# Lower Colorado River Multi-Species Conservation Program

*Balancing Resource Use and Conservation*

## Small Mammal Colonization at Habitat Creation Sites Along the Lower Colorado River: 2006

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

December 2007

# Lower Colorado River Multi-Species Conservation Program
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*Prepared by Allen Calvert (Wildlife Group)*

**Lower Colorado River**
**Multi-Species Conservation Program Office**
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**Lower Colorado Region**
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# Abstract

The Bureau of Reclamation is the lead agency for the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). One goal of the LCR MSCP is to create habitat for species covered under the Habitat Conservation Plan. The Colorado River cotton rat (*Sigmodon arizonae plenus*) and the Yuma hispid cotton rat (*Sigmodon hispidus eremicus*) are listed as covered species. Monitoring small mammals at current and future habitat creation sites will allow Reclamation to determine whether cotton rats are colonizing these sites. Two sites were surveyed in 2005. In 2006, trapping was increased to include five new sites. In 2005, cotton rats were found at both the Pratt site and the Cibola Nature Trail site. The Cibola site was not trapped in 2006. The only cotton rat captured in 2006 was found at the Beal Lake site inside Havasu National Wildlife Refuge. Eight total species were captured in 2006. Most captures were in areas that had a dense understory. Monitoring took place at two sites prior to the creation of habitat. Both sites were agricultural fields before planting occurred. This pre-monitoring trapping appeared to show that agricultural fields are low quality habitat for small mammals. Trapping in agricultural fields prior to conversion into habitat will continue in 2007 to acquire enough trap nights to understand the habitat suitability of agricultural fields. Trapping in areas adjacent to habitat creation sites may begin in the future to determine whether source populations of cotton rats exist in the vicinity.

# Introduction

The Bureau of Reclamation (Reclamation) is the lead implementing agency for the Lower Colorado River Multi-Species Conservation Program (LCR MSCP). The LCR MSCP is a 50-year cooperative Federal-State-Tribal-County-Private effort to manage the natural resources of the LCR watershed, provide regulatory relief for the use of water resources of the river, and create native habitat types along the LCR. Implementation of the LCR MSCP began in October 2005. To restore native habitats, the LCR MSCP will create the following cover types: 1) 5,940 acres (2,404 ha) of cottonwood-willow, 2) 1,320 acres (534 ha) of honey mesquite, 3) 512 acres (207 ha) of marsh, and 4) 360 acres (146 ha) of backwaters (Reclamation 2004).

One of the goals of these efforts is to provide habitat for plant and animal species covered under the Habitat Conservation Plan (HCP), including the Yuma hispid cotton rat (*Sigmodon hispidus eremicus*) and the Colorado River cotton rat (*Sigmodon arizonae plenus*). Of the habitat to be created, 125 acres (50.6 ha) have been designated for *S. a. plenus*, and 76 acres (30.8 ha) have been designated for *S. h. eremicus*. While habitat acreage for other covered species may overlap with these numbers, these amounts will be created with specific habitat characteristics for the two cotton rat species. Past research has shown that these two species may be versatile in their habitat preference (Hall 1946, Bradley 1966, Zimmerman 1970). Future research will be conducted to better define habitat characteristics of these two species, which will help determine what types of habitat to create.

Reclamation is increasing its understanding of restoration science through an adaptive management approach; therefore, monitoring of current habitat creation/restoration sites is crucial. Preliminary trapping in 2005 at the Cibola National Wildlife Refuge (NWR) Nature Trail site and the Pratt Restoration Demonstration site found that cotton rats had colonized each site (Reclamation 2006). In 2006, trapping at the Pratt site continued, and four habitat creation sites and one reference site were added to the total small mammal trapping effort along the LCR. The Cibola NWR Nature Trail site was not trapped in 2006. This report is a synopsis of all small mammal trapping done by Reclamation for the year 2006.

