LCR MSCP Bat Research and Monitoring:

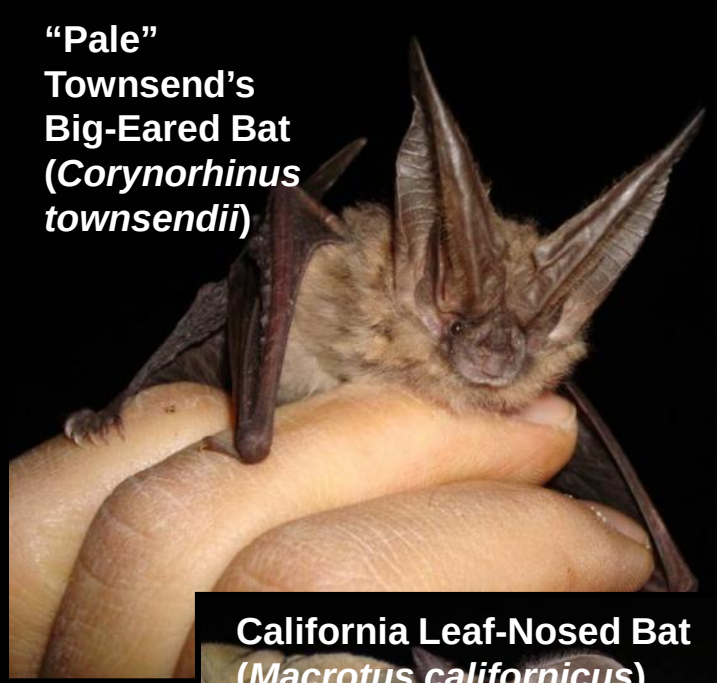
Where did we start,

Where are we now?

Allen Calvert

Covered and Evaluation Bat Species

Western Red Bat
(*Lasiurus blossevillii*)



"Pale"
Townsend's
Big-Eared Bat
(*Corynorhinus townsendii*)

Western Yellow Bat
(*Lasiurus xanthinus*)

California Leaf-Nosed Bat
(*Macrotus californicus*)

Western Red Bat (*Lasiurus blossevillii*)

- Migratory riparian tree roosting obligate
- Roosts within the foliage of trees
- Solitary but may be found in small groups
- Insectivore
- In the US, can be found in AZ, CA, NV, NM and UT.
- Occurs throughout the LCR but primarily within riparian restoration areas and the Bill Williams River

Western Yellow Bat (*Lasiurus xanthinus*)

- Migratory palm tree roosting obligate
- Roosts within the dead frond “skirt” of palm trees
- Assumed to roost solo
- Insectivore
- In the US, can be found in AZ, CA, NV, NM and TX.
- Occurs throughout the LCR

California leaf-nosed bat (*Macrotus californicus*)

- Cave and mine roosting obligate – migrates locally
- Needs “warm” roosts (80 F plus) – active year round
- Uses geothermally heated mines in the winter
- Insectivore but known to occasionally eat tree lizards (*Urosaurus ornatus*)
- In the US, can be found in AZ, CA, and NV.
- Occurs throughout the LCR

Pale Townsend's big-eared bat (*Corynorhinus townsendii*)

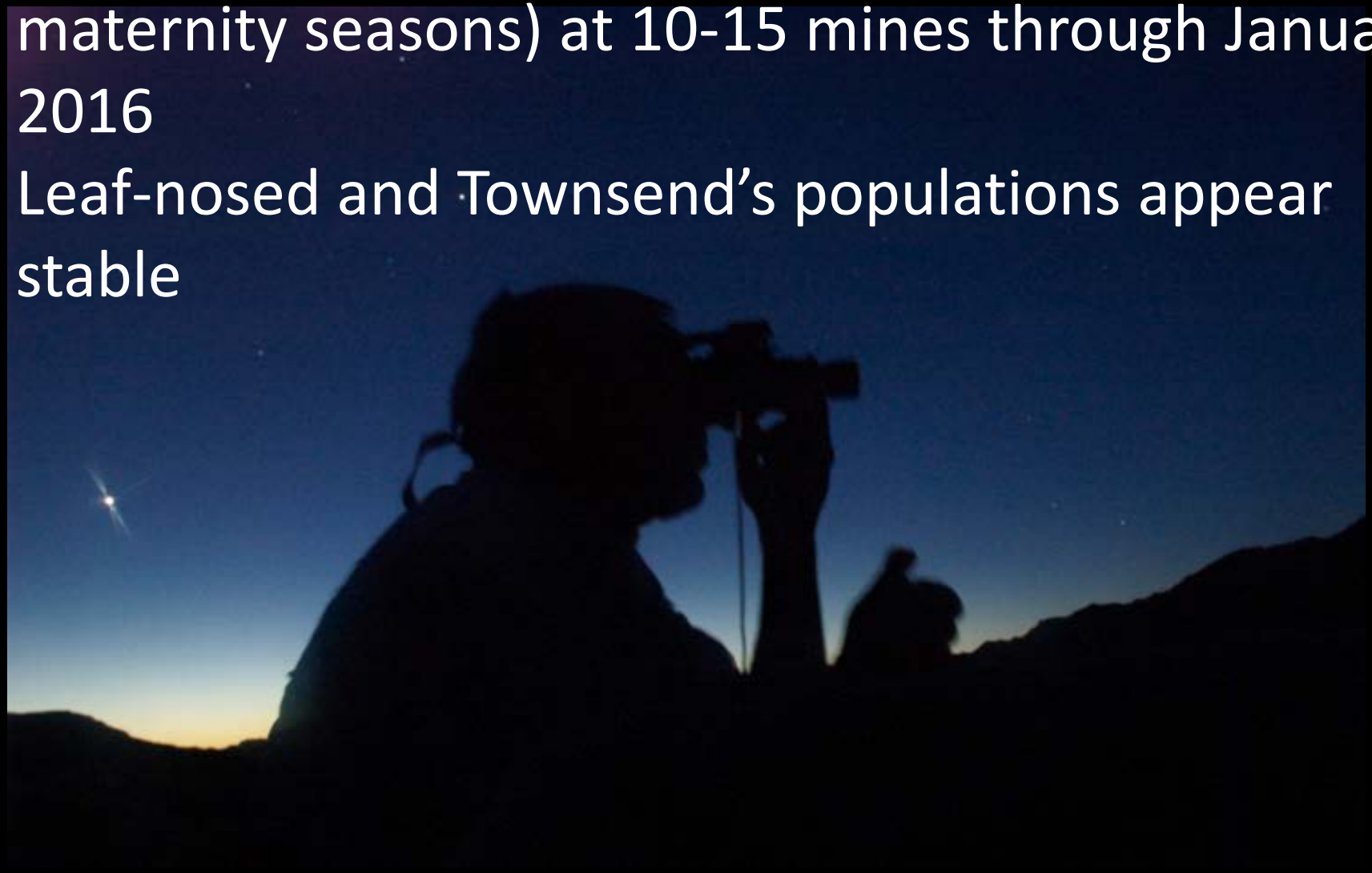
- Cave and mine roosting obligate
- Normally hibernates in winter
- Insectivore – known to prefer moths
- Found throughout the west and two isolated subspecies in the Midwest and east coast.
- One known maternity colony on the main stem LCR

Pre-MSCP Bat surveys

- Pat Brown has been studying bats on the LCR since 1968
- Some mine count and banding data goes back 40+ years
- Pat and Bob Berry provided baseline information for all bat species from 2000-2001 (Brown and Berry 2003) using roost, acoustic, and capture surveys

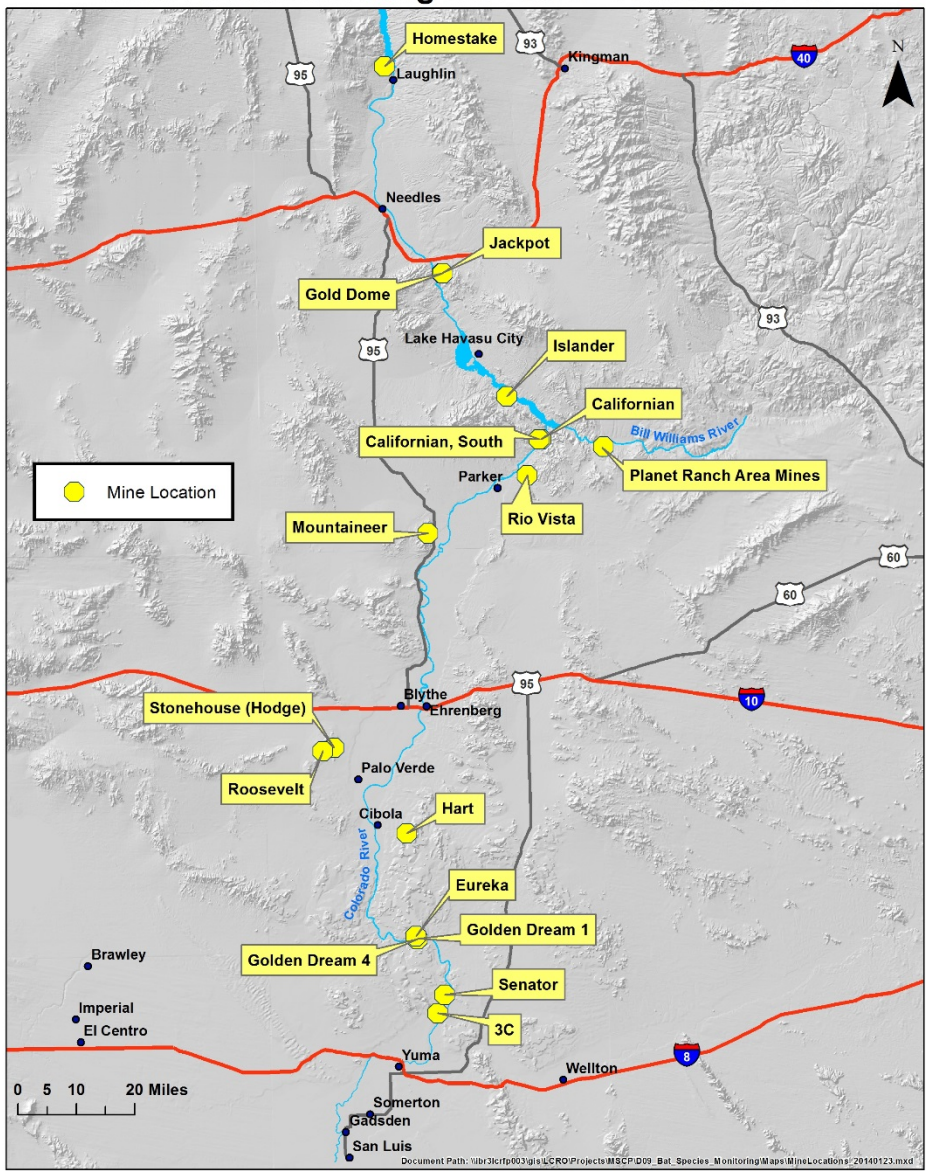
Roost Surveys

- Surveys were conducted biannually (winter and maternity seasons) at 10-15 mines through January 2016
- Leaf-nosed and Townsend's populations appear stable

