlife. **c) native species appropriate to the site must be used;** Using native species that are adapted to the specific soil, aspect and elevation of the site will assist in establishment and **d) sites which augment existing high-quality riparian habitats are favored.**

4. **Enhance the ability of secondary effluent or reclaimed water to support aquatic life.** In some cases, improvement of water quality may be necessary to support aquatic species such as fish or other aquatic organisms in the food chain.

5. **Manage riparian and aquatic ecosystems for native species.** In many cases, sites using reclaimed water or secondary effluent will require active management against non-native species and public education about why control efforts are needed. This is particularly true where open water bodies exist. Where open water bodies are proposed, the potential consequences on native species should be considered.

VII

Effluent, Riparian Areas, and the Sonoran Desert Conservation Plan



By Julia Fonseca,
Pima County Regional Flood Control District
Tucson, Arizona

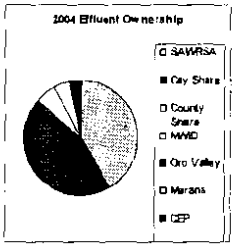
Allocating water for riparian

Santa Cruz River downstream of Roger Road

Biological Goal

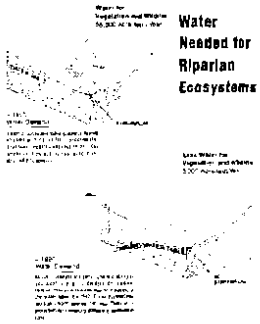
Protect the full spectrum of plants and animals native to Pima County by maintaining ecosystem structure and function.

Effluent Ownership



- Total production is 70,000 af/yr
  (Ringer/Ina/Randolph)
- CEP is 0 af now
- County 4000 af

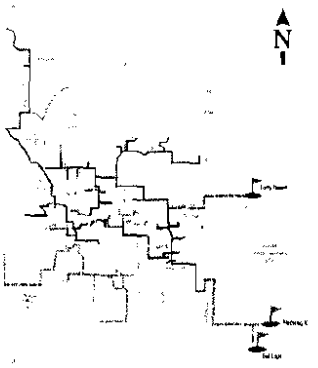
Ecological Dilemma



- Ecosystem impaired by depleted water table
- Groundwater for riparian functions is not protected
- Running out of time

STAT's effluent guidelines

1: To relieve groundwater pumping stress in otherwise self-sustaining riparian areas, the STAT prioritizes substitution of renewable water supplies for groundwater and surface water diversions



Projects to relieve stress on riparian areas

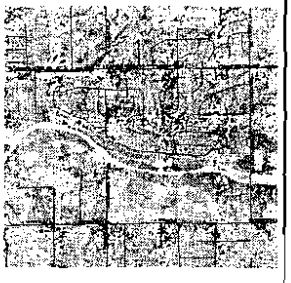
STAT's effluent guidelines

2: Restore or enhance native riparian and aquatic ecosystems by releasing water to restore local aquifer conditions.

Water quality concerns (N) pretty much limited aquifer recharge to existing locations, mainly Santa Cruz River.

Relieve stress on aquifer

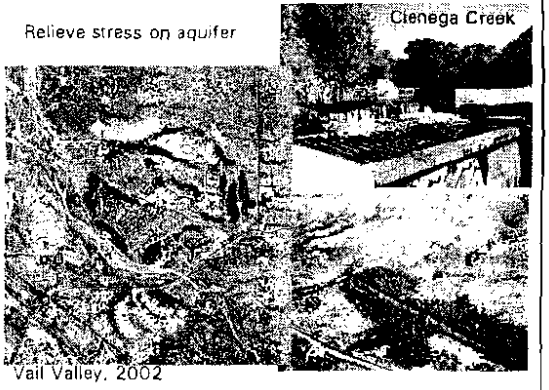
Forty-niner's Country Club



Santa Cruz River

- One of the richest bird areas
- Over 20 miles long
- 2nd largest cottonwood-willow forest
- Abert's towhee, Bell's vireo, Cuckoo
- GW pumping limits rise of aquifer

Relieve stress on aquifer



Vail Valley, 2002

STAT's effluent guidelines

3: If plantings are to be used:

a) revegetation is favored in areas where perpetual irrigation will not be needed;

b) conflicts with other social objectives should be minimized;

