

# 2015 annual summary of remote PIT scanning efforts in Reach 3



**CHASE EHLO, BRIAN KESNER,  
AND PAUL MARSH**

***MARSH & ASSOCIATES, LLC***



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# Background

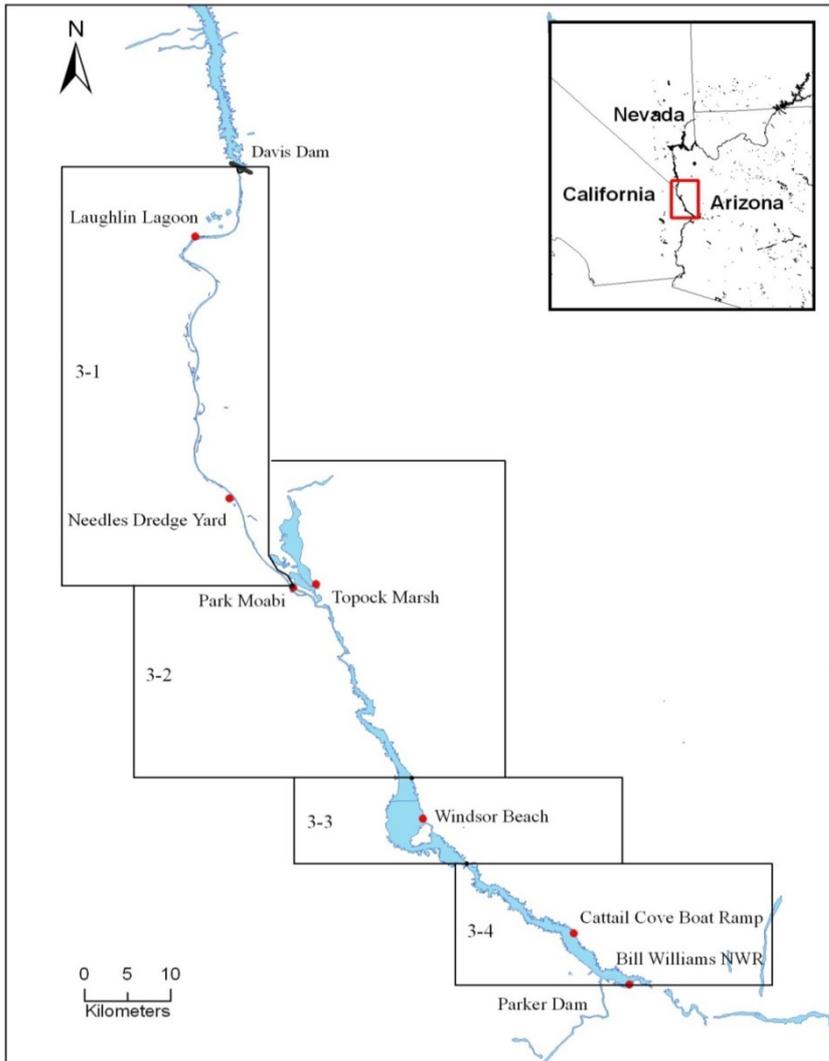


Abraham Karam

- Lake Havasu
  - LCR MSCP Reach 3
  - Between Davis and Parker dams
  - Suite of non-native sport fish
- Razorback sucker
  - No natural population in Lake Havasu
  - Over 50,000 stocked since 2006
  - Population numbers in thousands
  - Post-stocking survival unknown
  - Spawning aggregates observed
    - ✦ From Laughlin downstream to Needles