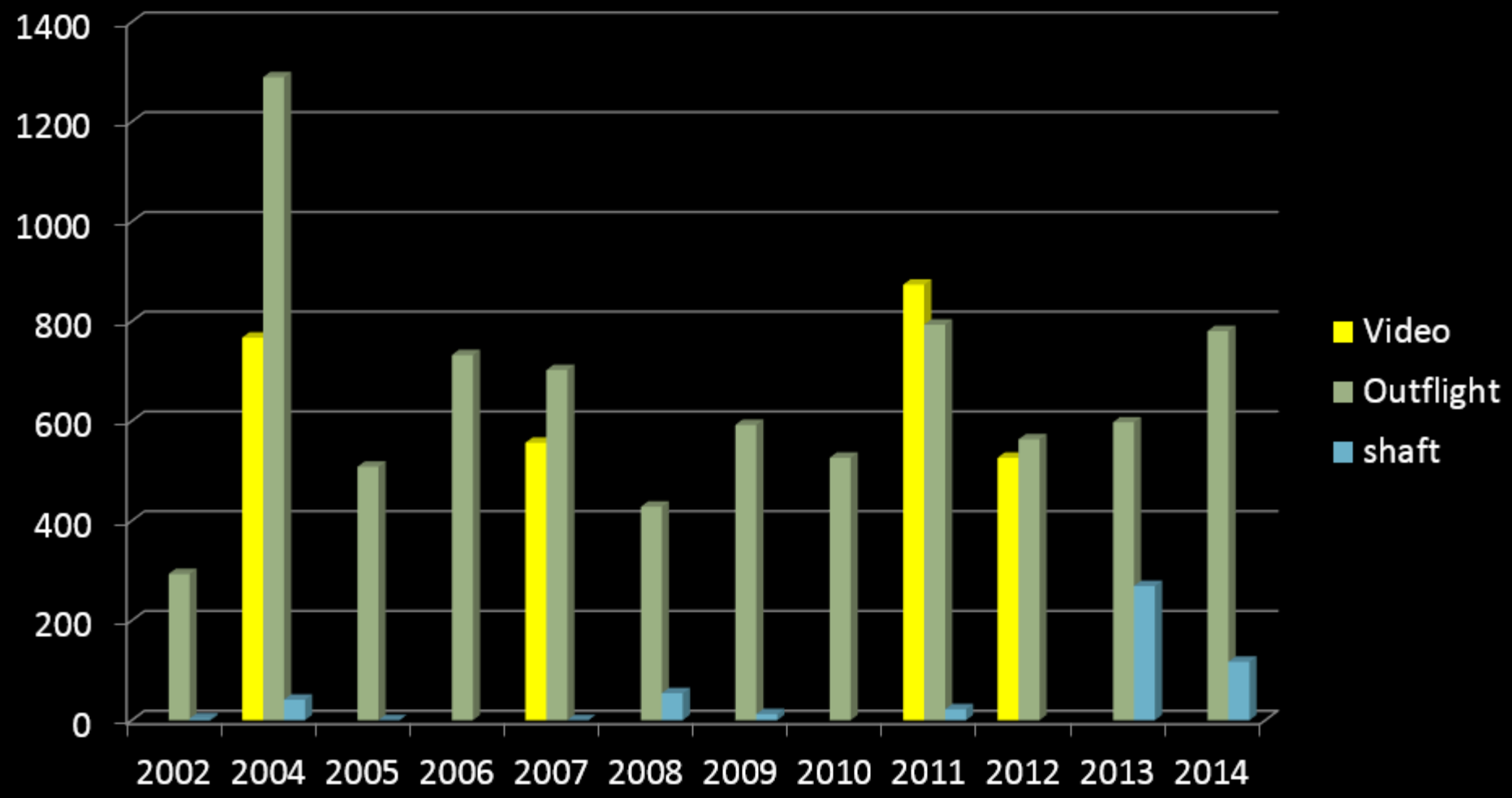


Roost Surveys

Roost Surveys

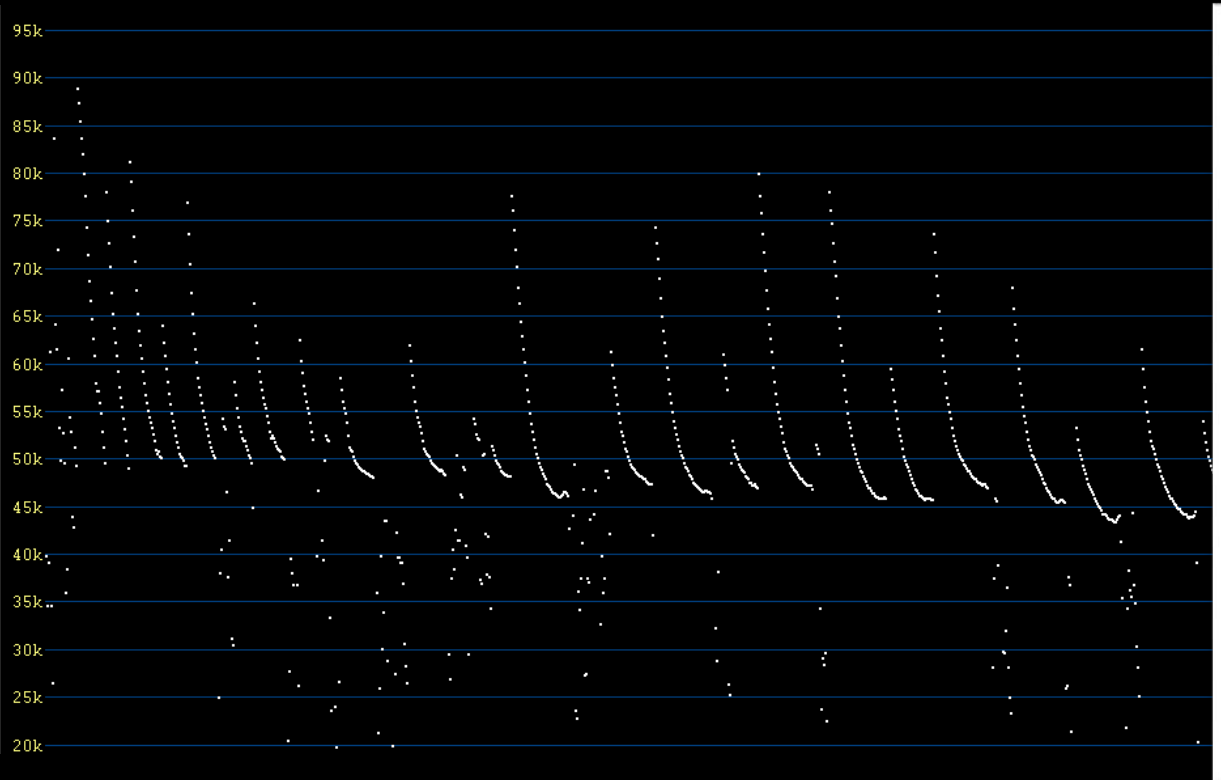


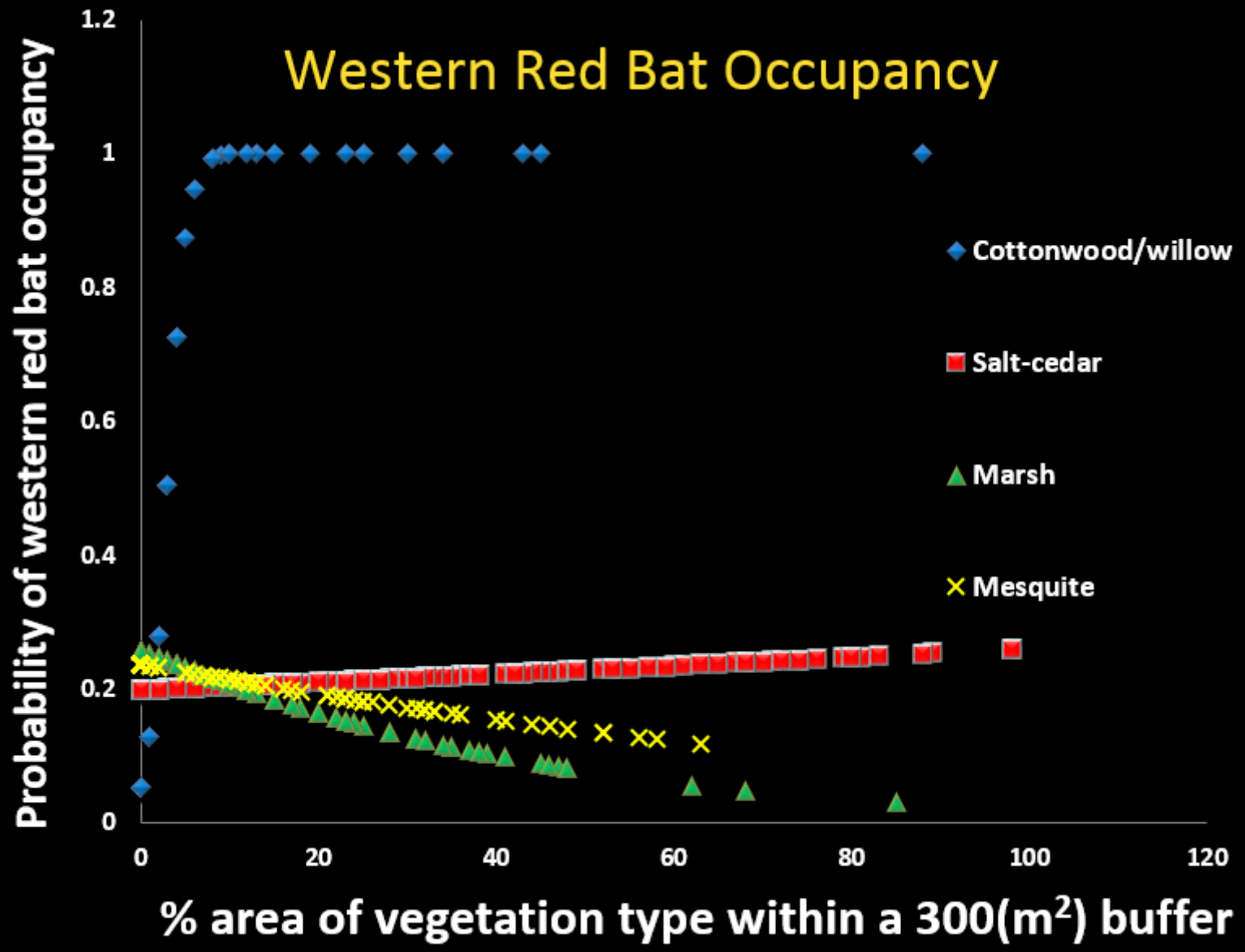
Mountaineer Mine winter exit count



Acoustic Surveys: System-wide

- Habitat study established in 2008 in Cooperation with AZGFD and NAU (Vizcarra, Piest, and Frary 2010)
- Four habitat types sampled - 72 locations per year
- Cottonwood-willow, Mesquite, Saltcedar, and Marsh
- New random locations selected each of the two years.
- Locations sampled 2 consecutive nights per season.




