

# RECLAMATION

*Managing Water in the West*

## Post-Restoration Bat Monitoring 2007 Acoustic Surveys



U.S. Department of the Interior  
Bureau of Reclamation

# PURPOSE

- Adaptive management process
- Develop management guidelines
- Determine distribution of covered & evaluation bat species

# MONITORING AREAS

**Beal Riparian and Marsh Restoration Area**

**Palo Verde Ecological Reserve**

**Cibola Valley Conservation Area**

**Cibola National Wildlife Refuge Unit #1**

**Pratt Restoration Area**

**Imperial Ponds Conservation Area**

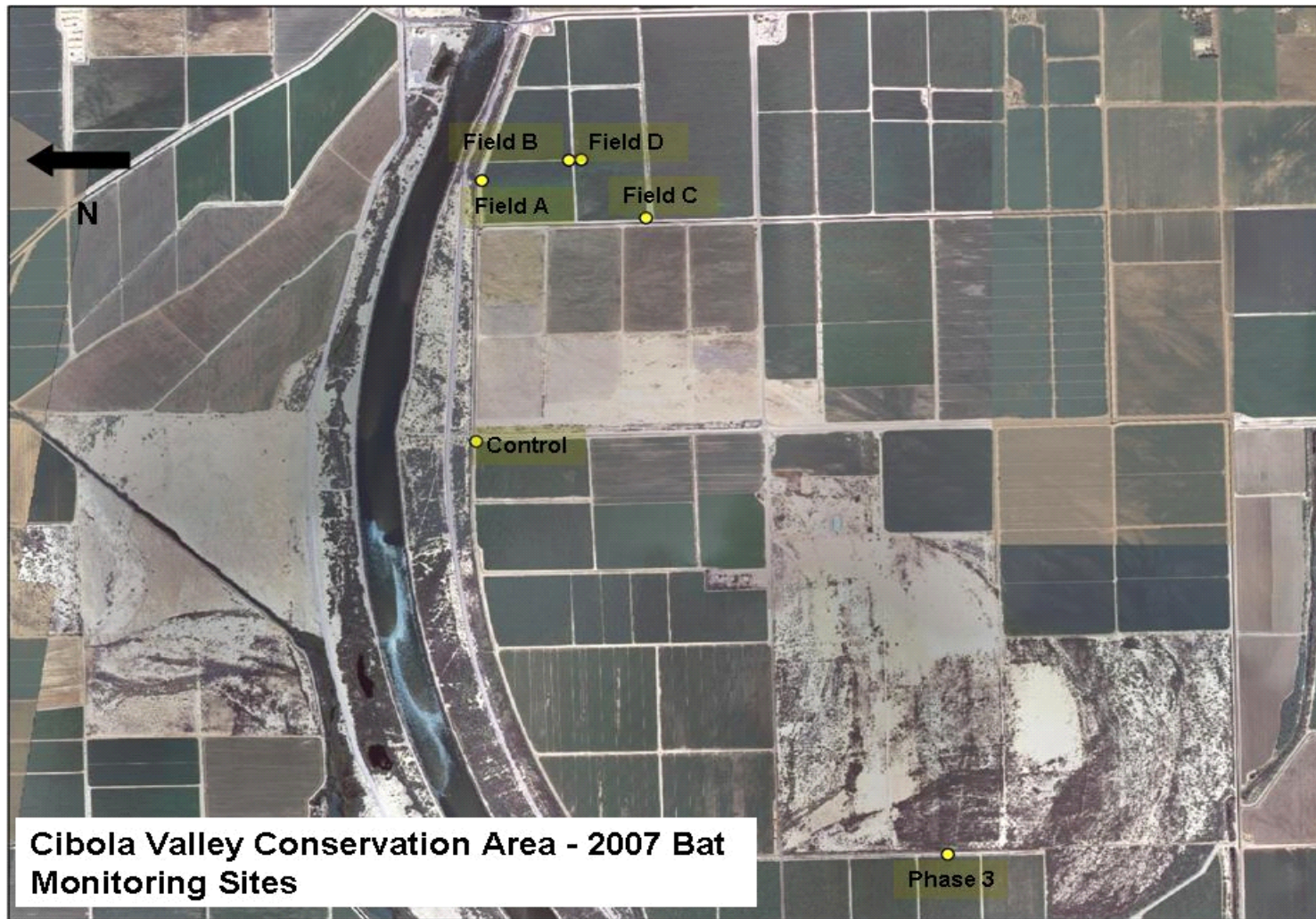


**Beal Lake Habitat Restoration – 2007 Bat Monitoring Sites**



**Beal Lake Habitat Restoration – South Dike Area – 2007 Bat Monitoring Sites**



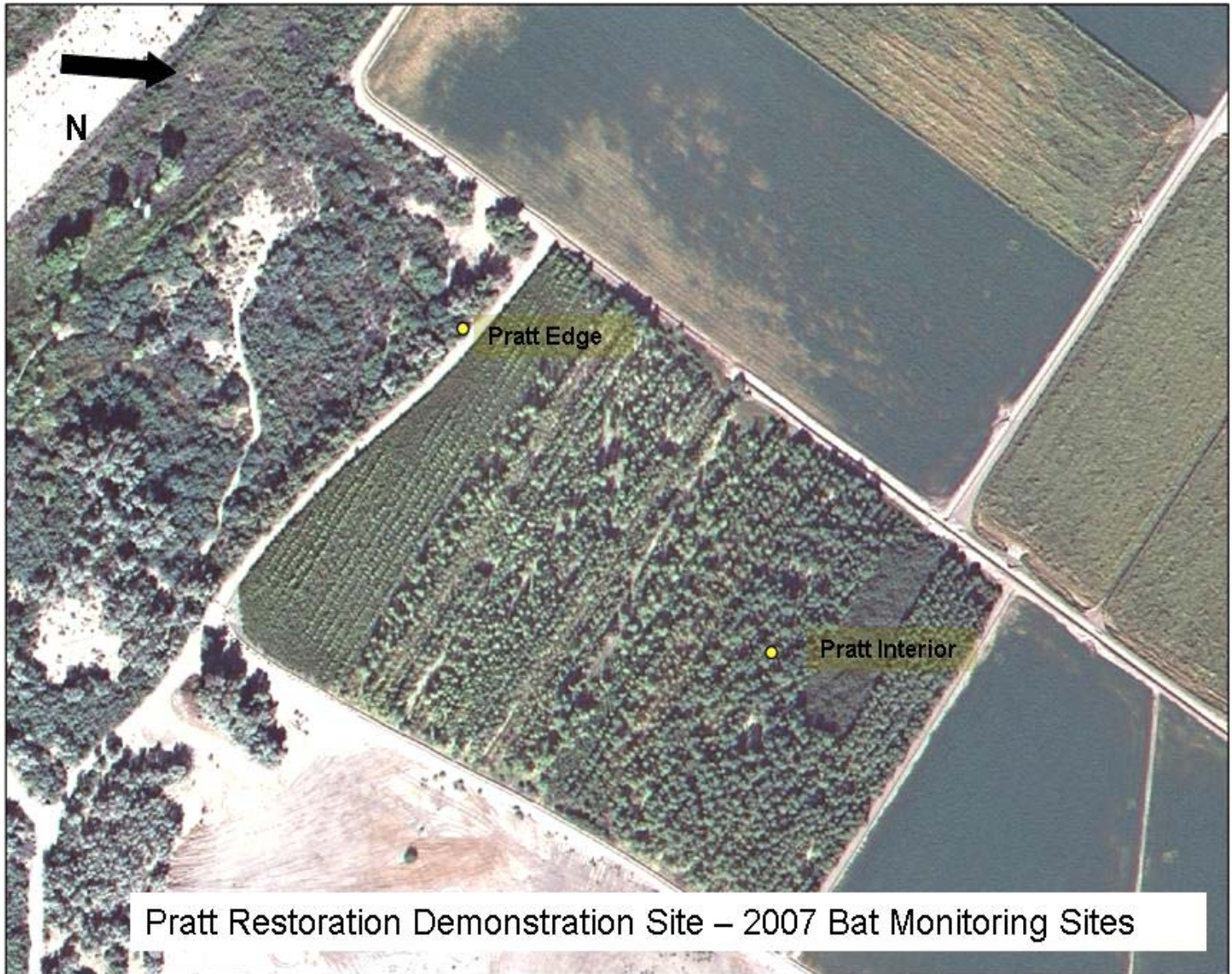


**Cibola Valley Conservation Area - 2007 Bat Monitoring Sites**



**Cibola NWR Conservation Unit #1 – 2007 Bat Monitoring Sites**





Pratt Restoration Demonstration Site – 2007 Bat Monitoring Sites