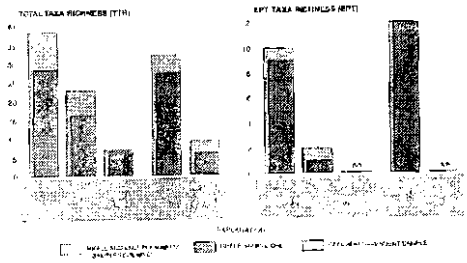
c) native species appropriate to the site must be used

Kino Ecosystem

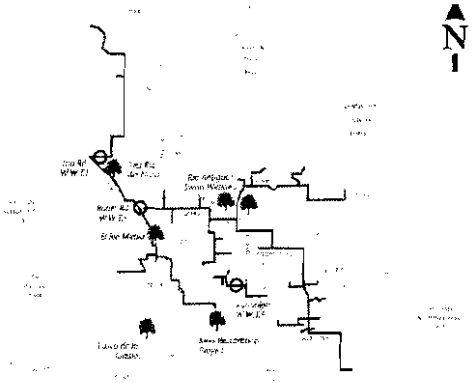
Ajo Detention Basin, August 2001

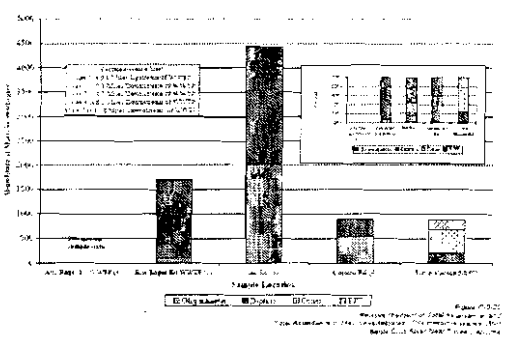
Same view, October 2005

USGS Research



Gebler, 1998





Source: Arid West Water Quality Research Project Habitat Characterization Study

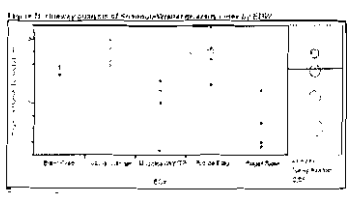
STAT's effluent guidelines

4. Enhance the ability of secondary effluent or reclaimed water to support aquatic life. In some cases, improvement of water quality may be necessary to support aquatic species such as fish or other aquatic organisms in the food chain.

Univ. of Arizona Research

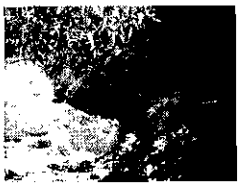
Diversity of macroinvertebrates was the lowest of five EDWs studied in Arizona

Only Roger Road discharge Was studied.



(Walker et al., 2004)

Univ. of Arizona (Walker et al., 2004)



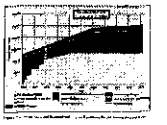
Aquatic life limited by
High ammonia
Low dissolved oxygen
High total org. carbon

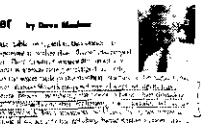
Rejected the notion that substrate is the limiting factor

Santa Cruz River Prospects

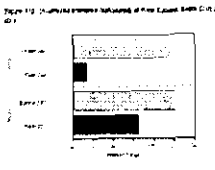
Nutrient removal is not everything…

- Daily flow variation
- Chronic stressors
- Outfall locations
- Reuse options

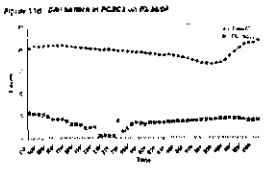


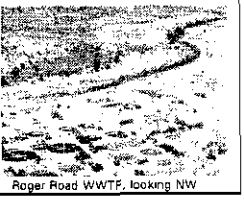


Nutrient Removal



Improved waste treatment will address high ammonia, carbon and oxygen, starting 2006 at Ina.





Roger Road WWTF, looking NW

Consequences of Improved Quality

To the river:

- Increased fish abundance; diversity?
- More aquatic invertebrate diversity
- More piscivorous, insectivorous birds

To the reclaimed system:

- Already supports aquatic diversity
- Less eutrophic ponds
- Greater potential for discharge to streams, restoring aquifers