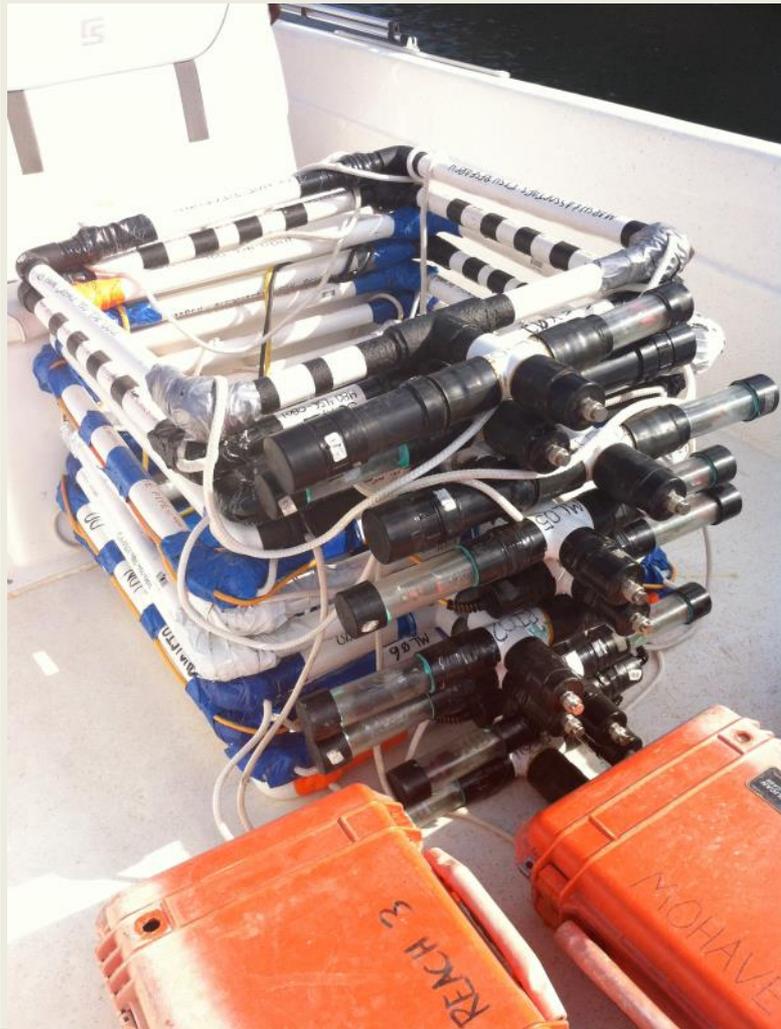


# Study Area



- Divided into four 'zones'
  - **3-1** - Riverine clear waters downstream of Davis Dam
  - **3-2** - Topock Marsh, Lake Havasu delta
  - **3-3** - Wide basin of Lake Havasu
  - **3-4** - Lower Lake Havasu, Bill Williams River NWR

# PIT Scanning - Equipment



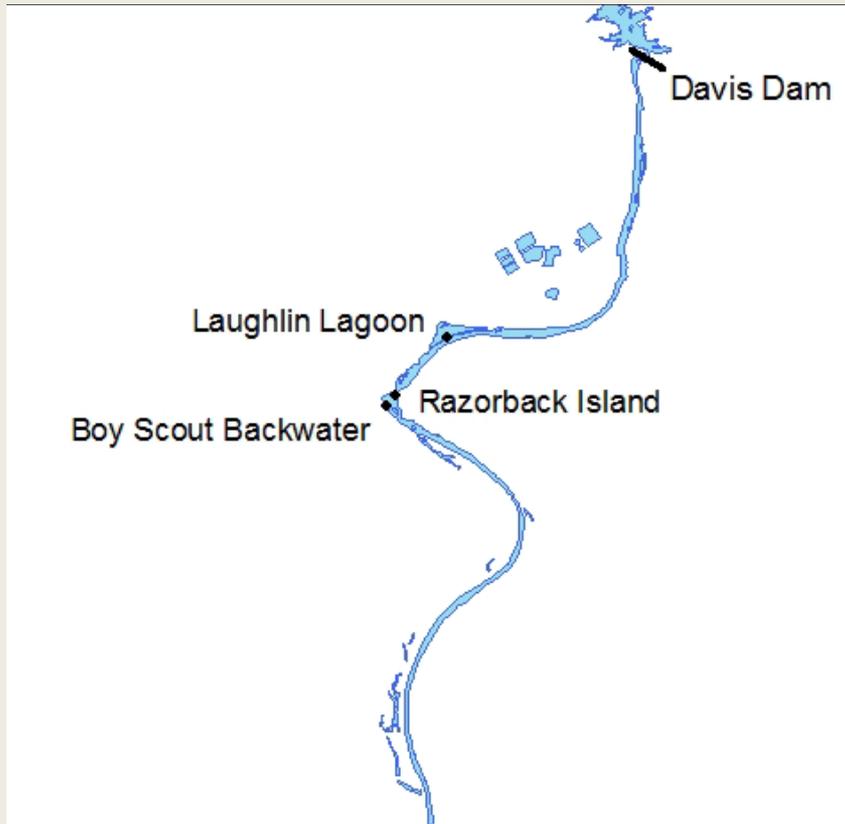
- Submersible PIT scanners
  - 80 x 80 cm antenna
  - Fully submersible to 10 meters
  - Retrieved via boat hook
  - 24-96 hour battery life
- Large submersible PIT scanners
  - 120 x 80 cm antennae
  - Submersible up to 10 meters
  - 96 hour battery life
- Shore based unit PIT scanner
  - 190 x 80 cm antenna
  - 50 meter cable connects logger to antenna
  - 96 hour battery life