Western Red Bat Occupancy
Probability of western red bat occupancy
1.2
1
0.8
0.6
0.4
0.2
0
0
20
40
60
80
100
120
% area of vegetation type within a 300(m2) buffer
Cottonwood/willow
Salt-cedar
Marsh
Mesquite

Acoustic Habitat Study Summary

- Red bat occupancy highest in cottonwood-willow
- Yellow bat occupancy highest in cottonwood-willow
- CA leaf-nosed bat and Townsend's big-eared bat occupancy was correlated with distance to roost and showed slight increase with higher % of saltcedar (probably related more to the total amount of saltcedar available especially near known roosts)
- Report available at www.LCRMSCP.gov

Monitoring of Covered and Evaluation Bat Species for the Lower Colorado River Multi-Species Conservation Program — 2010 Final Report

Prepared by Beatriz Vizcarra, Linden Piest, and Vincent Frary, Arizona Game and Fish Department

Acoustic Surveys: System-wide

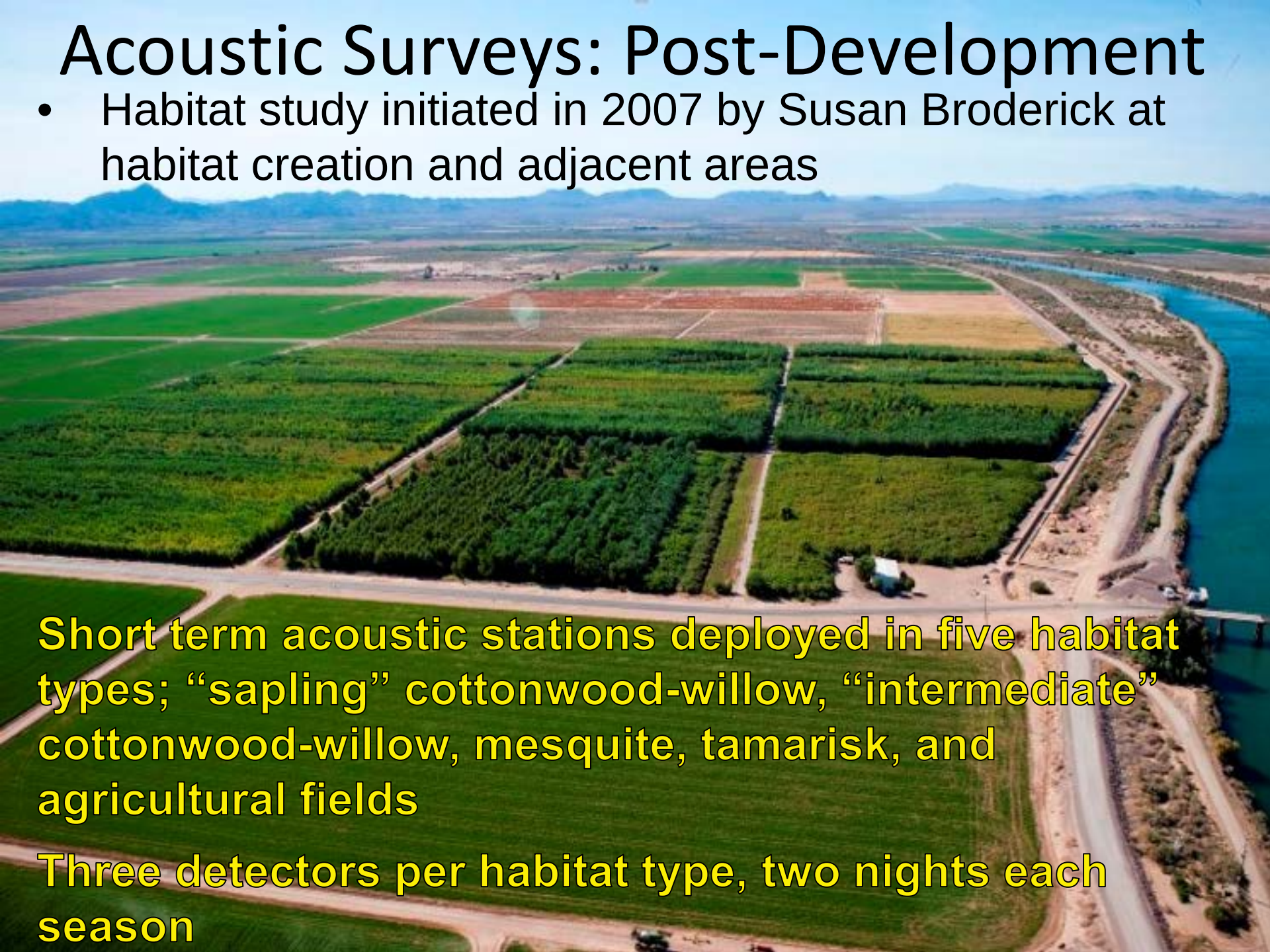
- Four long term stations established in 2008 in Cooperation with AZGFD and NAU.
- A fifth station was added by MSCP in 2014.
- Stations ran year round to provide temporal activity levels
- As of 2015, data analyzed during summer months only

Acoustic Surveys: System-wide

- System-wide analysis now includes conservation area stations (14 total stations)
- The Bill Williams River NWR station tends to have the most MSCP species detections for non-conservation area stations
- 2015 report is most recent report currently available on the website
- Stayed tuned for Ronny's talk!

Acoustic Surveys: Post-Development

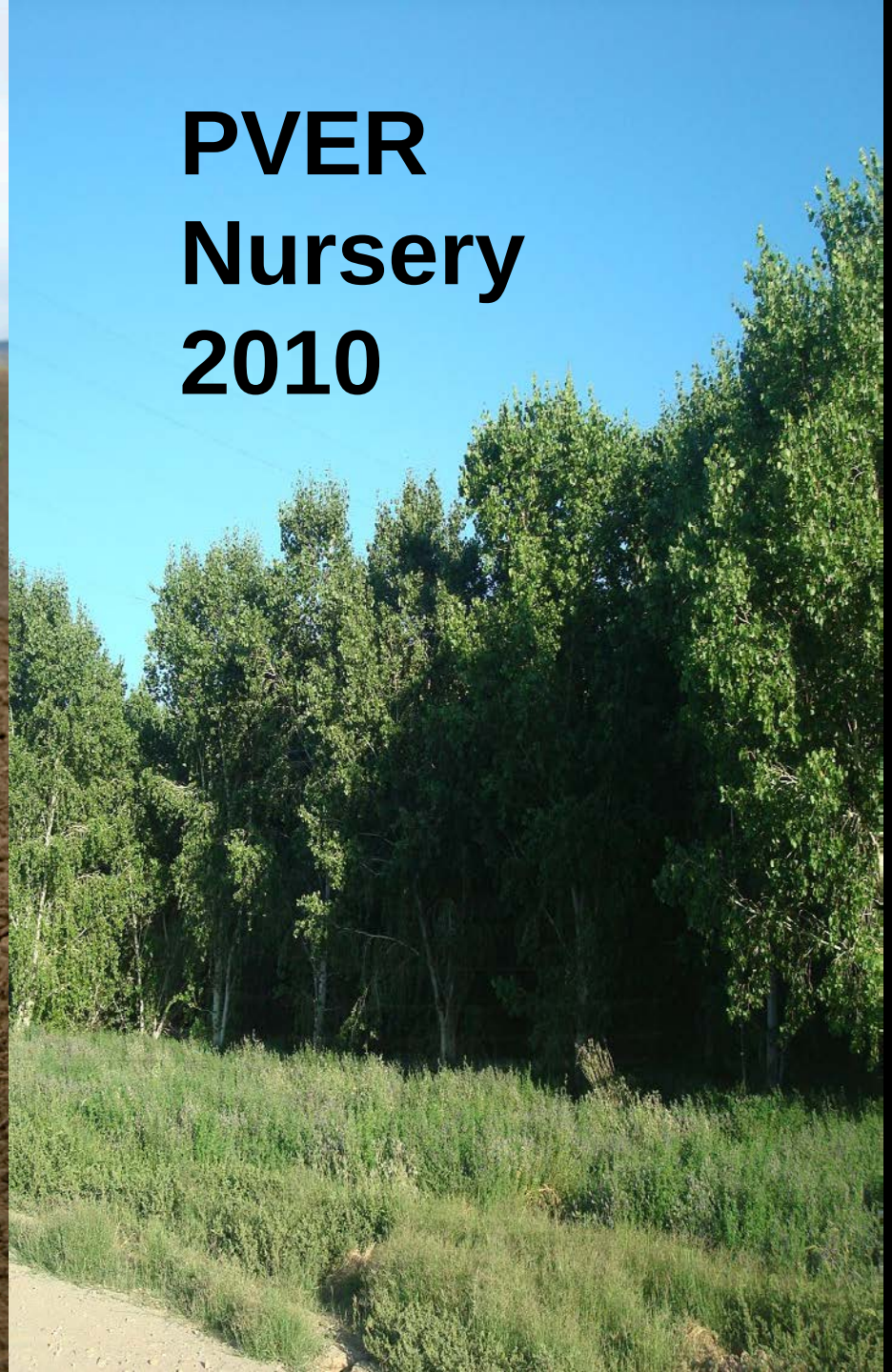
- Habitat study initiated in 2007 by Susan Broderick at habitat creation and adjacent areas



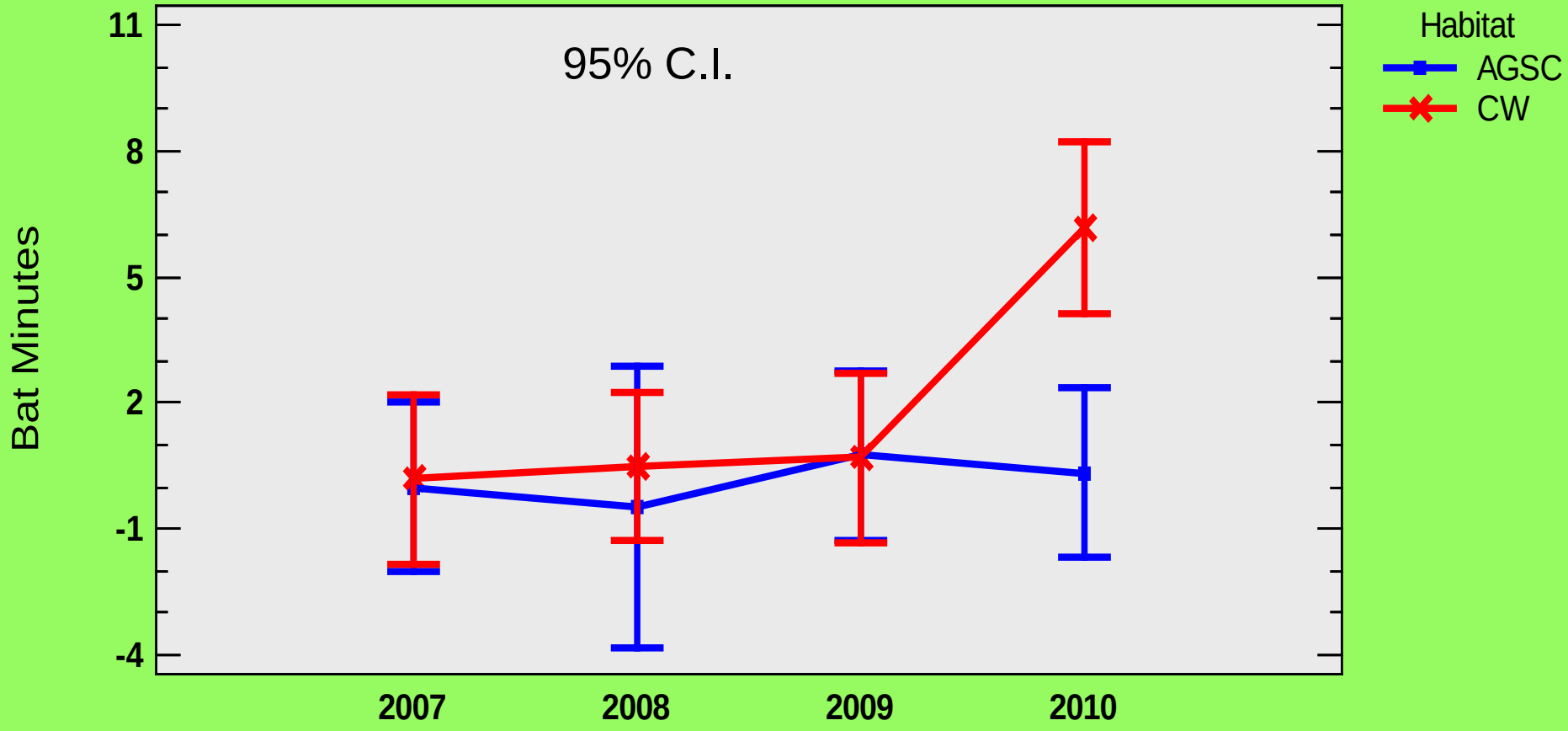
Short term acoustic stations deployed in five habitat types; “sapling” cottonwood-willow, “intermediate” cottonwood-willow, mesquite, tamarisk, and agricultural fields

