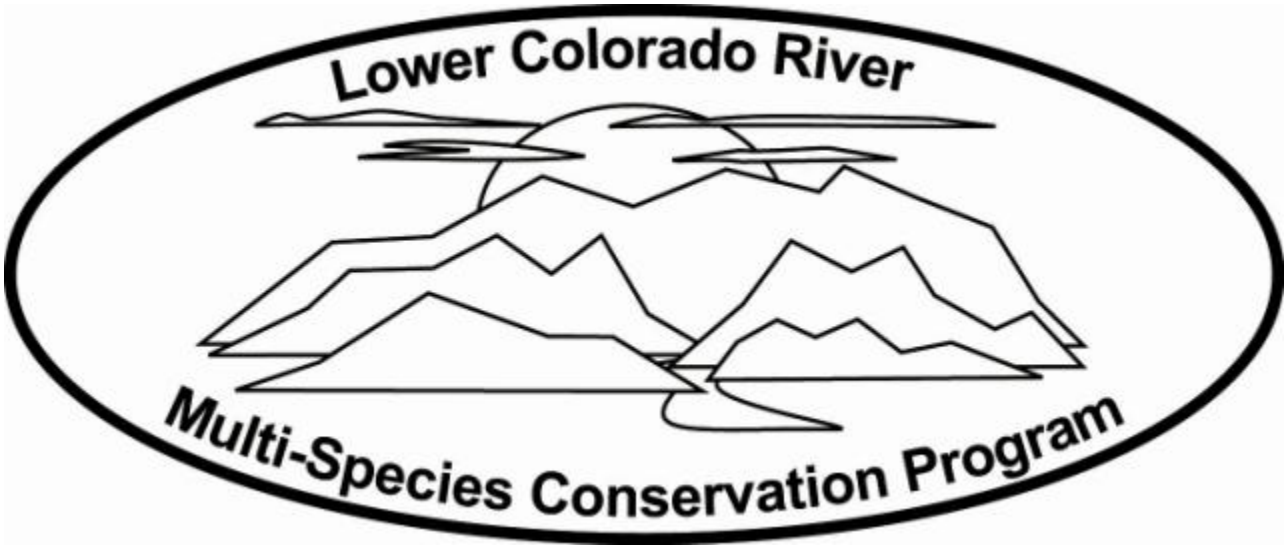
Bonytail post-stocking monitoring in Lake Havasu

KRISTEN G. HUMPHREY, BRIAN R. KESNER, AND PAUL C. MARSH

MARSH & ASSOCIATES, LLC

Colorado River Aquatic Biologist Meeting
January 6 – 7, 2016
Laughlin, Nevada, U.S.A.

Funding for this project has been provided by the Lower Colorado River Multi-Species Conservation Program.

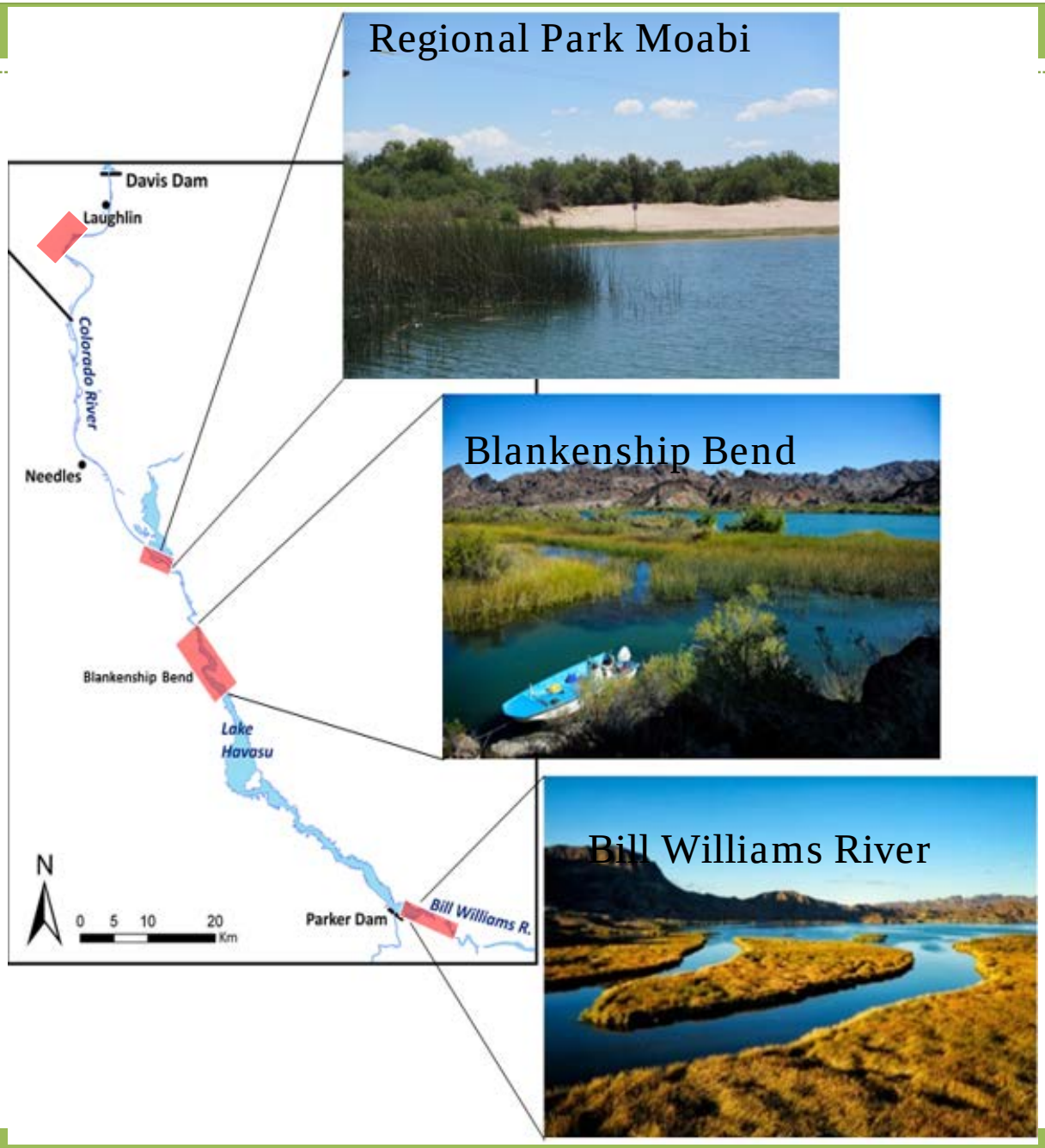


Endangered Bonytail (*Gila elegans*)

