Pima County MSCP Monitoring Plan Development

STAT Committee Meeting of June 8, 2006
Agenda Item IV

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Phase I Development

Phase I is the first step in developing a broad-based monitoring program to assess progress in meeting the ecological goals and legal requirements of the Pima County MSCP. In the next six months we will complete the following tasks:

1. **Develop program goals and objectives**, which will be developed iteratively—starting broad and becoming increasingly refined. The monitoring subcommittee will meet on June 23 to begin this process. Parameter-specific goals and measurable objectives will be established in later phases.
2. **Assess existing monitoring** activities within Pima County.
3. **Build conceptual models** to help identify potential parameters and stressors.
4. **Establish criteria for evaluating potential parameters.** A more refined parameter assessment process will be a major component of Phase II.
5. **Review spatial sampling designs**.

Funding Opportunities

Progress made in the Phase I development process will feed into a Cooperative Endangered Species Conservation Fund (Section 6) grant application. We will also and explore other funding sources.

Timeline for STAT and Monitoring Subcommittee Involvement

- **June-September**: Establish goals and objectives.
- **September**: Advise on conceptual models.
- **October**: Establish framework for evaluating parameters (to be incorporated into the Section 6 grant application).
- **November-December**: Review plan and advise on Section 6 grant application.
- **January**: Review Section 6 grant application.

Drought and Shrub Survival at the Desert Laboratory

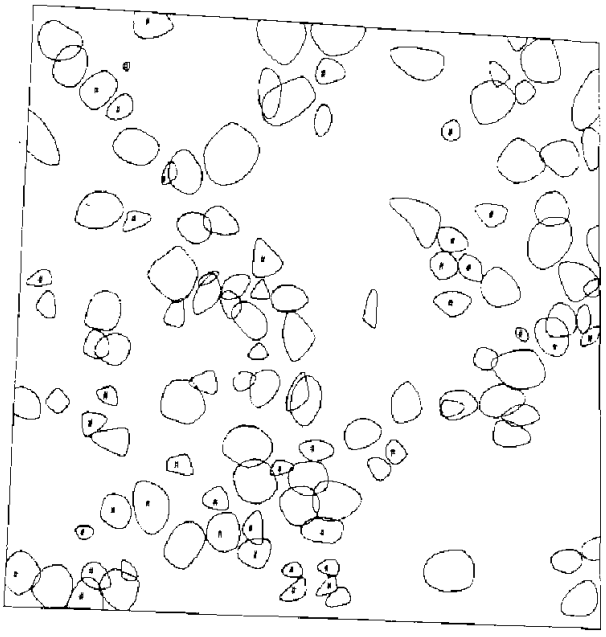
By Janice E. Bowers, USGS

Sonoran Desert shrubs and trees are adapted in various ways to deal with a scanty and irregular water supply: small, drought-deciduous leaves; stems and trunks that store water; branches that self-prune during drought; and so forth. By these and other means, woody plants in our region manage to get through two seasonal droughts every year (late spring and early autumn) and through occasional failure of the winter or summer rainy season. But what happens during major drought? Do adaptations that ensure short-term survival keep woody plants alive during several years of below-average rainfall?

I studied the effects of drought on shrub survival at the Desert Laboratory on Tumamoc Hill in the spring of 2004. Although rain in 2003 was close to the long-term annual average, the two previous years had been unusually dry, and whenever I walked across the Desert Laboratory grounds, I was struck by how many supposedly long-lived plants had succumbed to drought. Before 2003, for example, I had seldom seen a dead creosote bush in more than 20 years of research in the Sonoran Desert. Now I knew of two or three within 100 meters of my office. But I also knew that 20 years is nothing to a plant that can live for centuries. I needed a longer perspective.

I got that by analyzing maps of 16 vegetation plots that were established on or near Tumamoc Hill in 1906 or 1928. Each plot is 10 meters by 10 meters. Perennial plants on these plots were mapped in 1906, 1928/1929, 1936, 1948, 1957/1959/1960, 1968/1969, 1978, 1984/1985, and 2001. Not all plots were mapped at every census, and some censuses extended over two or more years. Early on, researchers used measuring tapes and graph paper to map plant locations; more recently, surveyors used a plane table and alidade or a total station. Except in 1906, when individual plants were shown as single dots, researchers mapped plant canopies as outlines. This level of detail makes it possible to track individuals from one map to the next. For the most part, only living individuals have been mapped, so when a plant present in one census is missing at the next census, we can safely conclude that it died.