Three detectors per habitat type, two nights each season

PVER
Nursery
2006


PVER
Nursery
2010

Year to Year Comparison of Bat Activity In Treated vs Untreated Habitats – Red and Yellow Bats

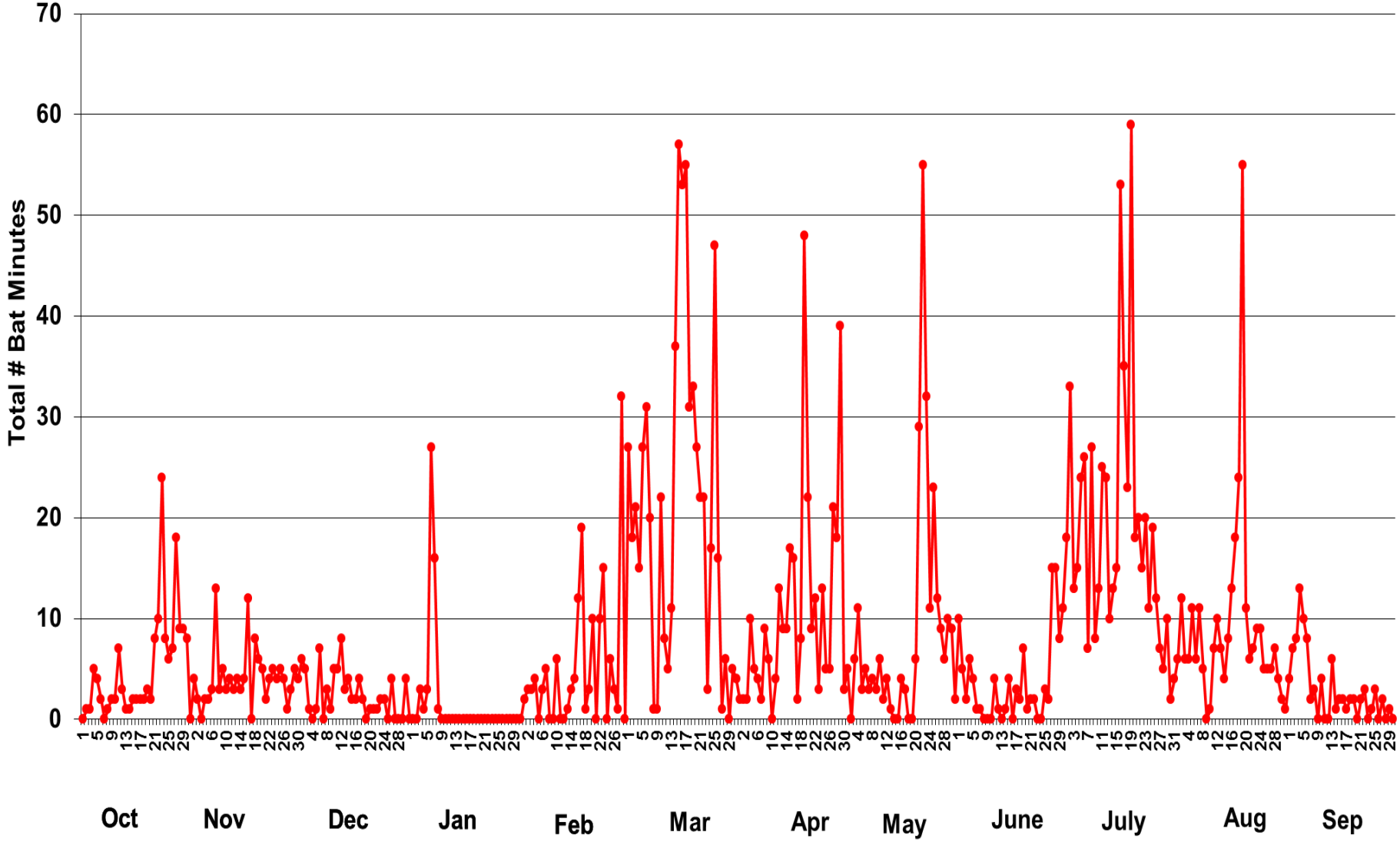


*** Least Squares Means**

Acoustic Surveys: Post-Development

- Transitioned to long term stations at conservation areas

CVCA1 Monitoring Station 2013
Western Red Bat

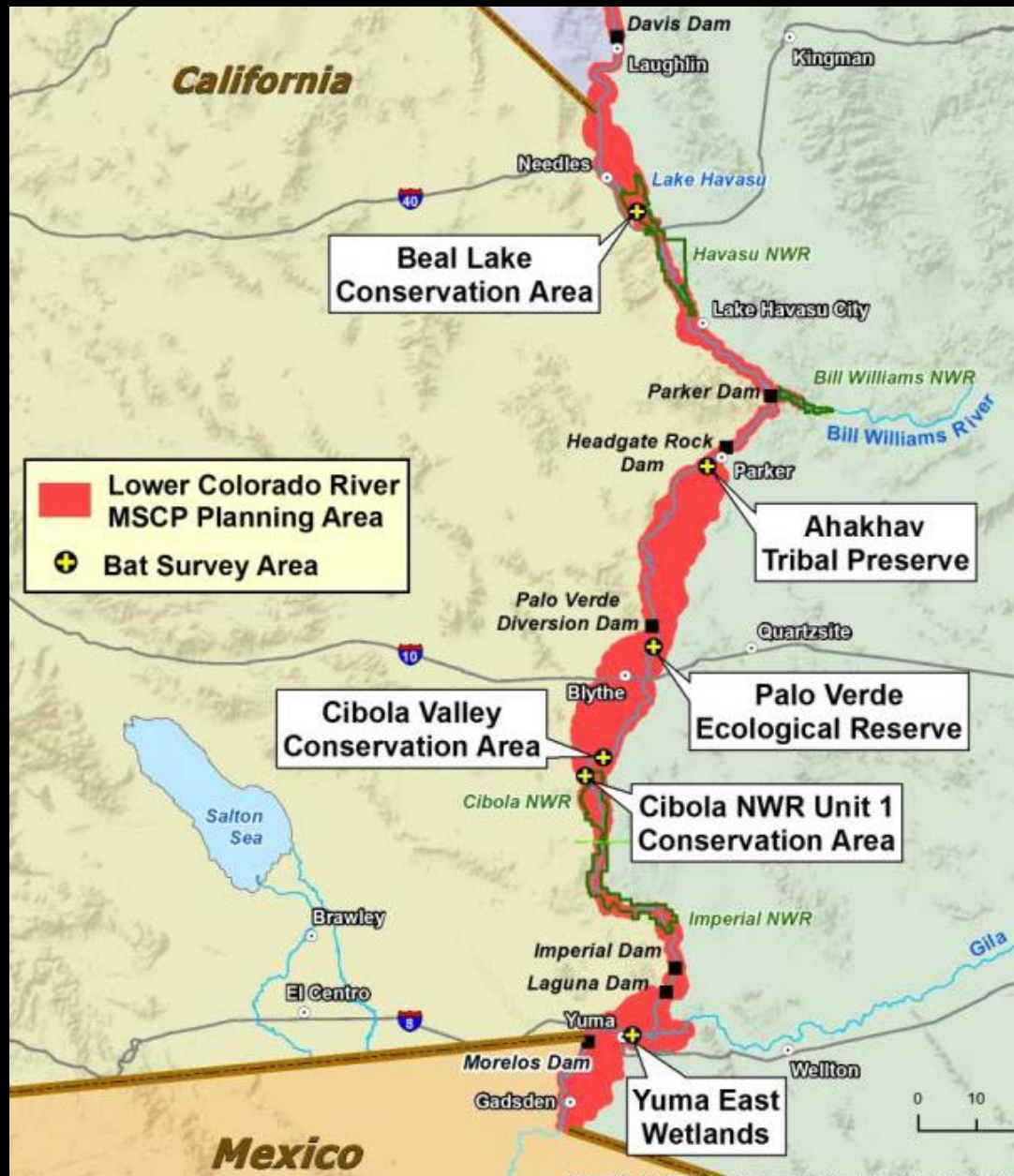


Acoustic Surveys: Post-Development

- Long term stations confirmed summer *and* winter resident activity of western red bats
- Migration pulses of red and yellow bats recorded
- Because MSCP focus is on summer activity, detectors at conservation areas now only operate from June-August
- Data can be analyzed by activity levels and by occupancy which can be used to determine proportion of nights detected across months
- Leaf-nosed and Townsend's are detected with acoustic monitoring but must be close to the microphone