- Last wild bonytail captured in Lake Havasu in the 1970's
- Rely entirely on stocking programs - over 216,000 stocked since 1981
- 307 have been recaptured (3 fish >yr)
- 1,220 contacted by PIT scanners (5 fish >yr)

Study Area – Lake Havasu

- LCR MSCP Reach 3
- Davis to Parker Dam
- Non-native sport fish:
  - Striped bass
  - Largemouth bass
  - Flathead catfish



Objectives

- Short-term survival estimates (1-3 months)
- Monitor movements and/or movement patterns of individual bonytail
- Identify specific habitat types used or preferred

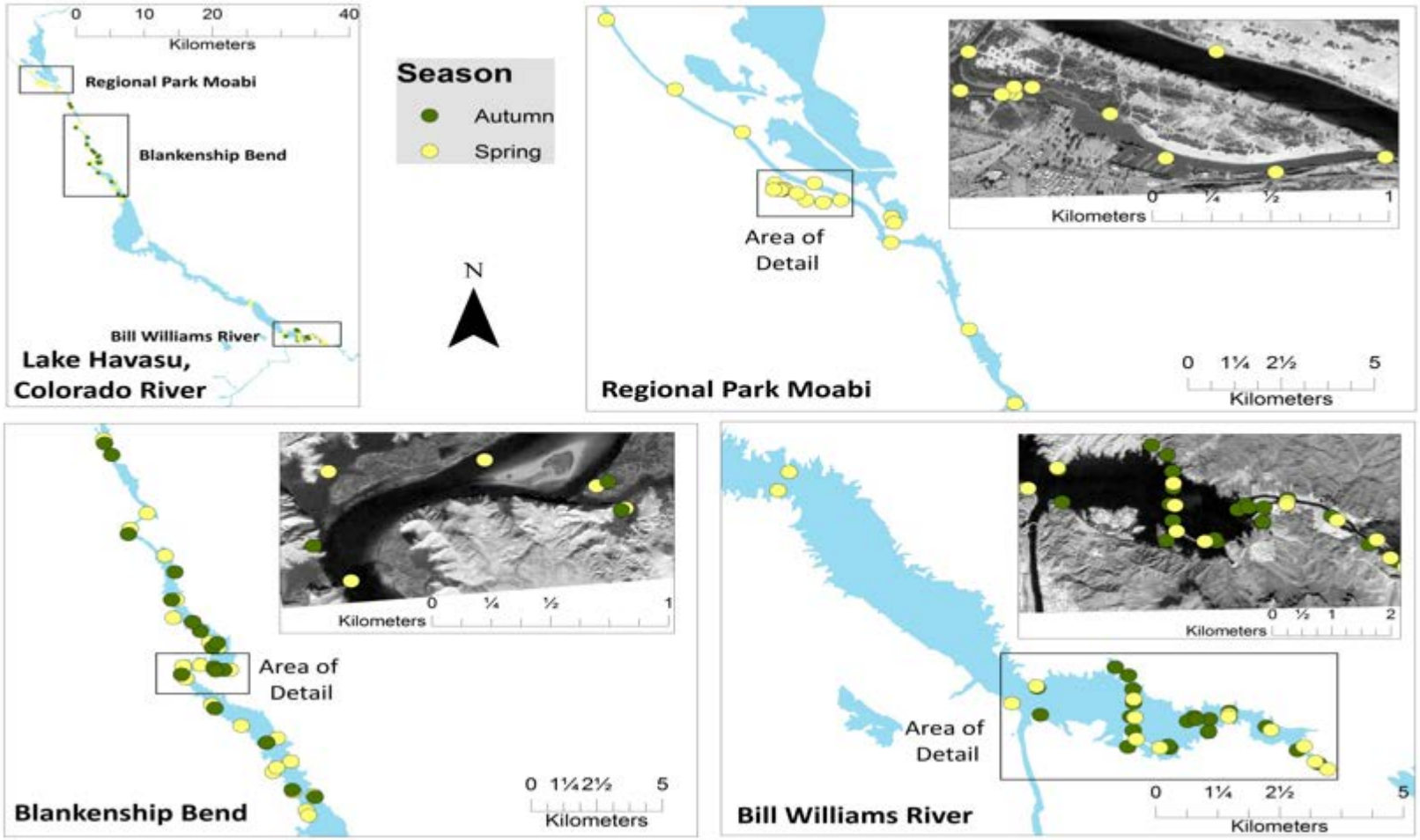
Acoustic Telemetry

- Surgeries
  - PT-4 or IBT-96-9-I acoustic transmitters (Sonotronics, Inc.)
  - Radio tags at Laughlin Lagoon
  - Abdominal cavity
  - Tricaine methanesulphonate (MS-222)

- Active tracking
  - Towable omnidirectional hydrophone
  - Directional hydrophone (triangulate)
  - Underwater diver receiver (UDR, recover tags)