# METHODS

ACOUSTIC SURVEYS CONDUCTED USING ANABAT BAT DETECTORS

BAT CALLS RECORDED DIRECTLY ONTO COMPACT FLASH CARDS

UP TO 9 UNITS DEPLOYED SIMULTANEOUSLY IN A RESTORATION SITE. SAMPLING SIMULTANEOUSLY INSURES THAT ANY VARIATION IN CONDITIONS THAT AFFECT BAT ACTIVITY IS CONSISTENT AMONG SAMPLING SITES

TREATMENT AREAS SAMPLED ALONG WITH UNTREATED SITES OR PRE-TREATMENT SITES. SOME EXPLORATORY SAMPLING ALSO CONDUCTED.

SAMPLING CONDUCTED QUARTERLY DURING DARK PHASE OF MOON NOVEMBER 2006, JANUARY, APRIL AND JULY 2007.

SAMPLED FOR 2 NIGHTS EACH QUARTER– EITHER CONSECUTIVELY OR WITHIN 4 DAYS OF FIRST SAMPLE NIGHT.

SAMPLING IN NOV 06 ONLY QUARTER IN WHICH ONLY ONE SAMPLE TAKEN

BAT CALLS WERE PROCESSED USING ANALOOK SOFTWARE.

CALLS WERE IDENTIFIED TO SPECIES OR SPECIES GROUPS BY COMPARING MINIMUM FREQUENCY, DURATION AND SHAPE OF EACH CALL SEQUENCE TO A LIBRARY OF REFERENCE CALLS FROM POSITIVELY IDENTIFIED BAT CALLS FROM THROUGHOUT THE WESTERN U.S. AND THE LCR.