Capture Surveys

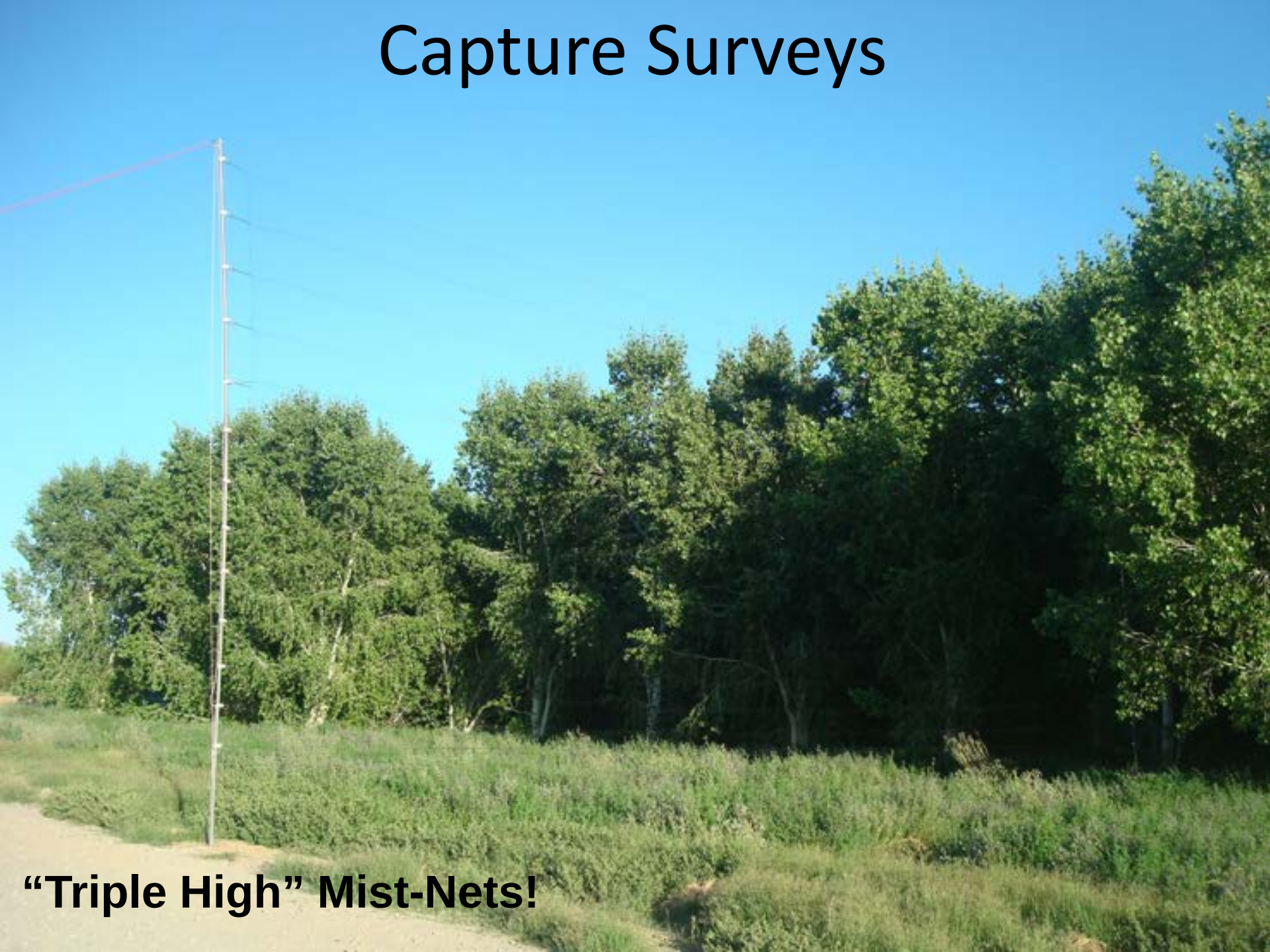
- Capture surveys using mist-nets and harp traps began in 2007
- In 2009, protocol was finalized and surveys have continued every year since
- In 2012, six sites were selected for annual surveys
- In 2016, Yuma East was dropped and Planet Ranch was added



Capture Surveys

“Triple High” Mist-Nets!

Capture Surveys



“Triple High” Mist-Nets!

Capture Surveys

Capture Surveys - Highlights

- From all 241 surveys combined, a total of 5,993 bats of 15 species have been captured from 10 different sites
- Western red bats and western yellow bats have been captured at four conservation areas
- California leaf-nosed bats have been captured at seven conservation areas
- Townsend's big-eared bats have been captured at two conservation areas
- Arizona myotis "rediscovered" on the LCR

The Southwestern Naturalist 57(3): 340–342

BATS IN RIPARIAN-RESTORATION SITES ALONG THE LOWER COLORADO RIVER, ARIZONA

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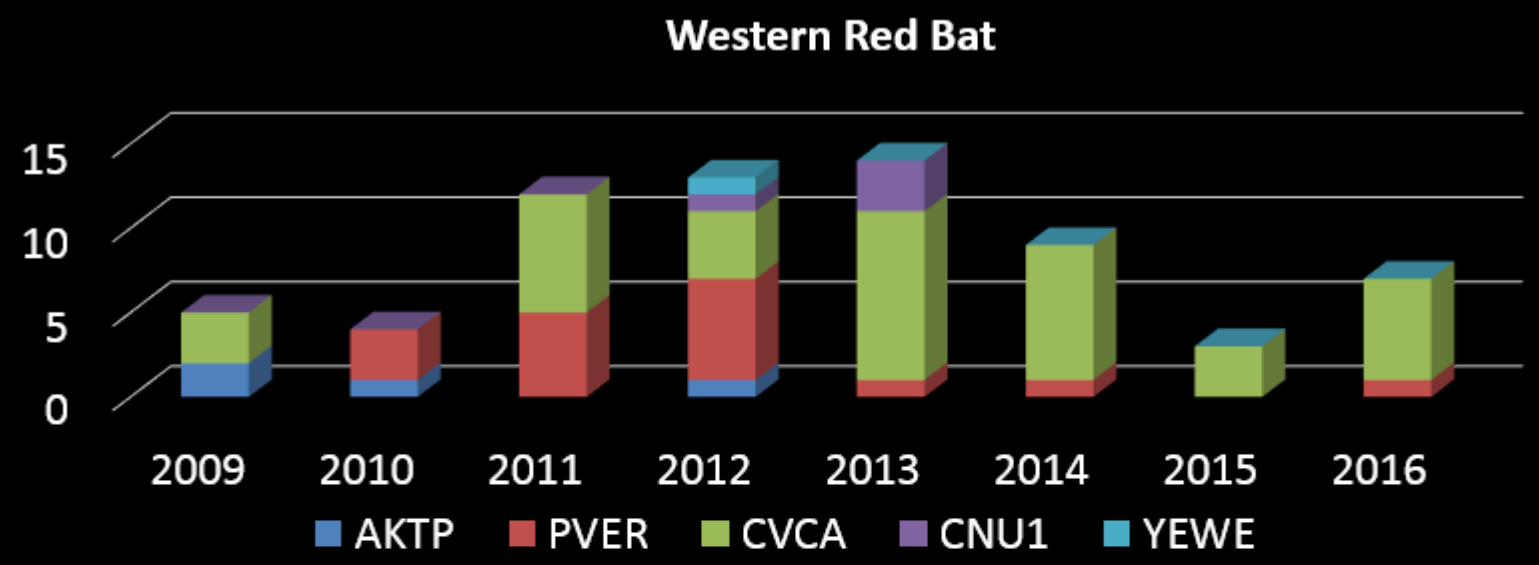
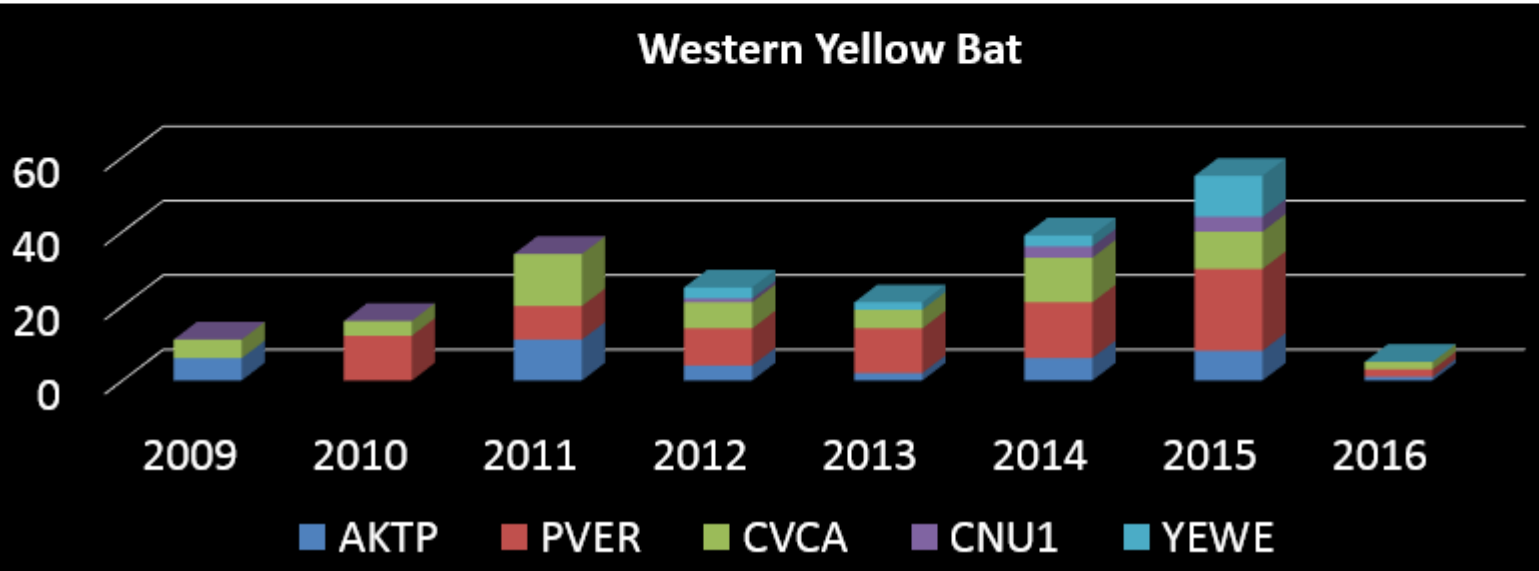
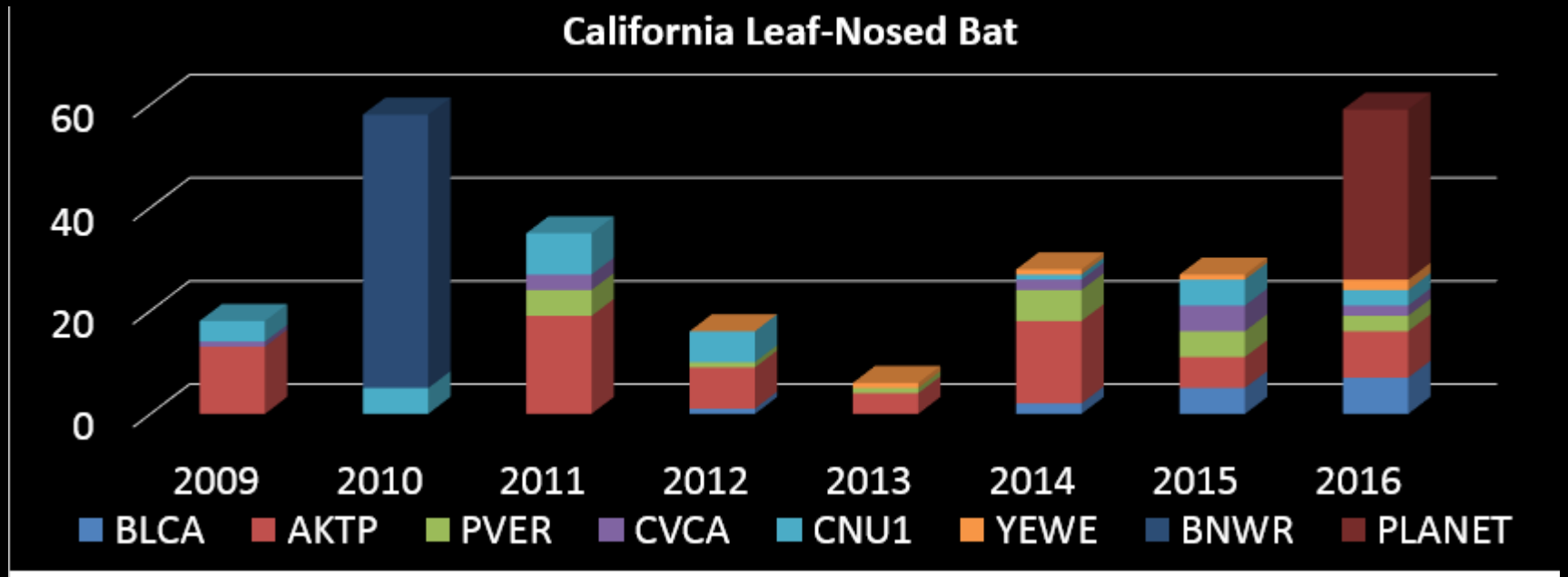
Abstract—During 2007–2010, we captured the western red bat (*Lasiurus blossevillii*) and Arizona myotis (*Myotis occultus*) in riparian-restoration areas along the lower Colorado River. Previously, the western red bat had not been reported along the lower Colorado River and the Arizona myotis was presumed to be extirpated from that area.