# PIT Scanning



- November 2014 - April 2015
  - ✦ Eight sampling trips
  - ✦ 3 overnight deployments
  - ✦ Up to 8 submersibles
  - ✦ one shore based
- Assimilated all Reach 3 data
  - ✦ October 2014 to August 2015
  - ✦ M&A scanning in 3-2 and 3-4 for bonytail
  - ✦ BOR scanning in 3-1 and 3-2

# PIT Scanning in Zone 3-1 (Laughlin)



- Laughlin Lagoon
- Razorback Island

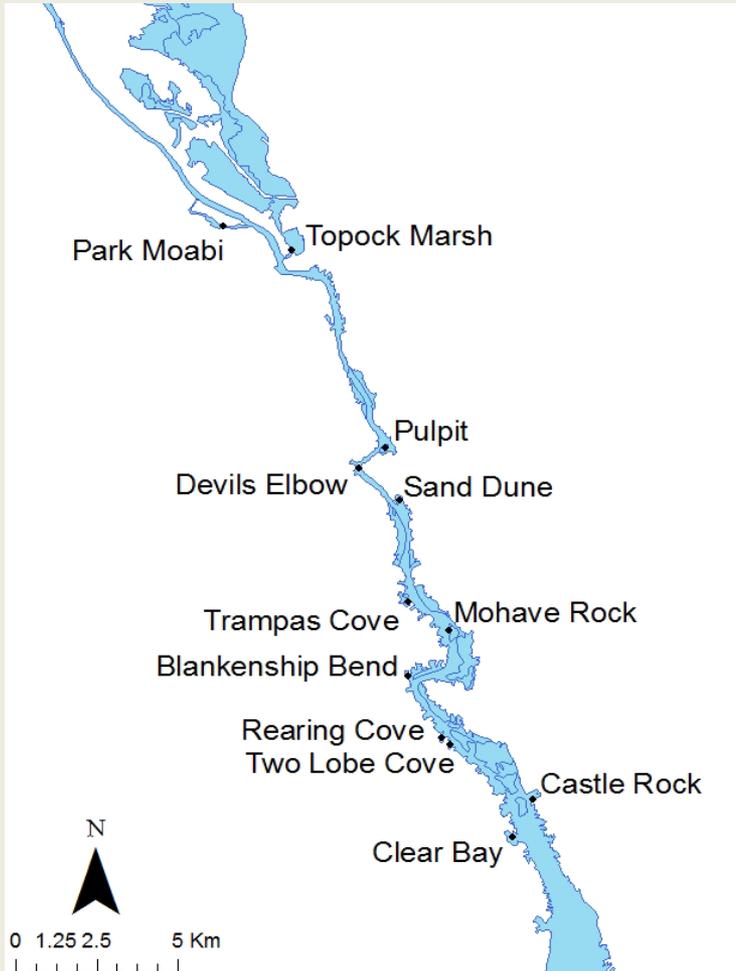
# PIT Scanning in Zone 3-1 (Needles)



- Palms
- Cliffs
- Cabana
- Tower
- White Wall
- Power Lines
- US 95 bridge
- Needles Dredge Yard



# PIT Scanning in Zone 3-2



- Park Moabi
- Golden Shores
- Pulpit
- Sand Dune
- Trampas Cove
- Blankenship Bend
- Two Lobe Cove
- Rearing Cove
- Castle Rock
- Clear Bay