A SET OF SPECIES FILTERS WAS ALSO USED TO AID IN SPECIES IDENTIFICATION

A BAT PASS IS DEFINED AS A CALL SEQUENCE OF DURATION GREATER THAN .5 MS AND CONSISTING OF MORE THAN 2 INDIVIDUAL CALLS

# OF BAT CALLS ARE CONVERTED TO BAT MINUTES

THIS IS A RELATIVE ACTIVITY INDEX THAT ELIMINATES THE BIAS OF OVER ESTIMATING BAT RELATIVE ABUNDANCE IF MULTIPLE FILES OF THE SAME INDIVIDUAL WERE RECORDED IN A SHORT PERIOD OF TIME, OR UNDER-ESTIMATING BAT ABUNDANCE BECAUSE OF MULTIPLE INDIVIDUALS RECORDED WITHIN A SINGLE FILE.

A CALL MINUTE INDICATES THAT A GIVEN SPECIES IS PRESENT IF IT IS RECORDED WITHIN THAT MINUTE.

THE HIGHEST RATING A BAT SPECIES CAN HAVE IS 60 IN AN HOUR INDICATING THAT THE SPECIES (BUT NOT NECESSARILY THE SAME INDIVIDUAL) IS RECORDED CONTINUOUSLY DURING THE HOUR.

A TOTAL OF 16 BAT SPECIES WERE IDENTIFIED BY CALLS IN THE STUDY AREAS.