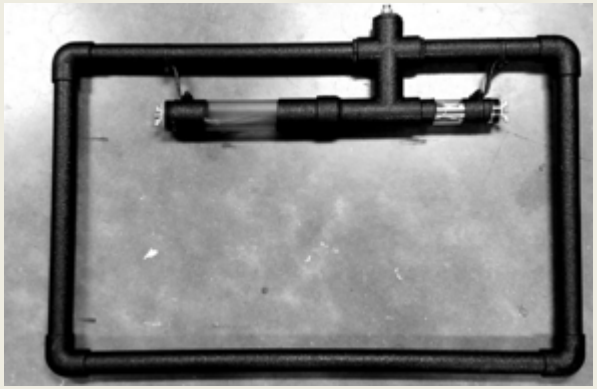
- Passive tracking
  - Submersible ultrasonic receivers (SURs) deployed throughout the study area targeting passageways of fish movement

SUR deployments



Passive integrated transponder (PIT) scanning

- Remote PIT scanning systems, developed in-house at Marsh & Associates, LLC (M&A), were deployed throughout the study areas following the release of PIT tagged bonytail



Study fish

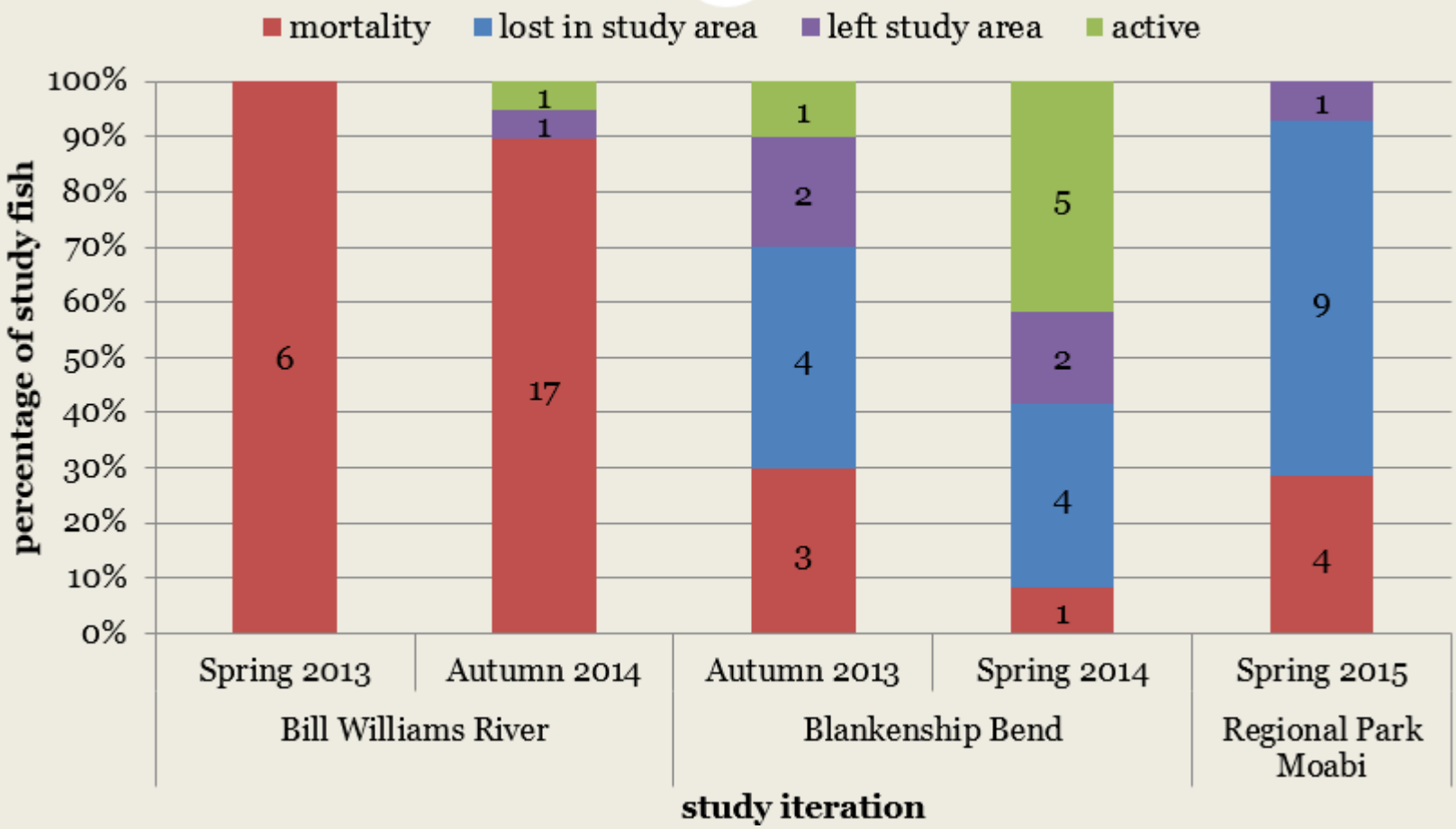
Acoustic

Season	Location	Telemetry study fish	Mean TL (mm)
Spring 2013	Bill Williams River	6	325
Autumn 2013	Blankenship Bend	10	306
Spring 2014	Blankenship Bend	12	346
Autumn 2014	Bill Williams River	19	324
Spring 2015	Regional Park Moabi	14	349
Winter 2015/16	Laughlin Lagoon	12 (acoustic) 12 (radio)	402
		85	