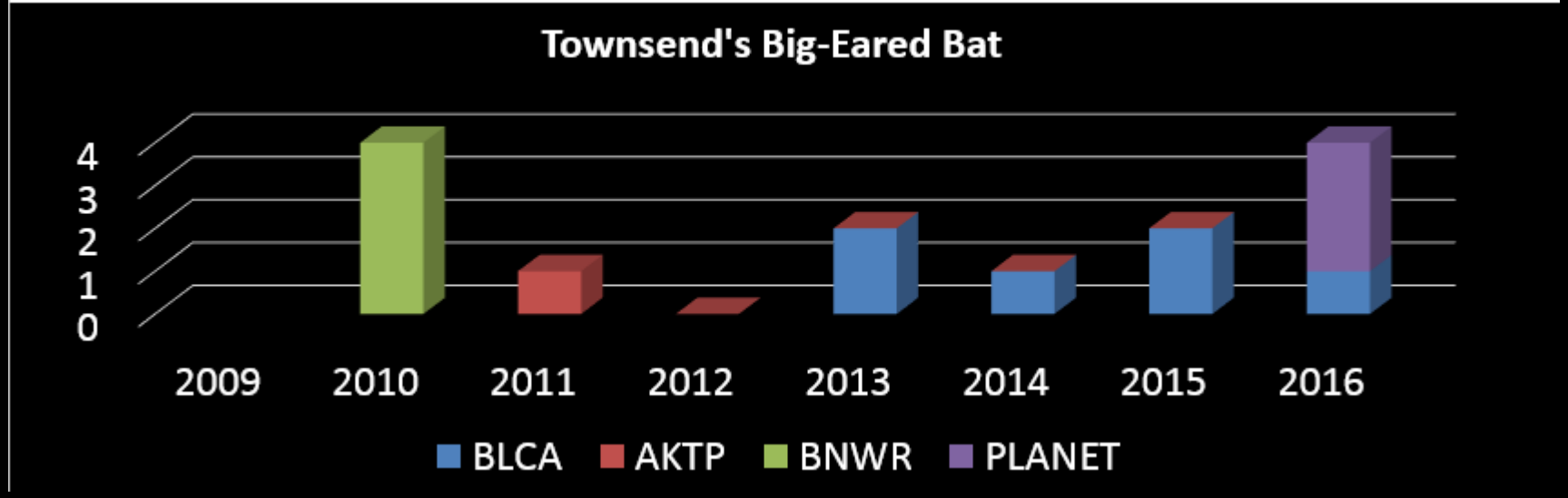
Capture Surveys





Capture Surveys





Capture Surveys

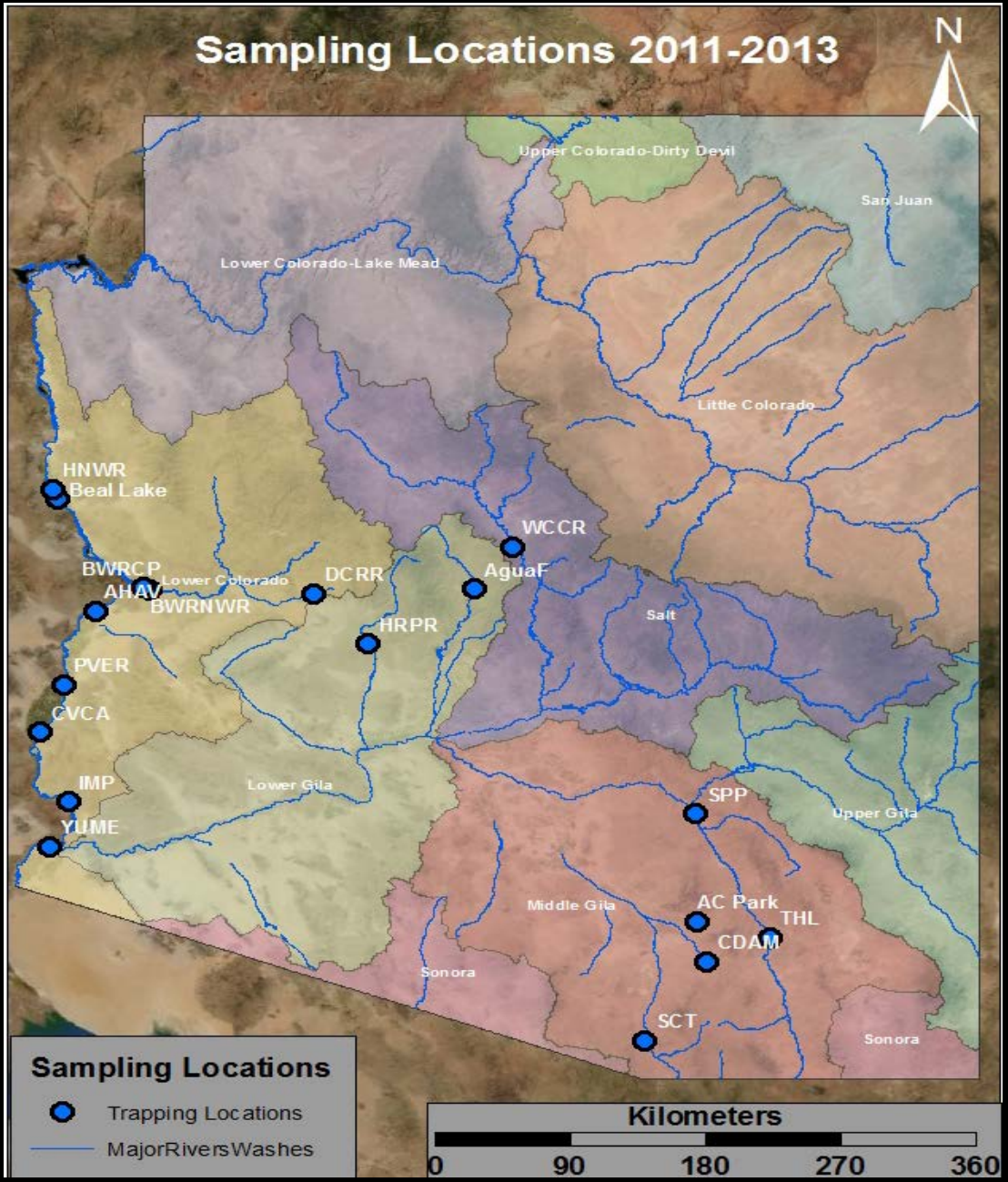
Red and Yellow Bat Roosting Study

- Collaborative effort with AZGFD
- Captured bats from across AZ and at PVER in CA at both natural (control) and planted (treatment) areas
- Radio-tracked red and yellow bats back to roosts
- Collected vegetation measurements at the roost tree and four nearest neighbor trees (Mixan et al 2015)

Survey Locations

17 areas were surveyed (six of which were treatment areas)

Four different watersheds and 10 different river systems were surveyed

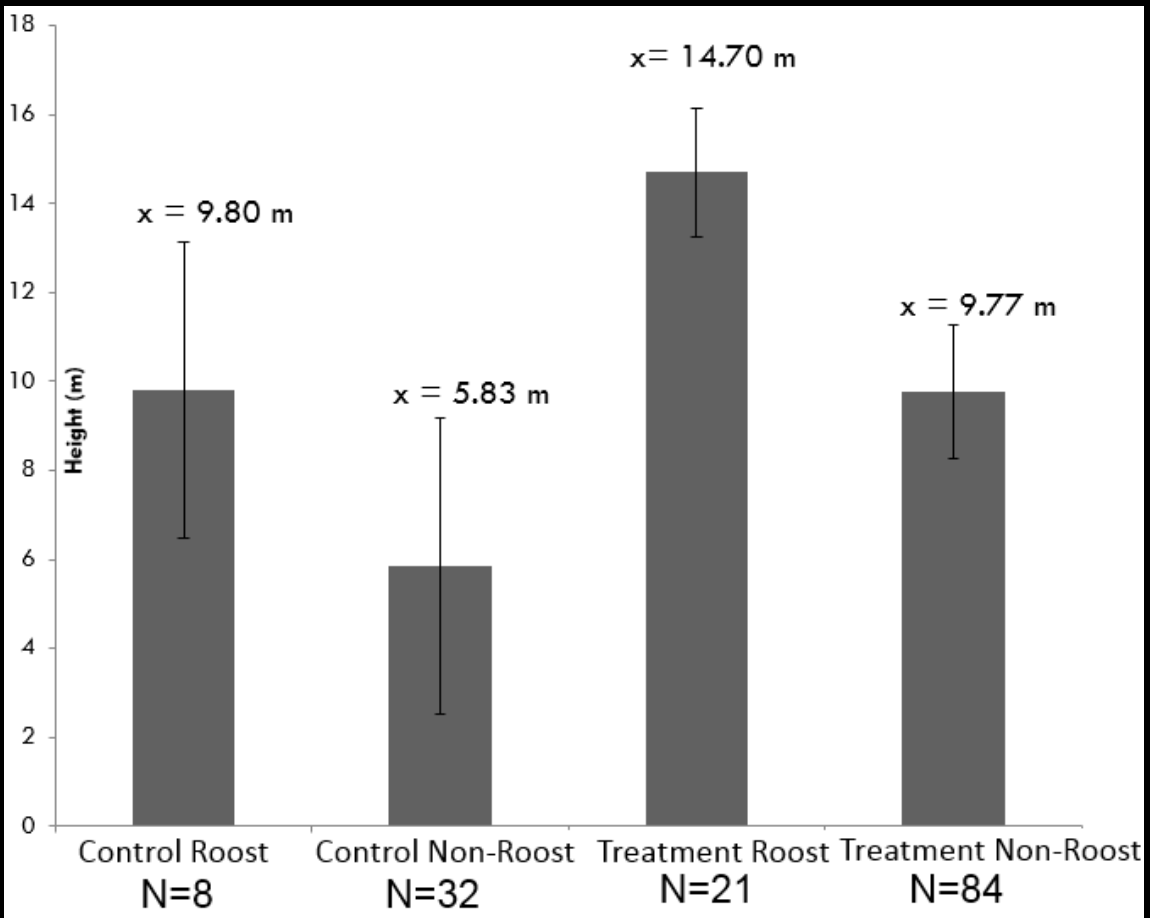


Where’s the bat?