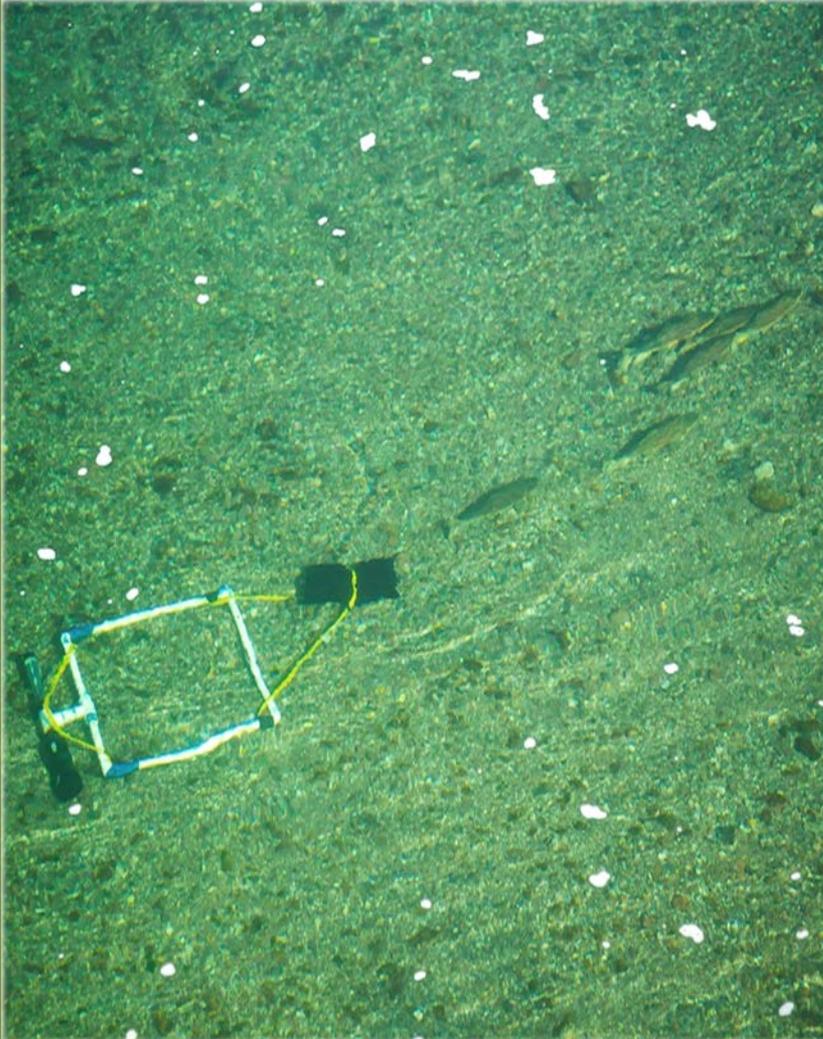


# Population Estimates



- Single census estimate
  - Modified Peterson formula
    - ✦ 
$$N^* = \frac{(M+1)(C+1)}{R+1}$$
    - 2014 Marking period
    - 2015 Capture period
  - 134 kHz PIT tagged fish
  - PIT scanned or captured