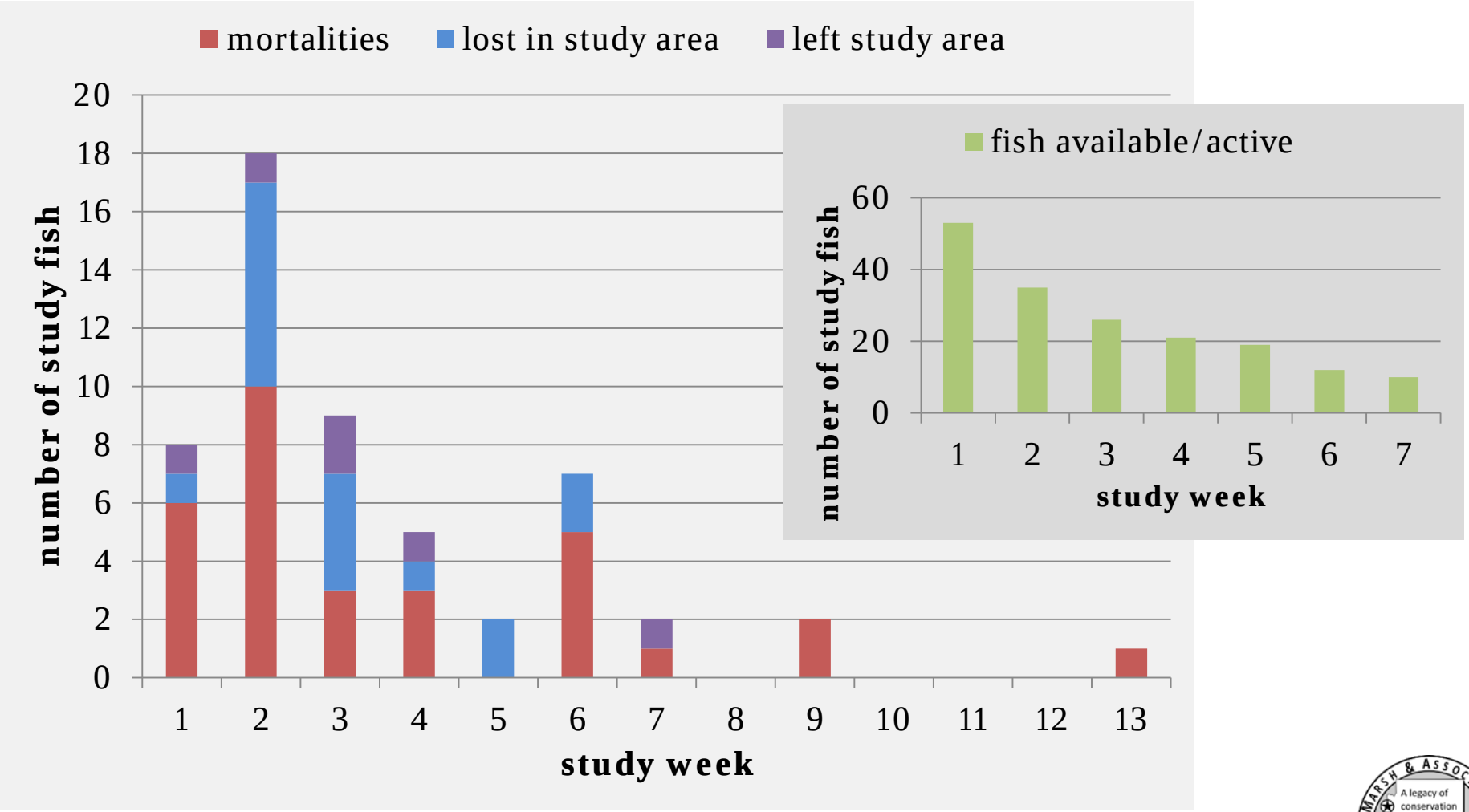
PIT

Season	Location	PIT tagged stocked bonytail	Unique contacts (%)
Winter 2014	Blankenship Bend	509	23%
Autumn 2014	Bill Williams River	2080	5%
Winter 2015	Bill Williams River	4019	5%
Spring 2015	Regional Park Moabi	424	68%
Winter 2015/16	Laughlin Lagoon	947	