11 BAT SPECIES WERE IDENTIFIED TO SPECIES BASED ON THE PRESENCE OF CHARACTERISTIC, DIAGNOSTIC CALLS IN THE RECORDINGS.

TOWNSENDS BIG EARED BAT  
WESTERN RED BAT  
WESTERN YELLOW BAT  
CALIFORNIA LEAF-NOSED BAT  
HOARY BAT  
SILVER-HAIRED BAT  
POCKETED FREE-TAILED BAT  
BIG FREE-TAILED BAT  
MASTIFF BAT  
WESTERN PIPISTRELLE  
CAVE MYOTIS

## 4 SPECIES GOUPS CONSISTING OF OVERLAPPING, SIMILAR CALL CHARACTERISTICS.

20-25 KHZ      OVERLAPPING CALLS OF  
NYFE, NYMA, LACI, TABR

25-30 KHZ      OVERLAPPING CALLS OF  
EPFU, TABR, ANPA

35 KHZ          ANPA & MYVE

40 KHZ          MOSTLY MYVE

45-55 KHZ      OVERLAPPING CALLS MYCA,  
MYYU & SOME PIHE



## 4 ABUNDANT “FLAGSHIP” SPECIES:

WESTERN PIPISTRELLE  
BRAZILIAN FREE-TAILED BAT  
CALIFORNIA MYOTIS  
YUMA MYOTIS

UBIQUITOUS SPECIES, WIDESPREAD IN A LARGE ARRAY OF HABITATS ALONG LCR WITH STABLE OR INCREASING POPULATIONS

FOCUS OF HABITAT CREATION EFFORTS IS IN RESTORING HABITAT FOR THE TWO COVERED SPECIES – WESTERN RED BAT & WESTERN YELLOW BAT AND TWO EVALUATION SPECIES – CALIFORNIA LEAF-NOSED BAT AND PALE TOWNSEND’S BIG-EARED BAT