## Study Areas

### Pratt Restoration Demonstration Site

The Pratt Restoration Site (PRAT) is located north of Interstate 8, near Yuma, Arizona, on land administered by the Bureau of Land Management (BLM). The site is north of Laguna Dam, south of Mittry Lake, and is surrounded by farm fields and *Tamarix* spp. (saltcedar). In the fall of 2003, *Tamarix* was removed by the BLM and by 2007 the area was restored to native vegetation. A leaseholder has farmed the 12-acre (4.9 ha) site since 1949. In 1999, Reclamation established six planting regimes with Fremont cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), and coyote willow (*Salix exigua*) using potted plants, seeds, and poles. Reclamation planted potted plants and poles from 3.3 ft (1 m) to 10 ft (3 m) apart. Seeded areas contained cottonwood and willow seeds collected locally and broadcast by hand over wet soils. One cottonwood plot contains a thick 13 ft (4 m) to 16.4 ft (5 m) high understory of *Baccharis* spp., which was independently established after the initial plantings. *Tamarix* was also established in

small numbers in the seeded areas, and new individuals of coyote willow were established in the potted coyote willow area (Raulston 2003). Most of the cottonwood trees ranged in height from 26 ft (8 m) to 46 ft (14 m), Goodding's willow ranged from 20 ft (6m) to 33 ft (10 m), and coyote willow ranged from 10 ft (3 m) to 20 ft (6 m).

### Imperial Nursery

The nursery site is located on the Imperial NWR, east of the Colorado River, near River Mile 59, just north of Martinez Lake. The project area is within a portion of the refuge known as the Intensive Management Area, which consists of fields and marshes that are managed for waterfowl, marsh birds, native fish, riparian obligate bird species, and other wildlife. The entire Intensive Management Area is restricted from public access. The nursery is currently about 3 acres (1.2 ha) in size. An additional 34 acres (14 ha) will be planted adjacent to the nursery as part of the Imperial Ponds Conservation Area (Lenon 2007). The nursery was planted in 1993 and contains rows of mature cottonwood and Goodding's willow, a section of coyote willow, and a few mesquites (*Prosopis* spp.) on the edge.

### Beal Lake Riparian and Marsh Project

The Beal Lake site is adjacent to Beal Lake and Topock Marsh, inside Havasu NWR within the Arizona side of the Colorado River floodplain. It is a two-phase habitat creation project that was initiated in the spring of 2003. The 100-acre (40.5 ha) site is a joint effort between Reclamation and the Havasu NWR with the purpose of evaluating riparian restoration techniques for the improvement of habitat for terrestrial LCR MSCP covered species (Raulston 2003). When complete, the site will contain Fremont cottonwood, Goodding's willow, coyote willow, and honey and screwbean mesquite habitat (Raulston 2003). Currently, the site contains areas of all tree species listed above. Arrowweed (*Pluchea sericea*) has begun to fill in the open areas and edges of most of the plots in the site.

### Cibola Valley Conservation Area

Cibola Valley Conservation Area (CVCA) is located in Arizona adjacent to the Colorado River, about 15 miles (24 km) south of Blythe, California. It will encompass about 1,019 acres (412 ha) when completed. The CVCA is a multi-phase plan in which the first three phases have been identified. All three phases will include Fremont cottonwood, Goodding's willow, coyote willow, and other riparian plant species. Phase 1 was planted in the spring of 2006 and contains a 22-acre (9 ha) nursery and a 64-acre (26 ha) area of cottonwood-willow habitat. The CVCA is being implemented to create habitat for LCR MSCP covered species.

### Palo Verde Ecological Preserve

Palo Verde Ecological Preserve (PVER) is located about 5 miles (8 km) north of Blythe, California, along the California side of the Colorado River. It will encompass up to 1,300 acres (526 ha) when completed. The acreages will be separated into 9 different phases, with one phase being planted every year. In the spring of 2006, a 31-acre (12.5 ha) nursery (phase 1) was planted. Phase 2 was farmed for alfalfa prior to conversion to native riparian habitat. In the spring of 2007, Phase 2 was planted with 80 acres (32.4 ha) of cottonwood, willow, and other riparian plants. The PVER is being implemented to create habitat for LCR MSCP covered species.

### Havasu Banding Site

The Havasu banding site (HAVA) is located in Havasu NWR at the southern end of Topock Marsh approximately 1 mile (1.6 km) north of the town of Topock, Arizona. A large portion of the area is covered in *Tamarix* and arrowweed, with a few large (greater than 46 ft (14 m) in height), mature cottonwoods forming an overstory over roughly 15% of the site. The cottonwoods are the remaining trees from a planting in 1988 where most of the trees planted did not survive. The south side of the dike consists of a monotypic stand of *Tamarix* ranging in height from 20 ft (6 m) to 26 ft (8 m), while the north side consists of *Tamarix*, with some areas having an overstory of cottonwood trees. The northern edge of the site is bordered by marsh vegetation. The HAVA is used as a bird-banding station by Reclamation. This site is more typical of the vegetation now found along the LCR.