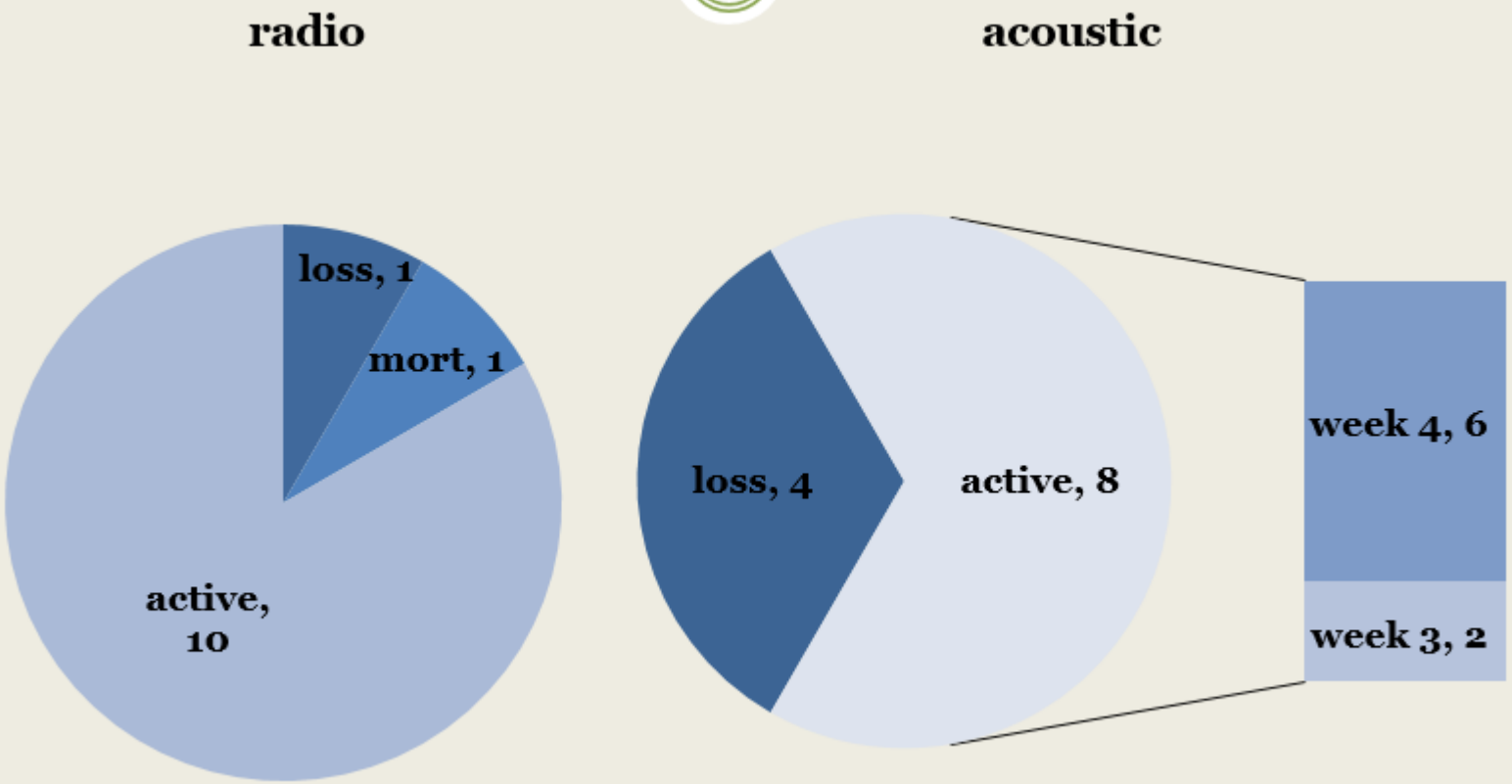
Telemetry Results



Telemetry Results



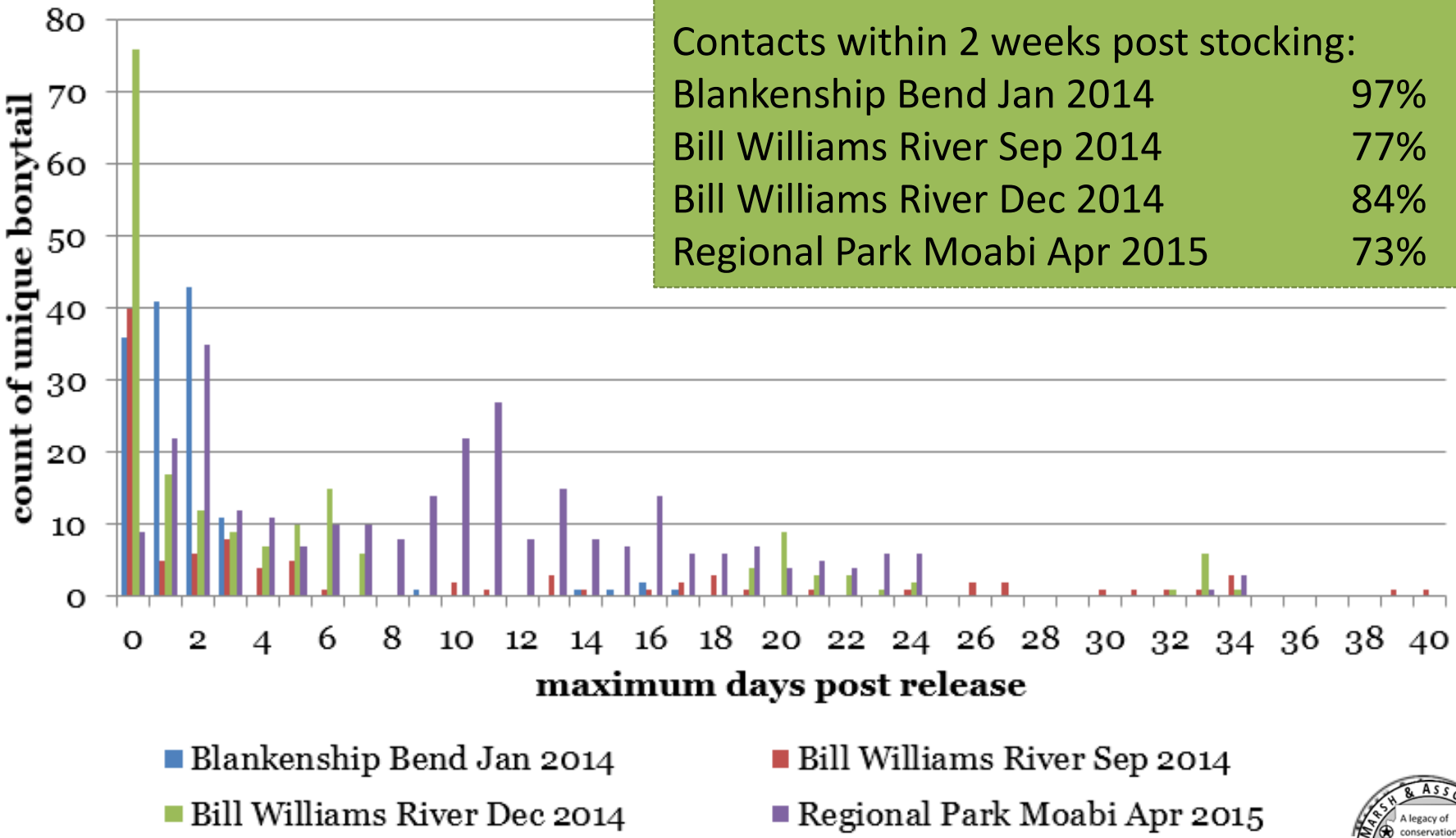
Laughlin Telemetry : Preliminary Week 4 Data