There’s the bat!

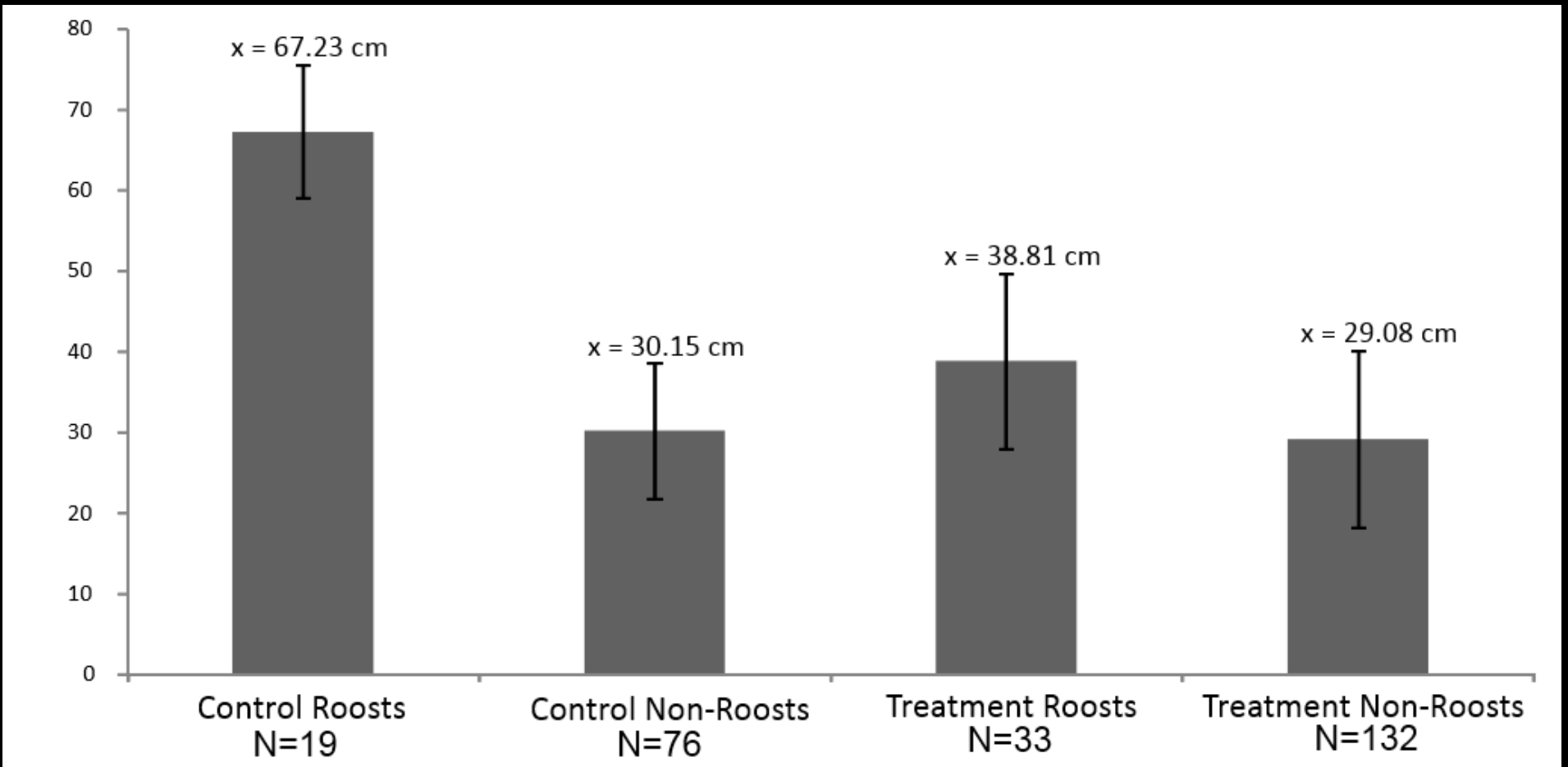
Western Yellow Bat - Results

- 93% of roosts were in fan palms -*Washingtonia* spp.
- Roost trees were taller than nearby non-roost trees



Western Red Bat - Results

- 85% of all roosts were in cottonwoods
- Bats chose trees with larger DBH in control sites



Western Red Bat - Results

Roosting Characteristics

Control roosts (n = 19)	**Maximum**	**Minimum**	**Mean (SE)**	**Median**
Tree height (m)	23.6	7.6	16.08 (1.11)	16.7
Tree DBH (cm)	194	23.2	67.23 (10.08)	50.4
Roost Height (m)	19.9	5	9.61 (1.31)	9.75
Treatment roosts (n = 33)	**Maximum**	**Minimum**	**Mean (SE)**	**Median**
Tree height (m)	22	6.9	14.17 (0.67)	13.3
Tree DBH (cm)	214*	4.9	38.81 (6.35)	28.7
Roost Height (m)	11.7	2	4.47 (1.73)	4

*This was the athel winter roost, largest DBH roost tree within treatment site was 65 cm

Other Interesting Observations

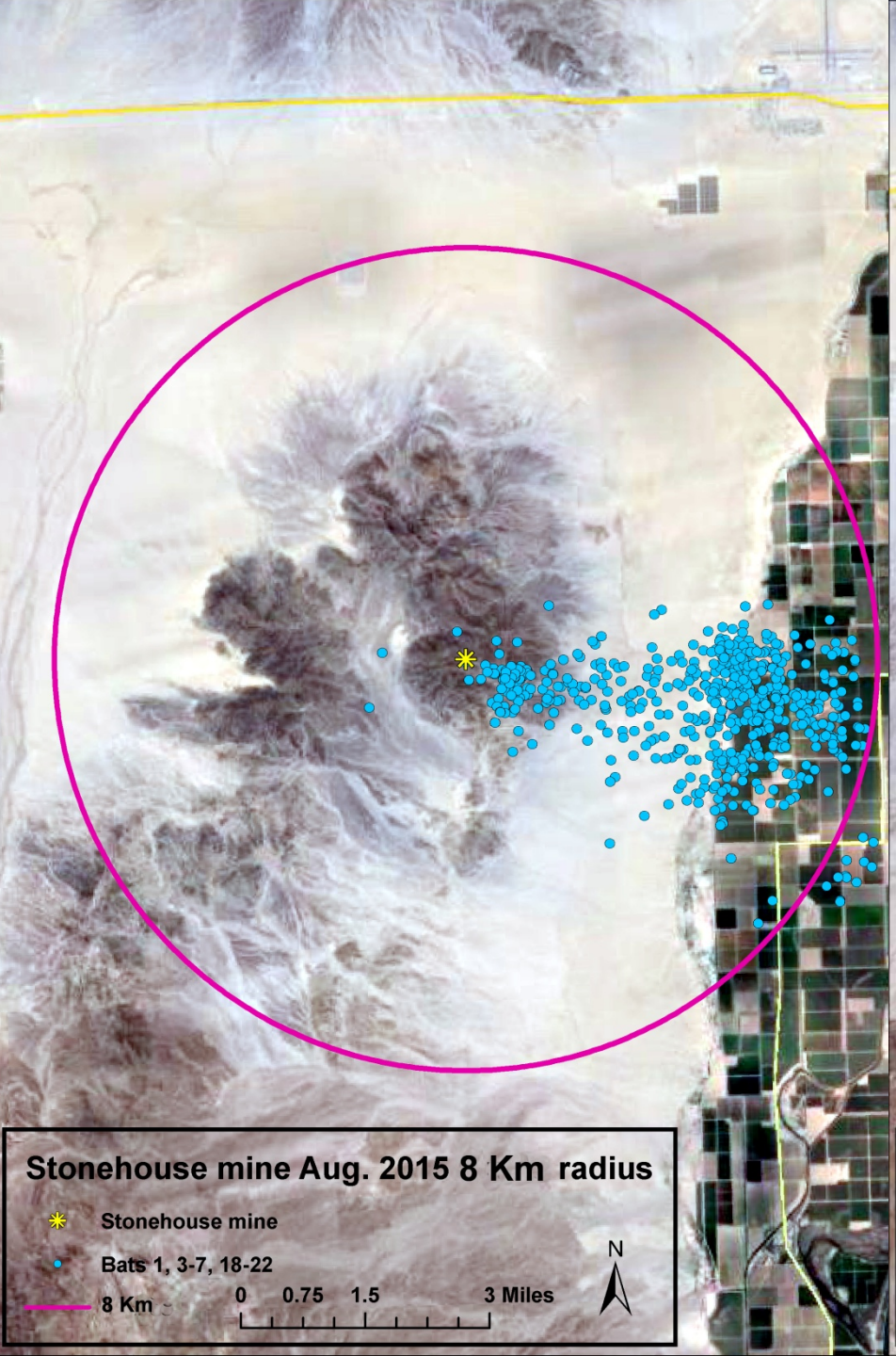
- Four different instances of finding red bats roosting in a cluster
- Often from visit to visit the number of bats in a cluster would vary with a minimum of 2 and a maximum of 8 bats

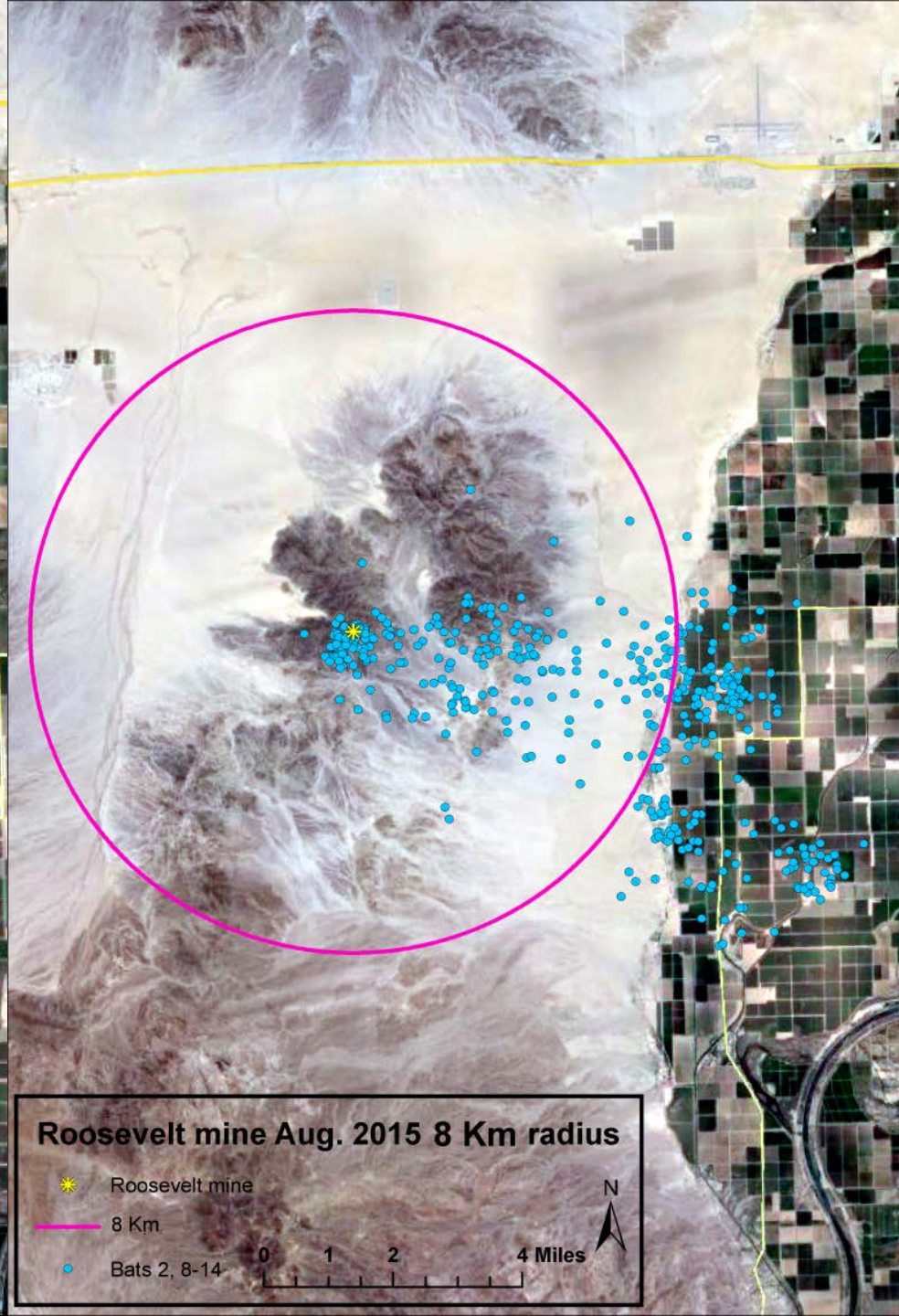
Population Genetics of the California Leaf-Nosed Bat