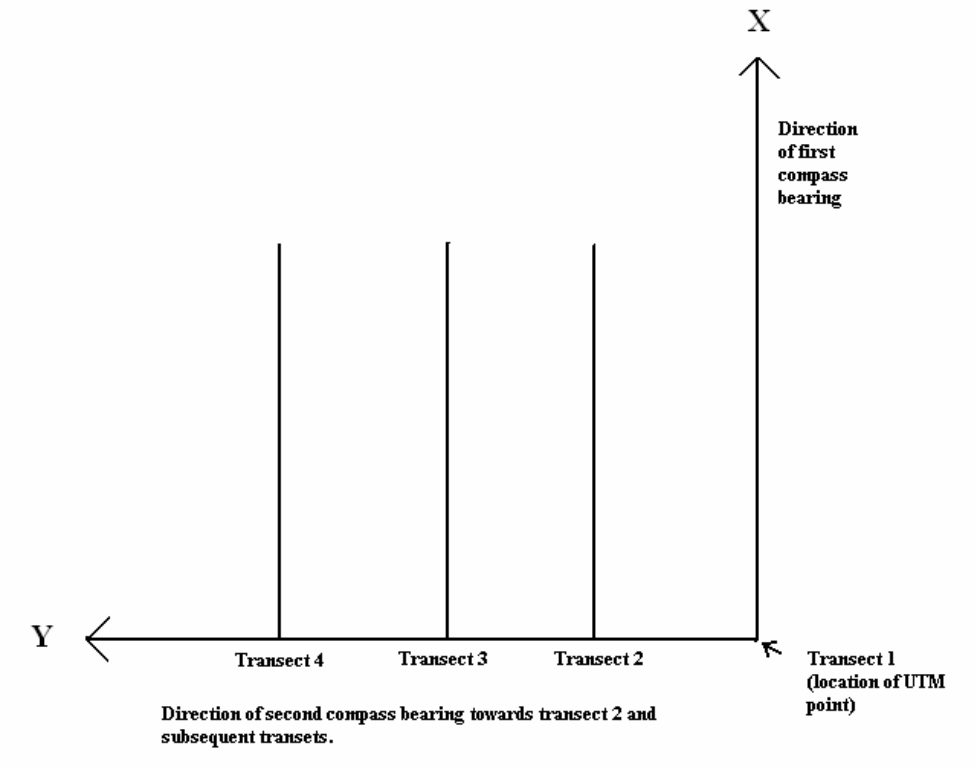
# Methods

An ocular examination was made of the habitat types at each site and traps were first placed in areas with the highest density of vegetation at ground level. High vegetation density at ground level has been shown to be positively correlated with higher capture numbers of *Sigmodon* along the LCR (Andersen and Douglas 1999). Once the densest habitats had been sampled, other less densely vegetated habitats were sampled.

Traps were baited with a mixture of oats, peanut butter, and vanilla. A small handful of cotton was also added to each trap to provide insulating cover for any animal trapped overnight. Sherman live traps were used, which are triggered by the animal stepping on a pressure plate that then closes a trap door behind the animal.

Traps were set in transects of 15 traps per transect whenever possible. Transects were then set in a grid to cover as great an area as possible. Traps in each transect were 33 ft (10 m) apart, and each transect was 50 ft (15 m) apart. A UTM reading (NAD 83) was taken at the location of the first trap of the first transect in the grid. At this point, a compass bearing (X) was taken in the direction of the first transect. A second bearing (Y) was also taken from this point perpendicular to the X bearing. In the Y direction, each subsequent transect in the grid was started at this bearing (see Figure 1). This enabled replication of the grid and determination of an approximate location for any noteworthy captures. Each transect was labeled by a letter, and each trap was numbered. For example, the first trap of the first transect of a grid was labeled A-1 on the data sheet.