## RESULTS

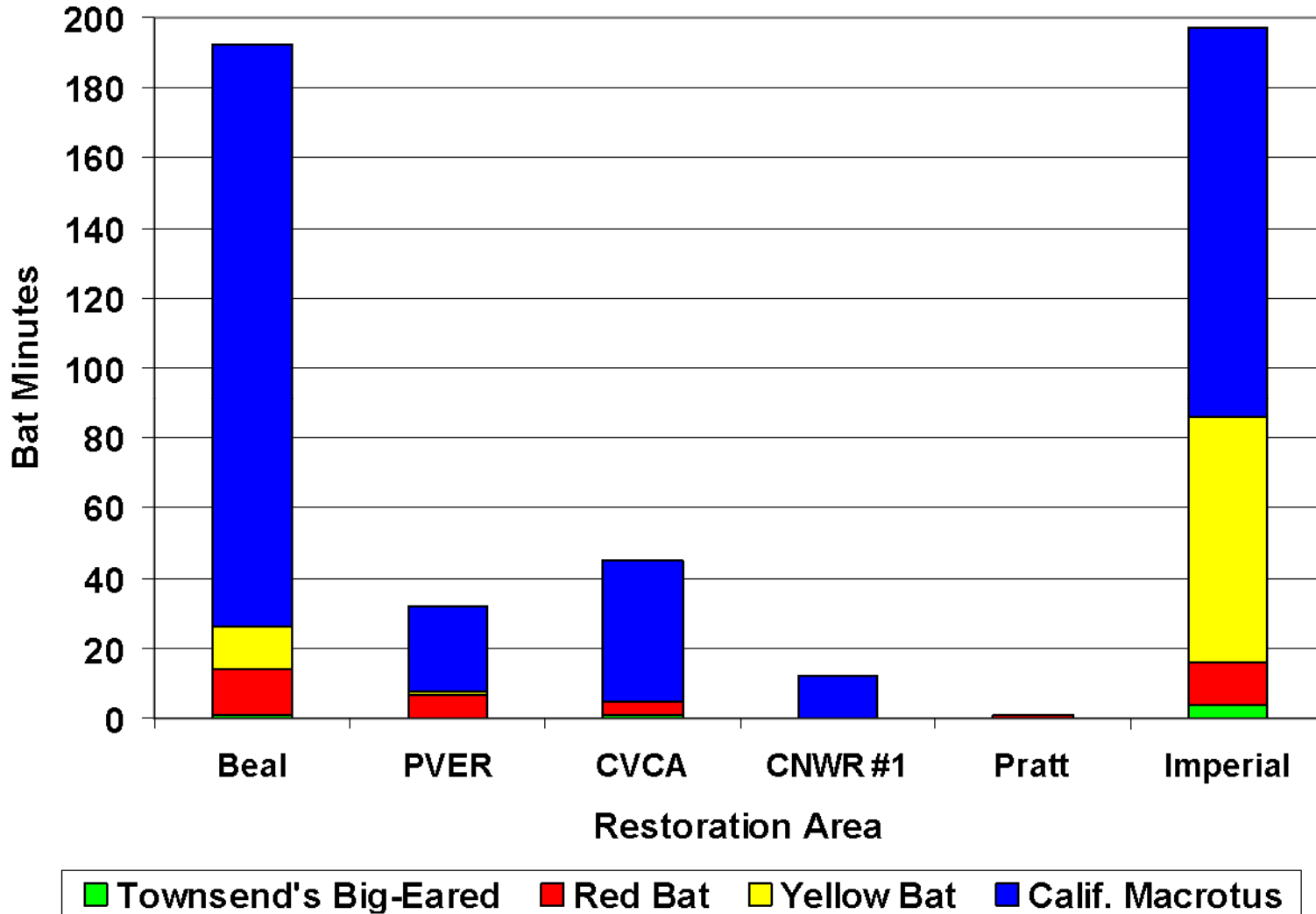
FOCUS IS ON 4 FOCAL BAT SPECIES. TO PUT INTO PERSPECTIVE  
LOOK AT THE FOLLOWING TABLE OF RELATIVE BAT ACTIVITY  
(EXAMPLE FROM BEAL LAKE):

45-55 kHz	0.401	4409
25-30 kHz	0.293	3223
Pihe	0.225	2477
Myve	0.038	393
35 kHz	0.015	170
<b>Maca</b>	<b>0.015</b>	<b>166</b>
Nyfe	0.007	82
Eupe	0.002	26
<b>Labl</b>	<b>0.001</b>	<b>13</b>
Laci	0.001	12
<b>Laxn</b>	<b>0.001</b>	<b>6</b>
Nyma	0.0005	6
20-25 kHz	0.0005	6
<b>Coto</b>	<b>0.0001</b>	<b>1</b>

# Example from Beal Lake Habitat Restoration Area Provides Example of Seasonal Variation in Mean Number of Bat Minutes

<b>Season</b>	<b>Mean Bat Minutes <math>\pm</math> SE</b>	<b># Detector Nights</b>
<b>November</b>	<b>82.0 <math>\pm</math> 27.0</b>	<b>9</b>
<b>January</b>	<b>4.2 <math>\pm</math> 2.3</b>	<b>17</b>
<b>April</b>	<b>300.9 <math>\pm</math> 71.2</b>	<b>16</b>
<b>July</b>	<b>358.2 <math>\pm</math> 50.5</b>	<b>15</b>