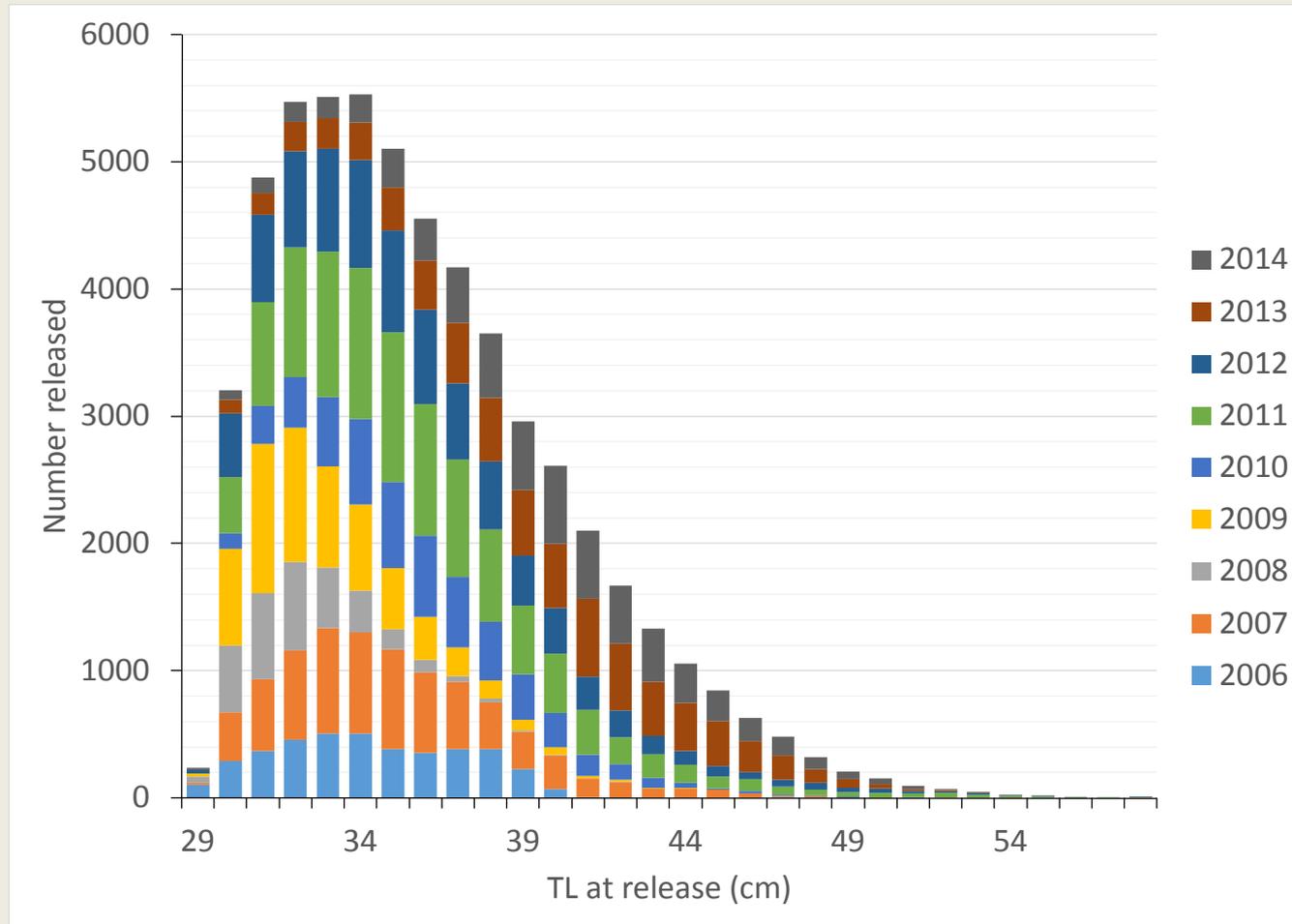
# Results – PIT scanning 2014



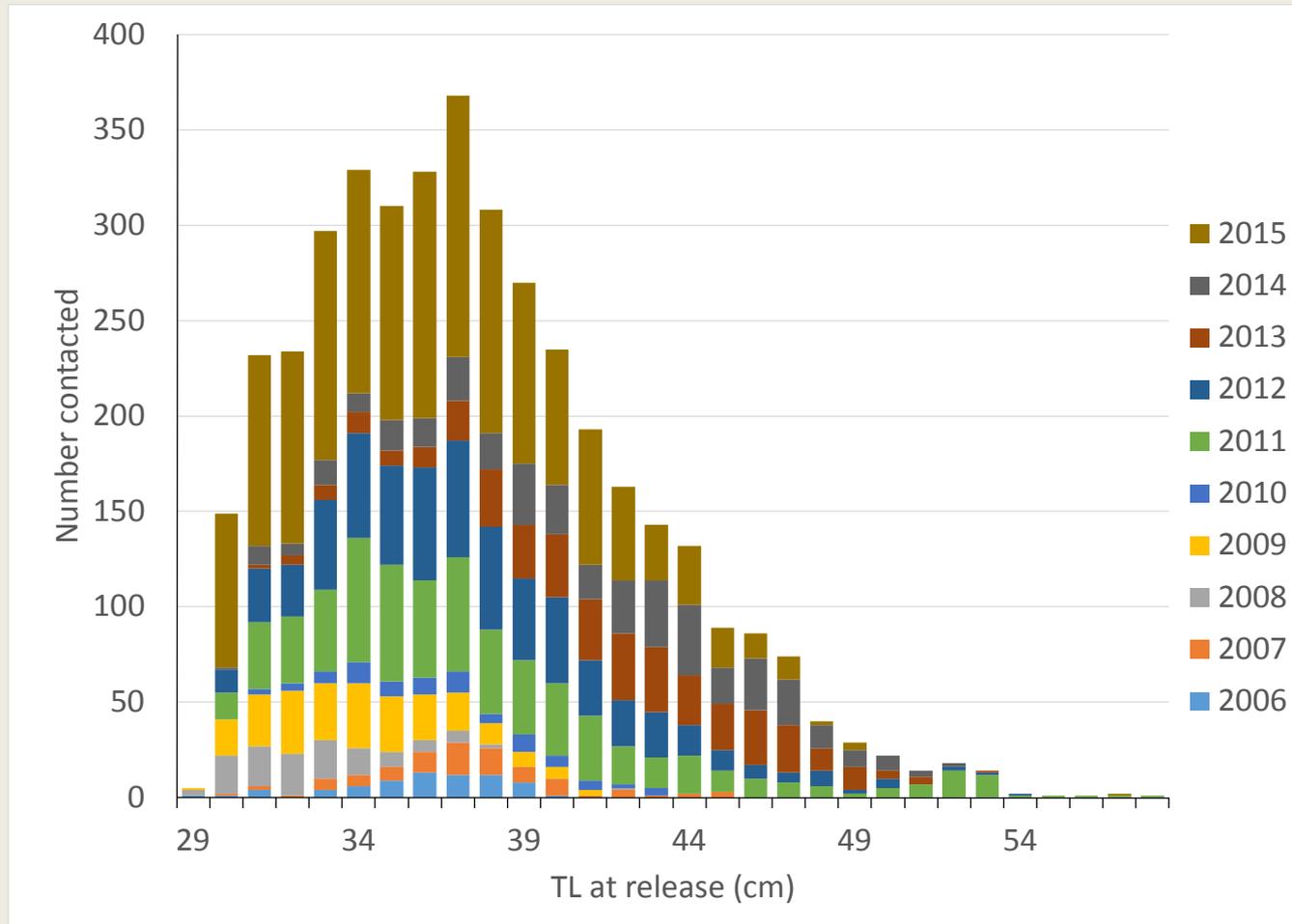
- M&A
  - 6195 total hours scanning
  - 2369 individuals
- M&A (bonytail scanning)
  - 15,551 total hours scanning
  - 1190 individuals
- Reclamation
  - 21,833 total hours scanning
  - 2203 individuals
- Combined
  - 4611 individuals
  - 4089 razorback sucker with a 134 kHz PIT tag release record
    - ✦ 1972 last year (2014)