**Figure 1. Diagram of a transect grid.**




Traps were set in the afternoon and collected the following morning after sunrise. Captured animals were transferred into a clear plastic bag and identified to species. Animals were identified using a key to local small mammal species provided by UNLV, a key included in the Mammals of California field guide (Jameson and Peeters 2004), and the Kays and Wilson field guide (2002). Measurements were taken if needed for identification. A standardized data sheet was used to list all animals captured, where in the grid they were captured, the location of the grid, and what ground cover was found in the trapping area. All animals were released back into the trapping area once identification was made. Traps in which an animal was captured were washed in a bleach water solution and then rinsed in plain water and set out to dry after each trapping day.

# Results

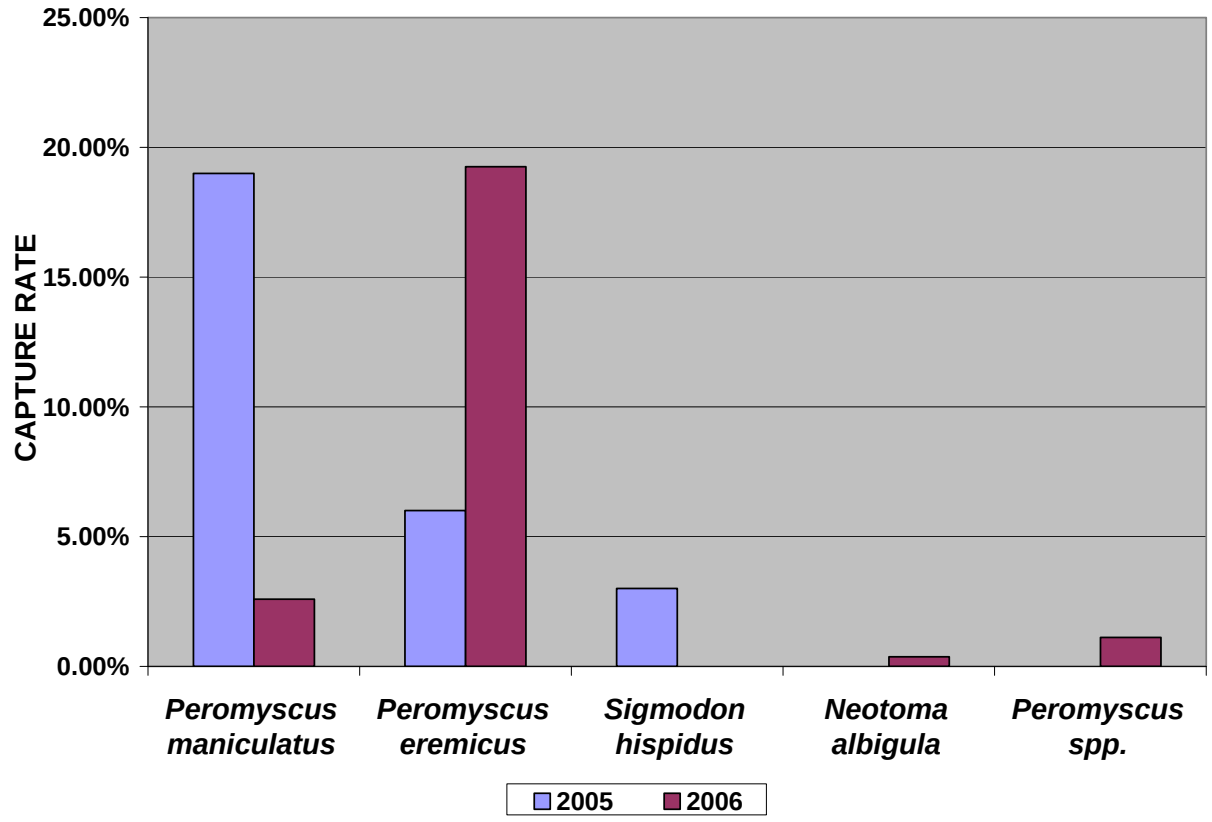
### Pratt Restoration Demonstration Site

The PRAT site was trapped in 2005 and 2006. A total of 180 traps were set in 2005 and a total of 270 traps were set in 2006. A total of 28 rodents were captured in 2005 and 63 were captured in 2006 (Table 1). Three cotton rats (presumably *S. hispidus*) were captured in 2005 and none were captured in 2006. The deermouse had the highest capture rate in 2005, and the cactus mouse (*Peromyscus eremicus*) had the highest capture rate in 2006 (Figure 2). In 2005, all captures were in a dense stand of *Baccharis* spp. In 2006, captures took place in this same *Baccharis* stand as well as a dense stand of coyote willow.