## Total # Bat Minutes for 4 Covered Bat Species



## BEAL LAKE HABITAT RESTORATION AREA

SPECIES	MEAN # BAT MINUTES PER DETECTOR NIGHT
COTO	0.02± 0.02
LABL	0.21 ± 0.11
LAXN	0.16 ± 0.08
MACA	2.63 ± 0.85

WESTERN RED BAT (LABL): MOST CALLS RECORDED IN JULY  
40% RECORDED IN LAKE HABITATS; 50% IN NEWLY PLANTED COTTONWOOD

WESTERN YELLOW BAT (LAXN): MOST CALLS RECORDED IN APRIL  
HALF RECORDED IN LAKE HABITATS; 40% IN NEWLY PLANTED MESQUITE

TOWNSENDS BIG-EARED BAT (COTO)  
ONLY 1 MINUTE RECORDED – IN JULY IN YOUNG COTTONWOOD/WILLOW STAND

LEAF-NOSED BAT (MACA)  
RECORDED DURING NOVEMBER, APRIL & JULY IN WIDE VARIETY OF HABITATS

## PALO VERDE ECOLOGICAL RESERVE

SPECIES	MEAN # BAT MINUTES PER DETECTOR NIGHT
COTO	0.02± 0.02
LABL	0.21 ± 0.11
LAXN	0.16 ± 0.08
MACA	2.63 ± 0.85

WESTERN RED BAT (LABL) - ALL CALLS RECORDED IN JULY  
MOST IN NEWLY PLANTED COTTONWOOD - WILLOW

WESTERN YELLOW BAT (LAXN) - 1 MINUTE – IN JULY ON LCR

TOWNSENDS BIG-EARED BAT – NO CALLS

LEAF-NOSED BAT (MACA) - MOST CALLS IN NOV OVER YOUNG  
COTTONWOOD/WILLOW HABITATS

## CVCA HABITAT RESTORATION AREA

<b>SPECIES</b>	<b>MEAN # BAT MINUTES PER DETECTOR NIGHT</b>
<b>COTO</b>	<b>0.02 ± 0.02</b>
<b>LABL</b>	<b>0.08 ± 0.05</b>
<b>LAXN</b>	<b>0.0 ± 0.0</b>
<b>MACA</b>	<b>0.82 ± 0.59</b>

WESTERN RED BAT (LABL) ALL CALLS IN JULY  
MOST IN NEWLY PLANTED COTTONWOOD - WILLOW

WESTERN YELLOW BAT (LAXN) – NO CALLS

TOWNSENDS BIG-EARED BAT – ONLY 1 MINUTE

LEAF-NOSED BAT (MACA) MOST CALLS R IN JANUARY  
OVER NEWLY PLANTED COTTONWOOD - WILLOW

## Cibola NWR Unit #1

12 minutes of bat activity recorded for MACA – in Nov & July – cottonwood plantINGS

## PRATT

1 minute bat activity recorded for Red Bat in July on edge of mature cottonwood habitat



## IMPERIAL PONDS HABITAT RESTORATION AREA

<b>SPECIES</b>	<b>MEAN # BAT MINUTES PER DETECTOR NIGHT</b>
<b>COTO</b>	<b>0.08 ± 0.05</b>
<b>LABL</b>	<b>0.23 ± 0.18</b>
<b>LAXN</b>	<b>1.30.0 ± 1.15</b>
<b>MACA</b>	<b>2.09 ± 0.52</b>

WESTERN RED BAT (LABL) - CALLS RECORDED IN APRIL AND JULY MOST IN POND HABITATS

WESTERN YELLOW BAT (LAXN) - UNUSUAL EVENT WHEN 70 MINUTES OF BAT ACTIVITY RECORDED IN APRIL OVER THE POND HABITAT

TOWNSENDS BIG-EARED BAT (COTO) – 4 MINUTES RECORDED DURING APRIL & JULY IN THE MATURE COTTONWOOD NURSERY

LEAF-NOSED BAT (MACA) – MOST BAT MINUTES RECORDED IN APRIL IN MATURE COTTONWOOD & UNTREATED

# **FUTURE EFFORTS**

**ESTABLISH A LONG TERM PERMANENT BAT MONITORING STATION**

**HABITAT SAMPLING**

**EXTEND SAMPLING TO CRIT**

**REFINE SAMPLING DESIGN TO INCREASE RELIABILITY**

**ACOUSTIC SURVEYS ABOVE CANOPY - COTO**