- Tissue samples collected at known roosts and at habitat creation areas during capture surveys
- Mitochondrial and microsatellite analysis conducted
- Stay tuned for Jeff's talk!

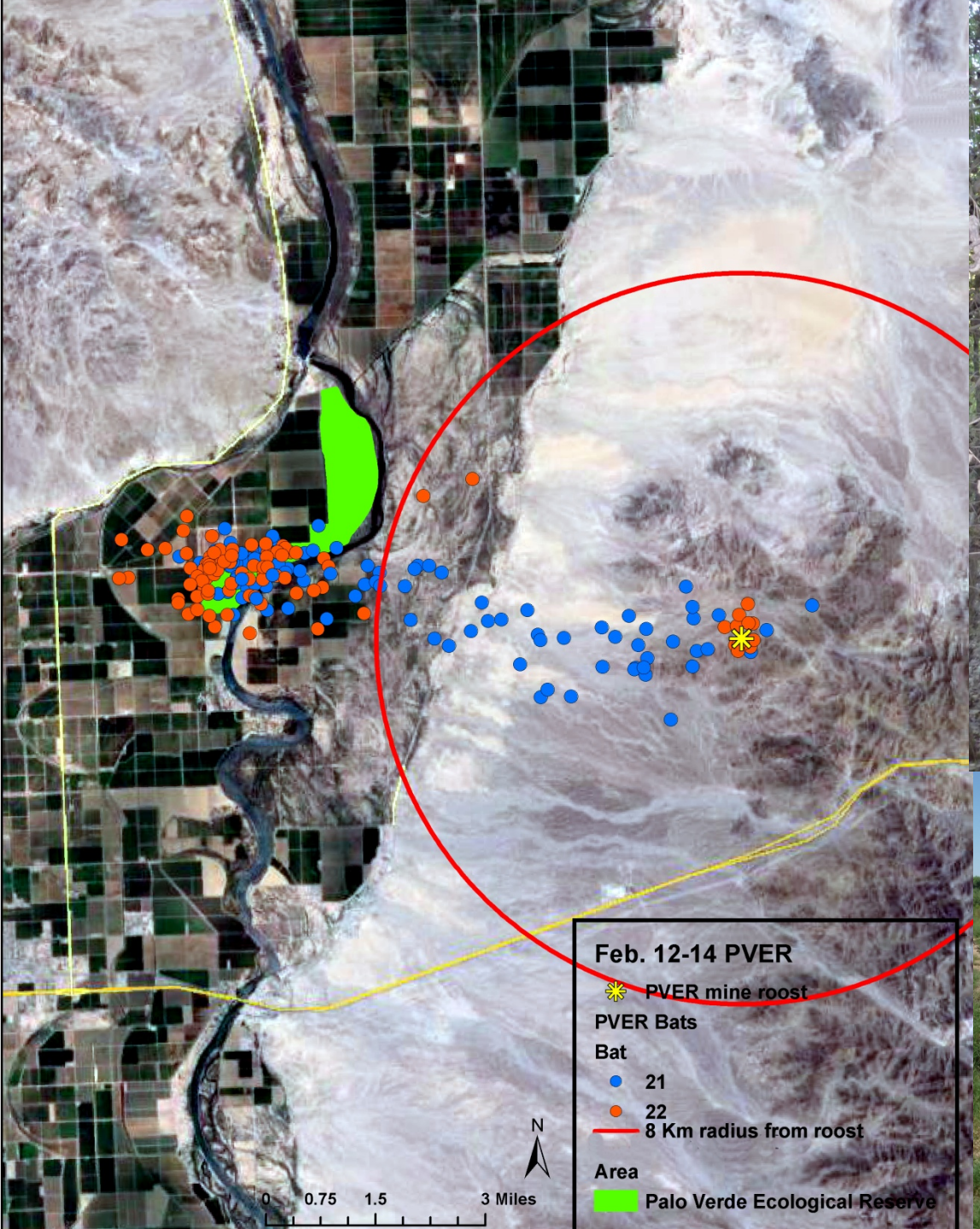
Foraging Distance Study for California Leaf-Nosed and Townsend's Big-eared Bats

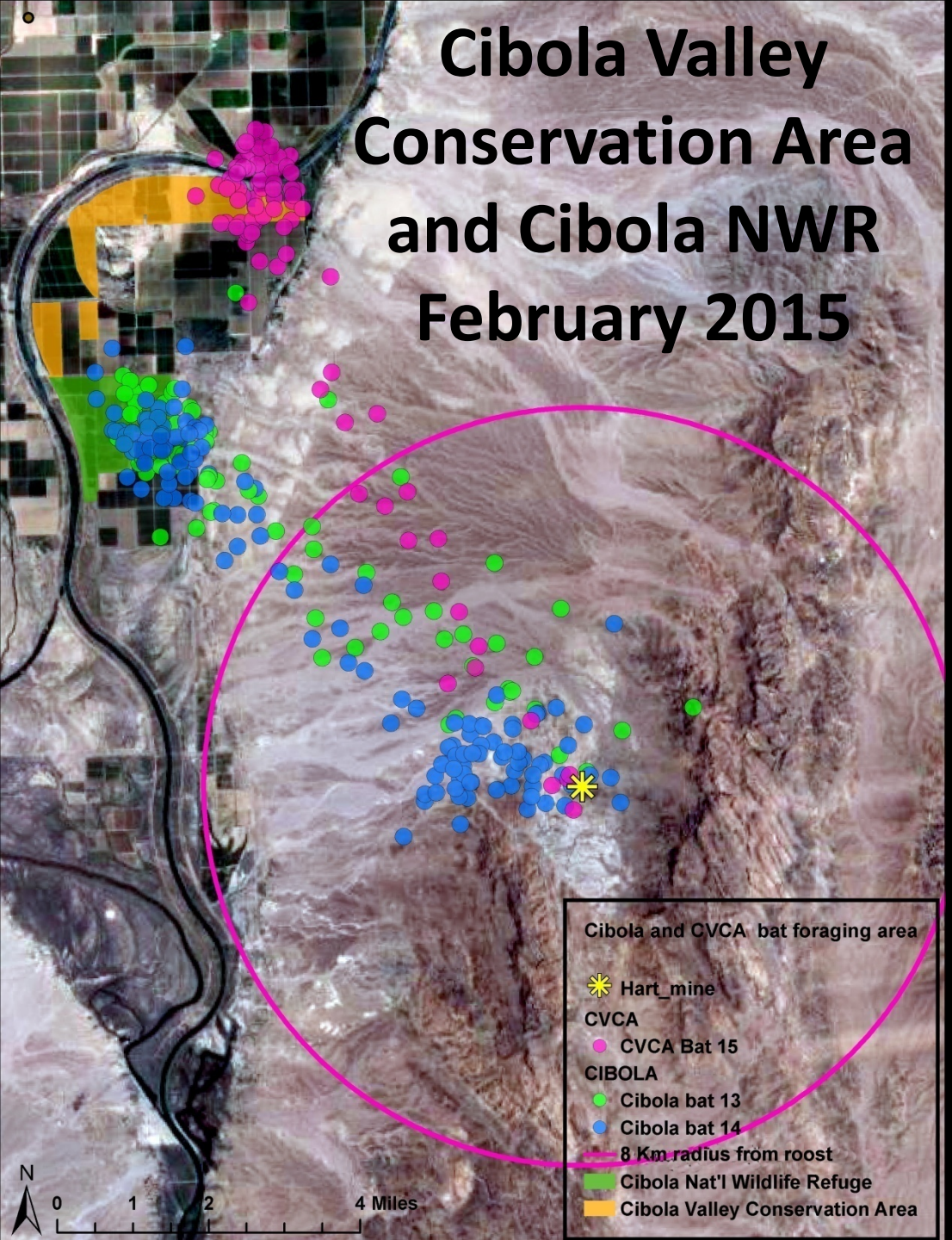
- Bats radio-tracked from known roosts and from habitat creation areas using ground and aerial telemetry


Stonehouse mine Aug. 2015 8 Km radius
Stonehouse mine
Bats 1, 3-7, 18-22
8 Km
0 0.75 1.5 3 Miles
N


Roosevelt mine Aug. 2015 8 Km radius
Roosevelt mine
8 Km
Bats 2, 8-14
0 1 2 4 Miles
N

Palo Verde Ecological Preserve





Leaf-nosed bats will regularly travel over 8 km (5 mi) from their roosts to forage at MSCP conservation areas

Townsend's tracked in Aug 2016

Stick around for Pat's talk!

Acknowledgements

Theresa Olson, Pat Brown, Bob Berry, Susan Broderick, Bea Vizcarra, Lin Piest, Joel Diamond, Ronny Mixan, Jeff Hill, Jenny Smith, Joe Kahl, Mary Ellen Chavez, Chris Dodge, Nathan Lenon, Sean Neiswenter, Carrie Ronning, John Swett, Nathan Rudd, Joe Sims, Michael Ingraldi, Angie McIntire, Carol Chambers, Bill Rainey, Tom Burke, the rest of MSCP, Havasu NWR, Bill Williams River NWR, Cibola NWR, Imperial NWR, AZGFD, CDFW, CRIT Tribe, City of Yuma, Quechuan Tribe and the MSCP Steering Committee, and the many many many volunteers and field helpers that made all of these projects a success!

Questions?

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

NATIONAL PARK SERVICE

Mojave Desert Network
Inventory&Monitoring

Lower Colorado River
Multi-Species Conservation Program

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