PIT Scanning Results

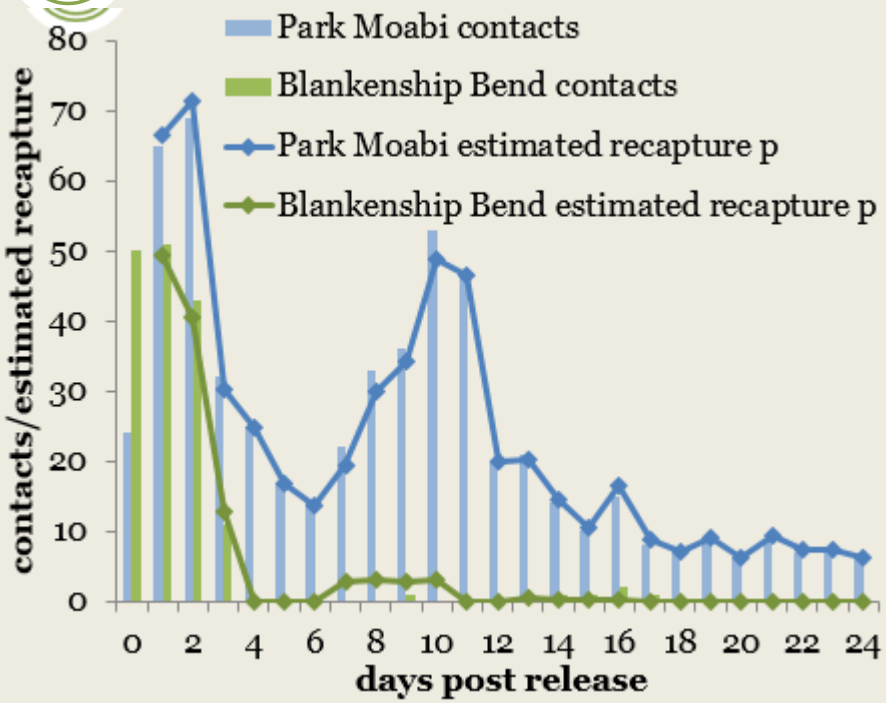
Contacts within 2 weeks post stocking:

Blankenship Bend Jan 2014	97%
Bill Williams River Sep 2014	77%
Bill Williams River Dec 2014	84%
Regional Park Moabi Apr 2015	73%



Survival

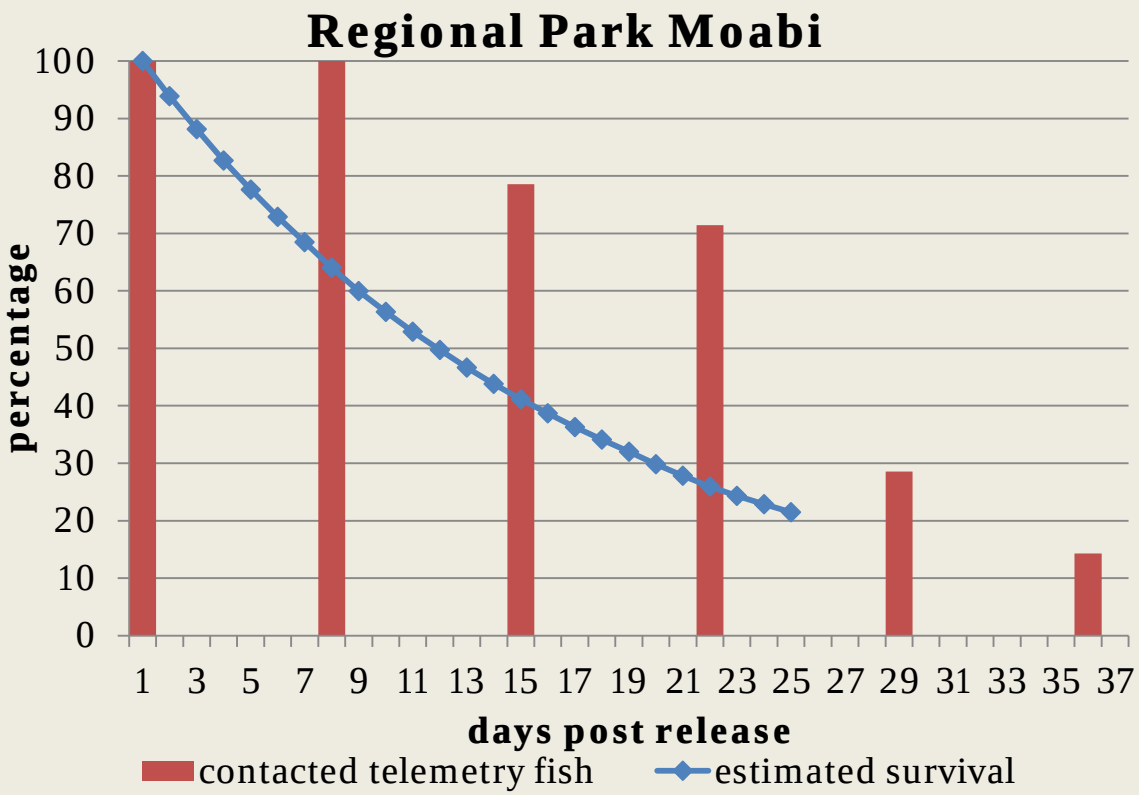
- MARK Cormack-Jolly-Seber (CJS) model
  - Group: release site and season
  - 25 encounter histories
- Recapture probabilities p (group and time)
- Apparent daily survival ϕ (group)
  - Blankenship Bend: 70.3 – 71.6%
  - Regional Park Moabi: 93.2 – 93.9%



Model	QAICc	Delta QAICc	QAICc Weights	Model Likelihood	Number of Parameters	QDeviance
φ(group) p(group+time)	4429.554	0.000	0.679	1.000	27.000	850.000
φ (group) p(time)	4431.202	1.648	0.298	0.439	26.000	853.717
φ (group+time) p(time)	4438.187	8.633	0.009	0.013	48.000	814.547
φ (.) p(group*time)	4438.835	9.281	0.007	0.010	49.000	813.065
φ (group+time) p(group+time)	4439.073	9.518	0.006	0.009	50.000	811.171
φ (group) p(group*time)	4440.958	11.404	0.002	0.003	50.000	813.056