**Table 1. Trapping summary for the PRAT site for 2005–2006.**

| Species | Year | Captures | Capture % | Year | Captures | Capture % |
|---|---|---|---|---|---|---|
| *Peromyscus maniculatus* | 2005 | 19 | 19.00% | 2006 | 7 | 2.59% |
| *Peromyscus eremicus* | 2005 | 6 | 6.00% | 2006 | 52 | 19.26% |
| *Sigmodon hispidus* | 2005 | 3 | 3.00% | 2006 | 0 | 0.00% |
| *Neotoma albigula* | 2005 | 0 | 0.00% | 2006 | 1 | 0.37% |
| *Peromyscus* spp. | 2005 | 0 | 0.00% | 2006 | 3 | 1.11% |

**Figure 2. A comparison of capture rates at PRAT by species for 2005 and 2006.**




## Imperial Nursery

A total of 75 traps were set at Imperial in 2006. Three different species were captured at the site (Table 2). Four transects were set inside the nursery area, and one was set on the other side of the road from the nursery along the edge of a dense stand of common reed (*Phragmites australis*). Two of the cactus mice were captured in the common reed transect. The other three captures were in the nursery. The western harvest mouse (*Reithrodontomys megalotis*) was unique to this site.

**Table 2. Summary of captures at Imperial for 2006.**

| Species | # of captures | Capture rate |
|---|---|---|
| ***Peromyscus eremicus*** | **4** | **5.33%** |
| ***Reithrodontomys megalotis*** | **1** | **1.33%** |
| **Total** | **5** | **6.67%** |

## Beal Lake Riparian and Marsh Project

Beal Lake was trapped in the spring and fall of 2006 (Table 3). A total of 1,100 traps were set in the spring and 315 were set in the fall for a total of 1,415 total traps in 2006. Of these traps, 500 were for pre-monitoring of a field that was planned for conversion into marsh habitat. The field was mostly barren with some patches of *Tamarix* spp. and quailbush (*Atriplex lentiformis*). A total of 611 traps were placed in arrowweed or mesquite. A total of 304 traps were placed in cottonwood-willow fields. The pre-marsh field had the lowest capture rate out of the three habitat types. The other two habitat types had similar capture rates. A summary of captures per habitat type can found in Table 4, and a summary of capture rates per species in each habitat can be found in Figure 3. One *Sigmodon* spp. (probable *arizonae*) was captured in dense arrowweed. Because Beal is within the Colorado River floodplain, the *Chaetodipus* spp. that were captured were probably desert pocket mice (*C. penicillatus*), although they cannot be distinguished from Bailey's pocket mouse (*C. baileyi*) in the field (Riddle 2007 pers. comm.[1]). The unknown species escaped before identification was made, but was probably a pocket mouse (*Chaetodipus* spp.).