I selected six shrubs for analysis: triangle-leaf bursage (*Ambrosia deltoidea*), creosote bush (*Larrea tridentata*), white ratany (*Krameria grayi*), brittlebush (*Encelia farinosa*), janusia (*Janusia gracilis*), and wolfberry (*Lycium berlandieri*). Of these, triangle-leaf bursage, janusia, and brittlebush have relatively short life spans, between 20 and 50 years on average.



Triangle-leaf bursage on plot 7 in 2001, showing plot boundary and outlines of plant canopies. Black dots denote plants that died between 2001 and 2004.

Creosote bush, white ratany, and wolfberry are all long lived, averaging 200 years or more. In the spring of 2004, I visited every plot and, with the most recent map in hand, noted which individuals had died since 2001. Back in the office, I examined the entire series of plot maps to determine first how many plants of each study species had been mapped in every census year, then how many of these individuals had survived until the next census year. Altogether, I gathered data for more than 8,000 individuals. From numbers of persistent and dead plants, I calculated per-capita annual survival probability for every species in each of eight intercensus periods (1928-1936, 1936-1948, etc.). (Per-capita annual survival probability is simply the probability that a single plant in a population will survive from the beginning to the end of a year.) Next, I summarized winter (November through March) and summer (July through September) rain to get percent average accumulation within every intercensus period. For example, if accumulated winter rain averaged across all possible seven-year-long periods was 800 mm, and the seven years from 1928-1935 received 900 mm of winter rain, the percent of average accumulation in that period would have been 113%. Finally, I analyzed per-capita survival probabilities as a function of seasonal rain during each intercensus period.

Averaged over eight intercensus periods, survival probabilities of long-lived species turned out to be quite high (creosote bush, 0.9861; white ratany, 0.9702; wolfberry, 0.9910), whereas those of shorter-lived species were somewhat to considerably lower (triangle-leaf bursage, 0.9167; brittlebush, 0.7952; janusia, 0.9334). Winter rain exceeded 90% of the long-term average accumulation in every period except 1948-1959 (65% of average), and 2001-2003 (49% of average). Summer rain never dropped below 90% in any period. Although shrub survival declined during both drought periods, dips during 1948-1959 were relatively modest, perhaps because nearly normal summers ameliorated the impact of successive dry winters. Effects of the recent drought were much more pronounced, with five of the six species reaching their lowest survival probability in 75 years — 0.6057 for brittlebush, for example, and 0.9445 for creosote bush. Higher mortality during the recent drought probably reflected greater drought severity. Not only was winter rain much lower in 2001-2003 than in 1948-1959, but summer rain was also lower. Plants thus experienced extreme winter drought during 2001-2003 with little chance to recuperate during the summer rainy season.

Long-term studies such as this one require the unselfish participation of many people over many decades. Volney Spalding and Forrest Shreve established the vegetation plots at the Desert Laboratory, and 20 additional researchers and technicians maintained them over the years. Thanks to their ingenuity, foresight, and dedication, the Desert Laboratory provides a unique long-term perspective into ecological systems and processes in the Sonoran Desert.

"A Long Term Vision for Protecting the Heritage and Natural Resources of Pima County"

Sonoran Desert Conservation Plan Update
May 2006

Effective May 15, the Pima County Sheriff's Department created a new unit to patrol County parks, using six sheriff's deputies and a volunteer sheriff's patrol. These individuals are receiving specialized training for their new duties. By July, the three existing park rangers in the Natural Resources, Parks and Recreation Department will be deployed full-time on resource management duties.

The American Fisheries Society Western Division has presented their 2006 award of excellence to the Pima County Board of Supervisors. The Riparian Challenge award is for leadership in riparian area protection and management in the Cienega watershed.

The Governor's Regulatory Review Commission will consider our comments on the proposed well spacing rule development in early June. Pima County urged ADWR to adopt rules that protect users who hold surface water rights. Where surface water rights are impaired by groundwater pumping, effects have included massive die-offs of riparian vegetation, fires, decreased property values, and sinkholes.

Ms. Tedra Fox has been hired to fill a new position supervised by Sherrie Ruther in Development Services.

District staff posted a powerpoint presentation on the SDCP website which describes the SDCP, its relationship to the Multi-species Conservation Plan, and the role of Public Works departments. District staff presented an SDCP update at last month's Resource Management in the Deserts Conference in Tucson.

Staff has presented two different concepts for increasing underground water storage credits using in-channel constructed and managed recharge to stakeholders in the the Lower Santa Cruz Managed Recharge Facility stakeholders. In-channel recharge can maintain ecosystem benefits while also addressing community water needs.

The next STAT meeting will be held on June 8, 9 a.m. at 350 N. Campbell Ave.
Documents from STAT meetings can be found at
http://www.pima.gov/cmo/sdcp/STAT/STAT.html