Survival estimates

- Blankenship Bend: release group **disappear** within 24 days post release
- Regional Park Moabi: release group decrease to **22%** within 24 days post release



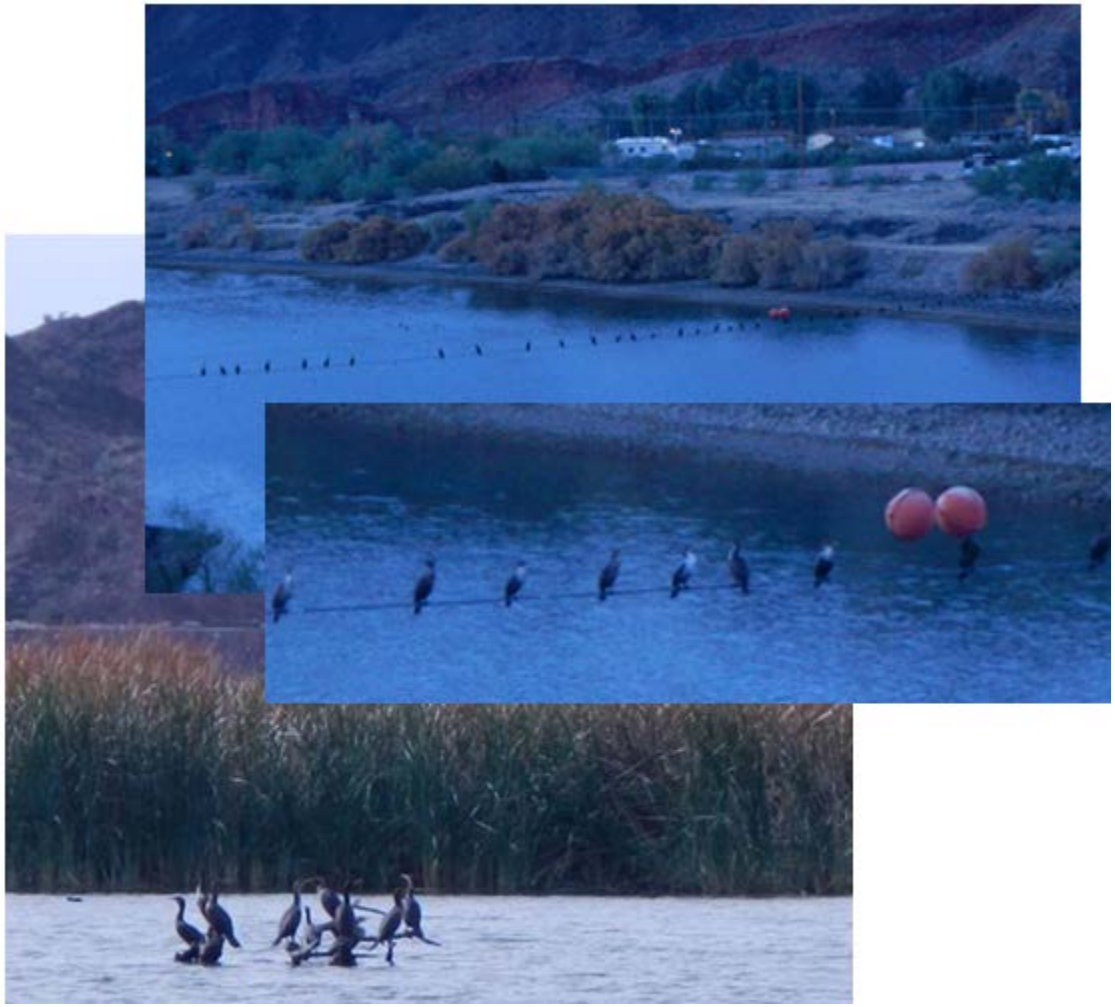
Predation

(Photo Credit: Rick Wydoski [BOR])

- Do not attribute mortalities to surgical techniques
  - Dummy tags
  - No fish remains at tag recovery sites
- Trammel netting
  - 2 bonytail mortalities inside the digestive track of a non-native largemouth bass at Blankenship Bend

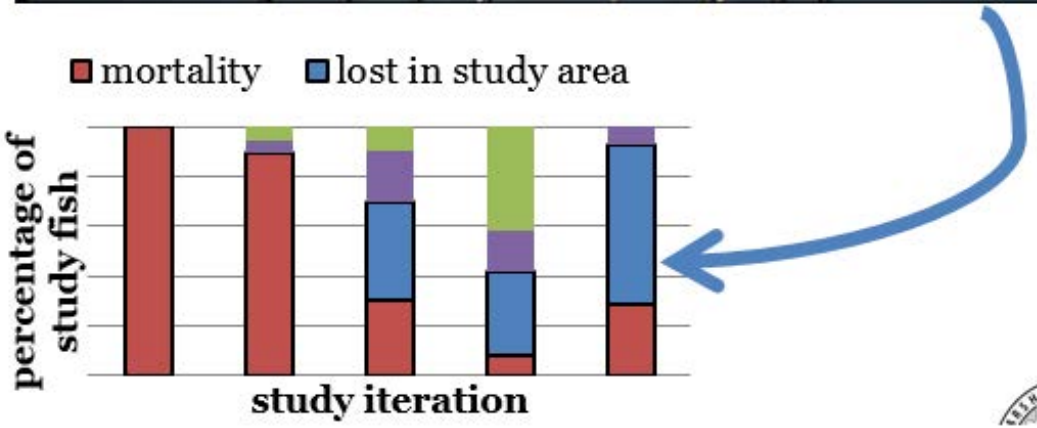
Avian predation

- Tags contacted under known Double-Crested Cormorant roost sites
  - Powerlines and downstream from Parker Dam
  - 5 acoustic tags
  - 14 PIT tags