**Table 3. Summary of captures at Beal for 2006.**

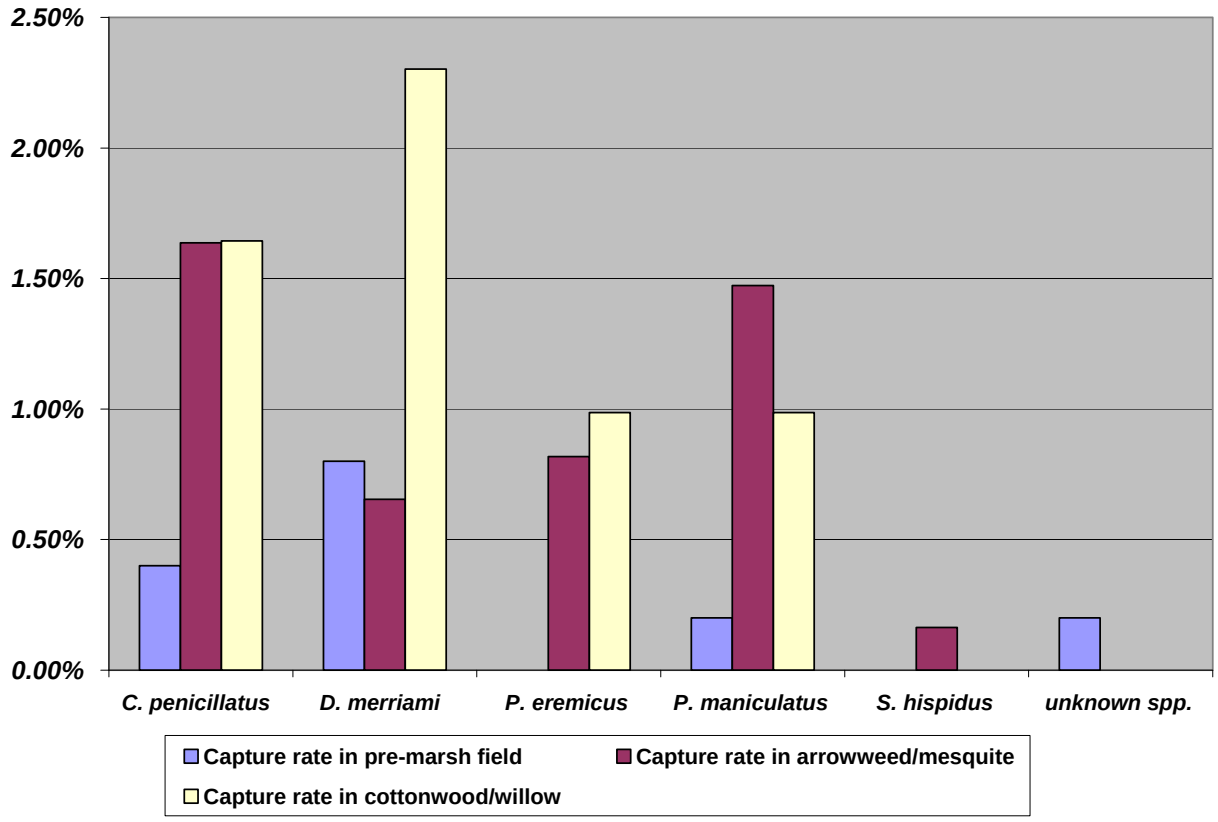
| Species | Spring | Fall | Total | Capture rate |
|---|---|---|---|---|
| ***Chaetodipus penicillatus*** | 10 | 7 | 17 | 1.20% |
| ***Dipodomys merriami*** | 14 | 1 | 15 | 1.06% |
| ***Peromyscus eremicus*** | 6 | 2 | 8 | 0.57% |
| ***Peromyscus maniculatus*** | 9 | 4 | 13 | 0.92% |
| ***Sigmodon arizonae*** | 0 | 1 | 1 | 0.07% |
| **unknown species** | 1 | 0 | 1 | 0.07% |
| **Total** | 40 | 15 | 55 | 3.89% |

**Table 4. Summary of captures per habitat type at Beal.**

| Species | Total captures in pre-marsh field | Total captures in arrowweed/mesquite | Total captures in cottonwood/willow | total |
|---|---|---|---|---|
| ***C. penicillatus*** | 2 | 10 | 5 | 17 |
| ***D. merriami*** | 4 | 4 | 7 | 15 |
| ***P. eremicus*** | 0 | 5 | 3 | 8 |
| ***P. maniculatus*** | 1 | 9 | 3 | 13 |
| ***S. hispidus*** | 0 | 1 | 0 | 1 |
| **unknown spp.** | 1 | 0 | 0 | 1 |
| **total** | 8 | 29 | 18 | 55 |
| **# of traps** | 500 | 611 | 304 | 1415 |

[1] B. Riddle can be contacted at brett.riddle@unlv.edu

**Figure 3. Capture rate per habitat type at Beal.**




## Cibola Valley Conservation Area

In the spring, prior to planting, 484 traps were placed in Phase 1. In the fall, after the first growing season, 255 traps were placed in Phase 1, and 195 traps were placed in the control field. When trapping was conducted in the spring, Phase 1 was a fallowed cotton field consisting of bare ground and the remains of cotton plants. Phase 1 was then planted with cottonwood and willow trees with a cover crop of alfalfa. When trapping took place in the fall, much of the site was overrun by ivyleaf morning-glory (*Ipomoea hederacea*), with the surviving cottonwood and willow trees reaching close to 2 m in height in some areas. The control field is currently being farmed for alfalfa. The most captures occurred in Phase 1 prior to planting (Table 5).