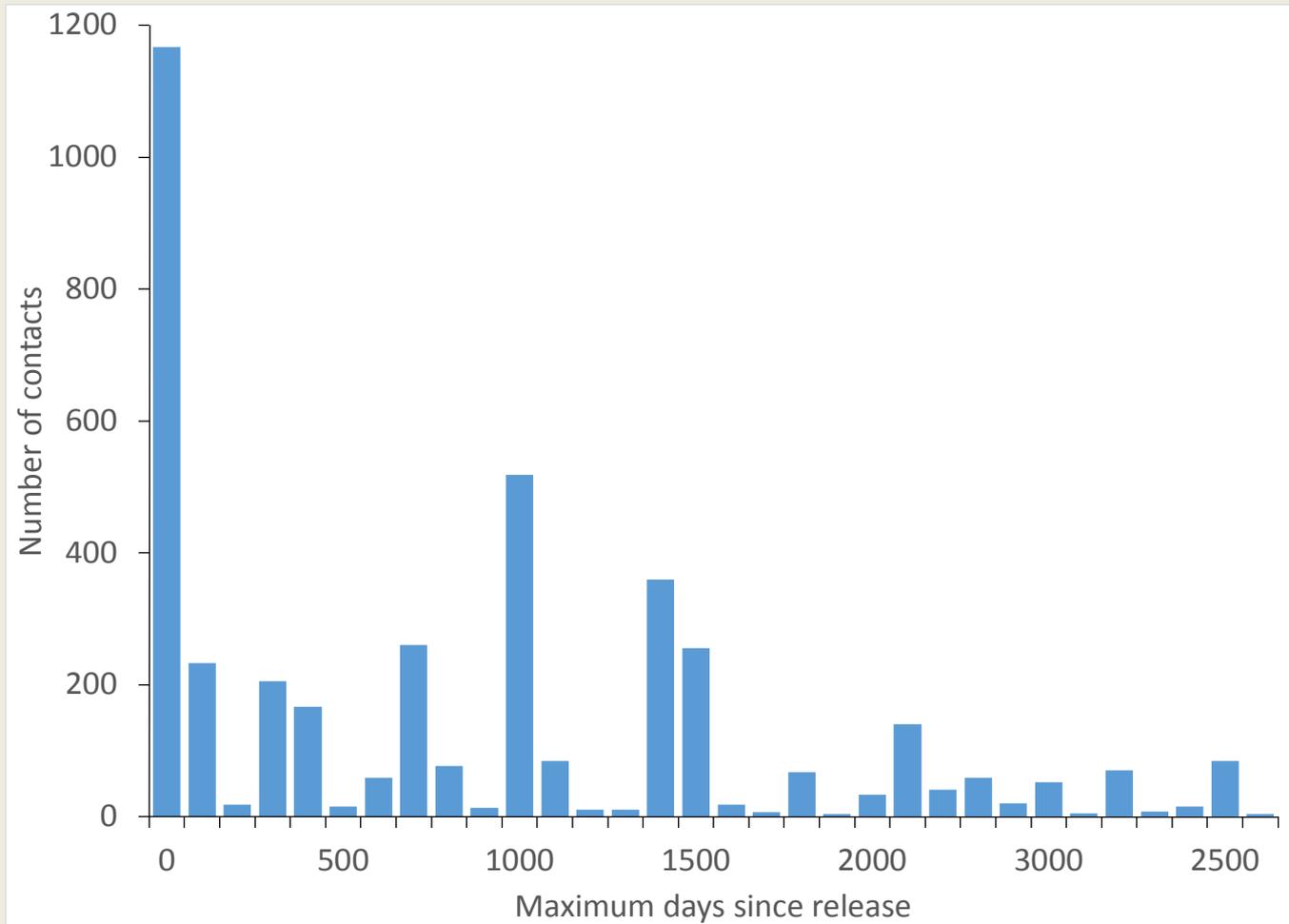
# Size at Release



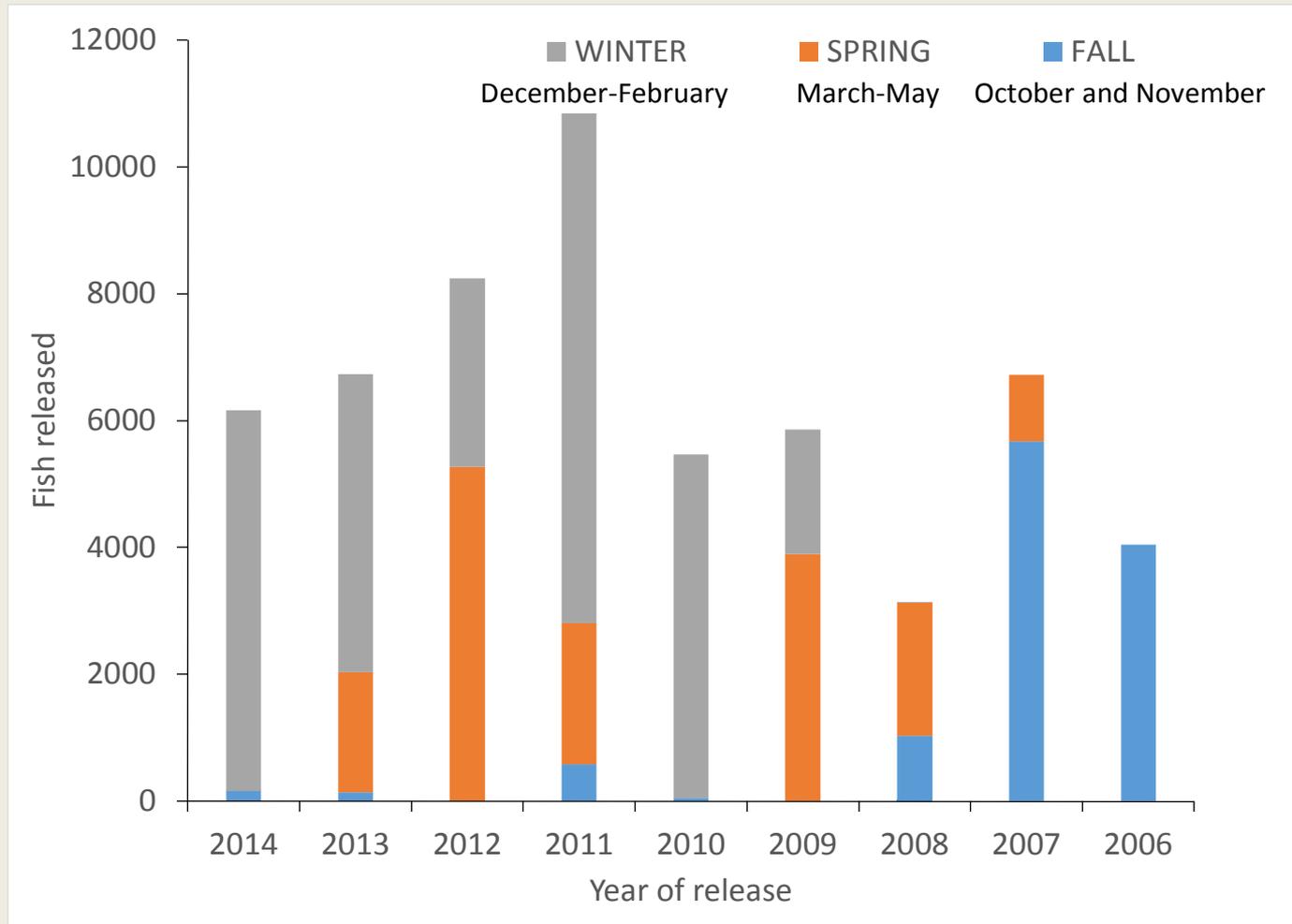
# Size at Release – Contacted in 2015



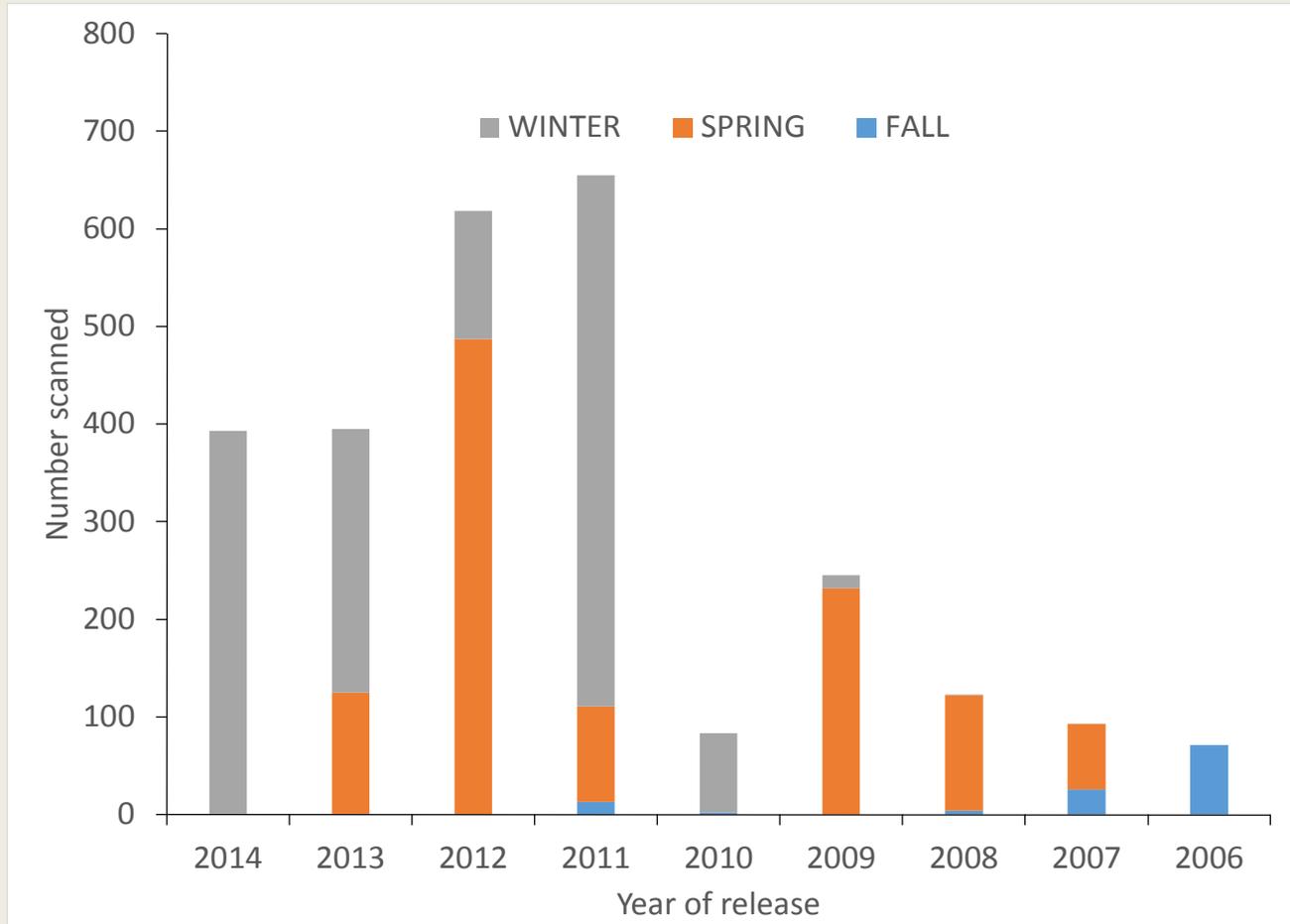
# Days at Large



# Season of Release



# Season of Release



# Results – Population Estimates



Year	Number Marked	Number Captured	Number recaptured	Population estimate (95% C.I.)
2011	228	642	59	2496 (1935-3220)
2012	934	1373	284	4524 (4027-5081)
2013	1335	1730	518	4456 (4089-4855)
2014	1852	2202	857	4795 (4496-5124)

$$N^* = \frac{(M + 1)(C + 1)}{R + 1}$$



# Discussion



- PIT scanning greatly increased contact rates
  - 1167 of 4089 fish were contacted less than 100 days post-release
- Population estimates are relatively stable
  - Utilization of PIT scanning has greatly improved precision of the estimate
- Population dynamics appear to differ from similar studies in Lake Mohave
  - Size at release and survival relationship different
  - Is adult survival similar?



# Thanks to our partners for their support

- USBR



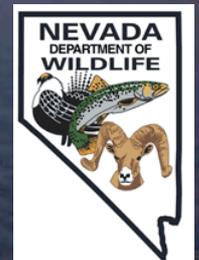
- USFWS



- NPS



- NDOW



- Cross Country Consulting, LLC

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