Avian predation

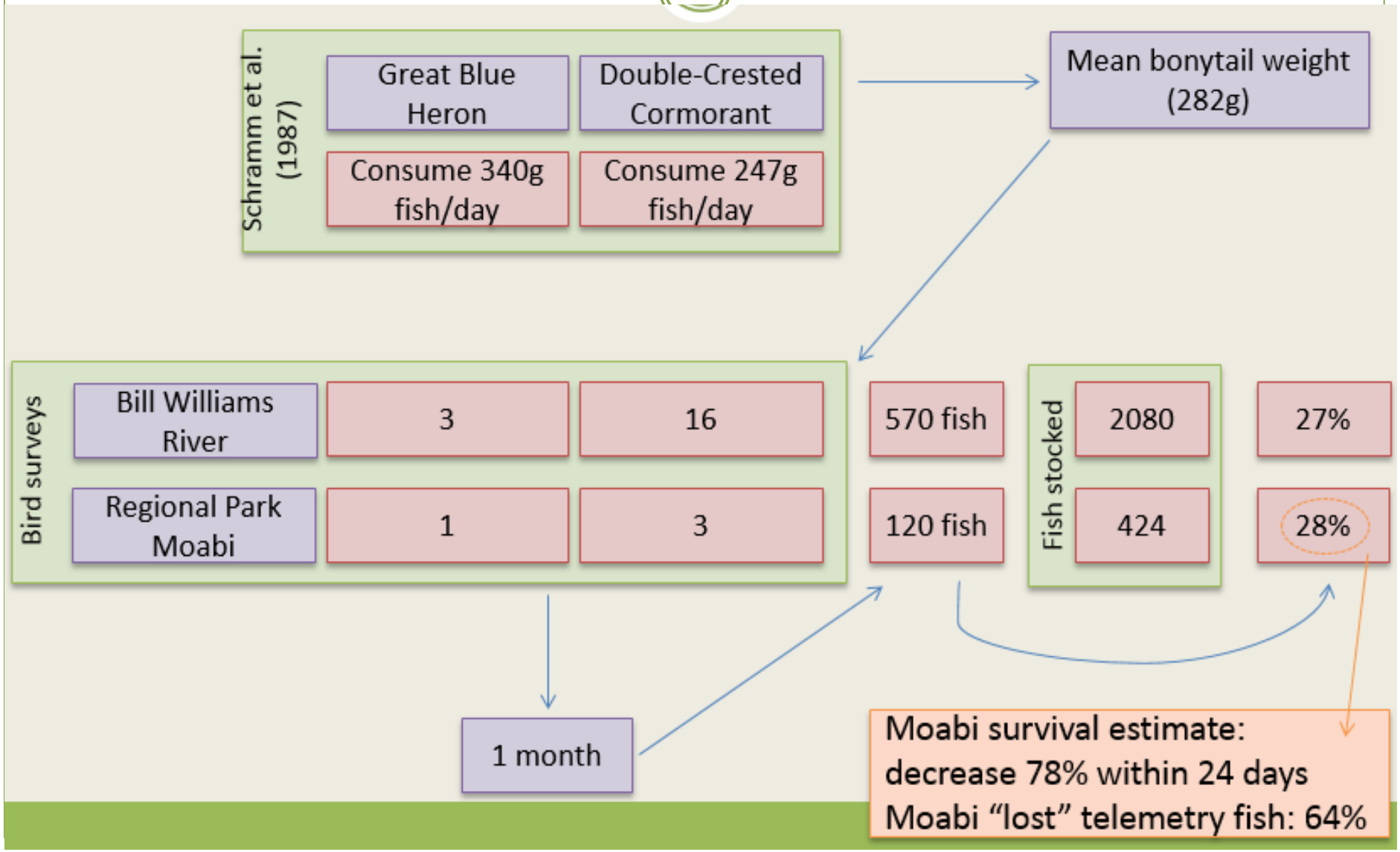
- Talon markings
- Increased avian activity after stocking
- Observed predation events by Great Blue Heron



Regional Park Moabi Spring 2015

Recovered radio tag at Laughlin Lagoon within 1 week post release

Avian predation: how many fish can birds eat?



Minimal Movement and Habitat Data

- 49 – 84% passive contacts sundown
- Movement
  - Park Moabi & Bill Williams River: 3/43 permanently emigrated
  - 201/227 still in marina area of Laughlin Lagoon
  - Blankenship Bend: 3x greater (spring 2014 main channel release)
- Bulrush use
  - 20% of active contacts at Regional Park Moabi
  - Direct observation

Laughlin Lagoon
Bulrush

Bulrush
Laughlin Lagoon

Bulrush
Fish 163
Regional Park Moabi

Laughlin Lagoon

Summary

- Post stocking survival of bonytail is low
  - Predation by non-native fish and birds of prey (Double-Crested Cormorants and Great Blue Herons) contribute to low bonytail survival
  - Lost study fish within SUR confined study areas may be due to avian predation
- PIT scanning is an effective means of monitoring post-stocking bonytail survival
  - PIT scanning data complement telemetry data
  - Sharp decreases in contacts after two weeks post release
- Most telemetry fish were lost or confirmed mortalities within a month after release, and few fish were available long enough post release to determine movement patterns and habitat selectivity

Future Work

- Radio telemetry this December at Laughlin Lagoon to further investigate avian predation (find “lost” fish)
- Increasing the size of study fish will decrease predation threats (Marsh et al. 2005)
- Telemetry tags with a dissolvable “trigger” to detect consumption by a predator (Hydroacoustic Technology, Inc. 2014)
- Investigate post-stocking survival with alternative stocking options such as protected backwaters

Thanks to our partners for their support

Southwest Native Aquatic Resources & Recovery Center (SNARRC)

Lake Mead Fish Hatchery

USFWS Achii Hanyo Native Fish Rearing Facility

Special thanks to
Eric Best
Eric Laux
Jeff Lantow