**Table 5. Summary of trapping at CVCA**

| Site | Species | # of captures | # of traps | Capture rate % |
|---|---|---|---|---|
| **Phase 1 Pre-planting** | ***Peromyscus maniculatus*** | 5 | 484 | 1.03% |
| **Phase 1 Post** | ***Peromyscus maniculatus*** | 1 | 255 | 0.39% |
| **Control** | ***Peromyscus maniculatus*** | 0 | 195 | 0.00% |
| **Total for all sites** | ***Peromyscus maniculatus*** | 6 | 934 | 0.64% |

## Palo Verde Ecological Preserve

A total of 195 traps were set at PVER for Phase 2. This was the pre-monitoring trapping for the phase. When trapping occurred, the field was being farmed for alfalfa. No captures occurred at PVER.

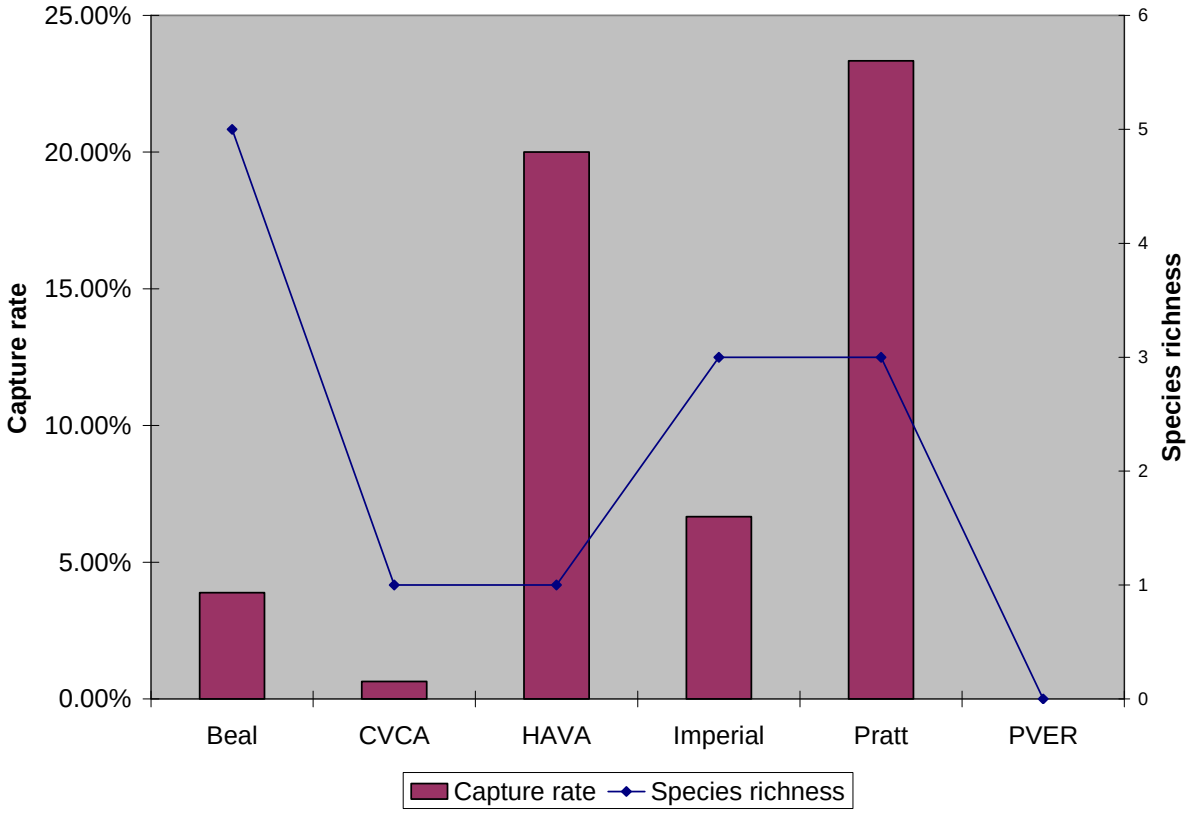
## Havasu Banding Site

A total of 30 traps were set at HAVA. The traps ran along the edge of the habitat near Topock Marsh. Ground cover generally consisted of dense *Tamarix* spp., both live and dead, on two sides of the new south dike. One side consisted primarily of *Tamarix* spp. and the other side included an overstory of a few mature cottonwood trees. Four cactus mice were captured on the side with the cottonwood overstory, and two cactus mice were captured on the side where only *Tamarix* spp. occurred.

## Between-Site Comparison

A comparison of capture rates and species richness between the sites showed that Beal had the highest species richness, and Pratt had the highest capture rate of all the sites (Figure 4). The CVCA and HAVA sites had the lowest species richness, and CVCA had the lowest capture rate of all the sites.

**Figure 4. A summary of capture rates and species richness at all sites in 2006.**



# Discussion

This was the second year of small mammal trapping at habitat creation sites. The first year was a preliminary effort at two small demonstration sites (Reclamation 2006). In 2006, effort was increased as there were five new sites in which at least some trapping took place. Trapping did not occur at Cibola NWR Nature Trail in 2006 but will resume there in the spring of 2007.

Beal had the highest species richness, most likely due to the size of the site, the mosaic of habitat, and the fact that it is surrounded by natural vegetation rather than agricultural fields. The most important finding at Beal was that a cotton rat was captured at the site. Because Beal is located near the most northern area of distribution for the Colorado River cotton rat, and much farther north than where the Yuma hispid cotton rat has been found, it is highly likely that the captured rat was a Colorado River cotton rat. The animal was found in arrowweed, which cotton rats are not as commonly associated with due to arrowweed being a drier, more upland riparian shrub. The location of the capture was, however, just across a dirt road from an unlined ditch with dense vegetation on both banks. This cotton rat probably was captured when it ventured away from the more desirable habitat along the ditch.

Most captures at Beal took place along the edges of the fields, where arrowweed tended to grow densely. Inside the fields, especially the cottonwood-willow fields, there is very little ground cover. The only species that was captured in high numbers in these fields was Merriam's kangaroo rat (*Dipodomys merriami*). This species is known to inhabit sandy, more open areas (Jameson and Peeters 2004). Much of the site contains sandy soils that were originally dredged from Beal Lake.

The other two large-scale sites had very few captures, mostly due to the fact that trees either had not been planted yet, or were only in their first growing season. Phase 2 at PVER contained very short alfalfa when trapping occurred, which provided very little cover for small mammals. Phase 1 at CVCA did have trees and a low, dense understory in the fall, made up mostly of dense invasive morning-glory and some alfalfa. It is unknown why there were few captures at this site. Morning-glory may not be a suitable ground cover for native small mammals.

The Imperial nursery site was not trapped intensively in 2006. The harvest mouse that was captured at Imperial was a species that had not been previously captured as part of Reclamation's small mammal colonization surveys. The effort at Imperial was preliminary to the future habitat creation adjacent to the nursery. In 2007, the Imperial site will be more intensively trapped, especially along the edges of areas where habitat will be created, to determine what species may colonize the site and to determine if there is a nearby cotton rat population.

The Havasu site was trapped to obtain some reference information for an area that was more similar to existing conditions found along the LCR. This site may be more heavily trapped in the future.

In 2005, the Pratt site was found to contain a cotton rat population inside the area where a dense stand of *Baccharis* spp. developed after planting. In both the spring and fall of 2006, trapping occurred in the same location where cotton rats had been found; however, no cotton rats were

captured. One possible reason for the lack of captures is that the *Baccharis* spp., which was over 2 m tall in 2006, may be too mature and have too open of an understory to provide adequate cover for cotton rats. In the future, areas adjacent to Pratt may be trapped to determine whether cotton rats still occur in the area. It is assumed that those cotton rats that originally colonized Pratt were from a nearby source population.

Data collected in 2006 indicate that agricultural fields may not provide suitable habitat for cotton rats along the LCR. Additional data are being collected in 2007 to help determine habitat suitability for agricultural fields. Areas where potential cotton rat habitat exists near habitat creation sites, such as unlined drainage ditches, will be surveyed in the future.

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