Remote Sensing Results of Stocked Bonytail and Razorback Sucker in Reaches 4 and 5 of the Colorado River

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MARSH & ASSOCIATES, LLC

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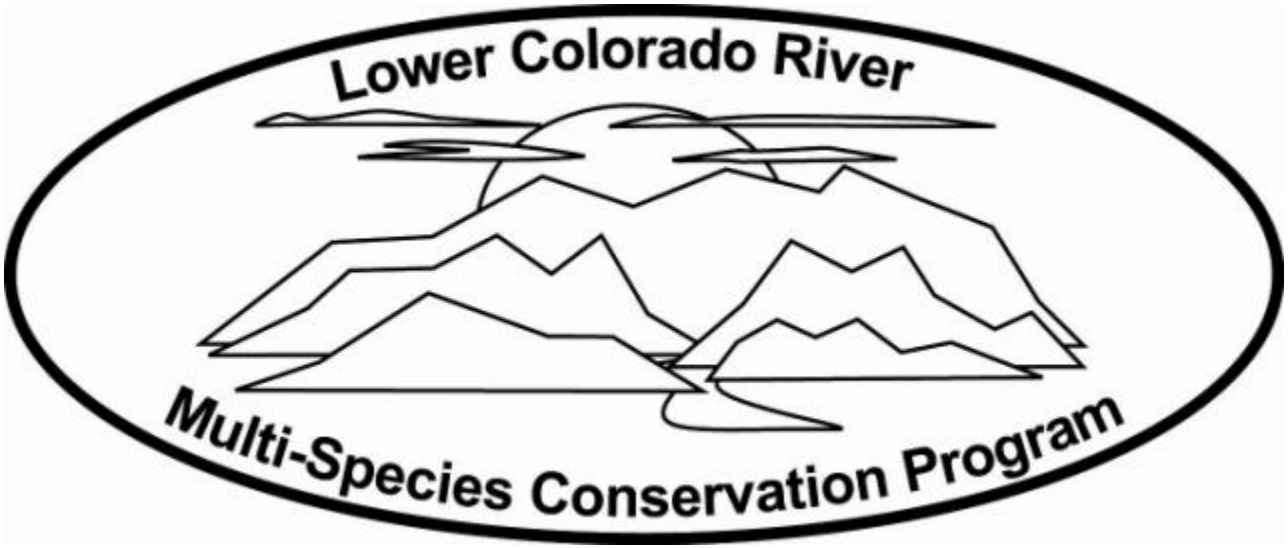
Funding for this project has been provided by the Lower Colorado River Multi-Species Conservation Program.



Background

- Reach 4-5
  - From the Parker Dam, south to the southern border of the Cibola National Wildlife Refuge
  - River miles 85.9-192.3
  - The stretch includes numerous backwater habitats

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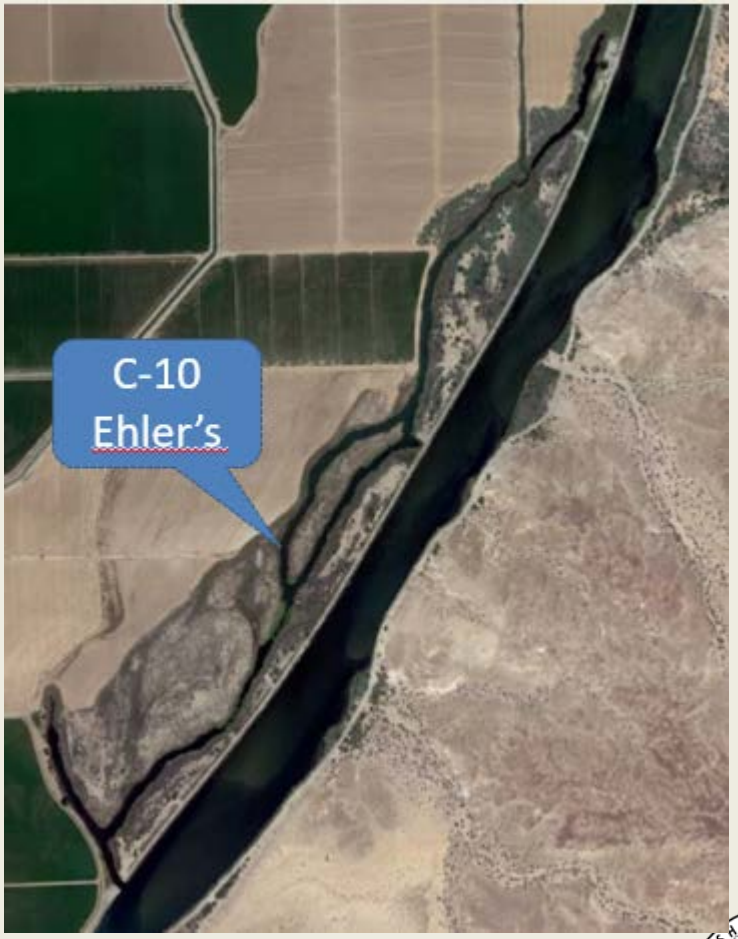
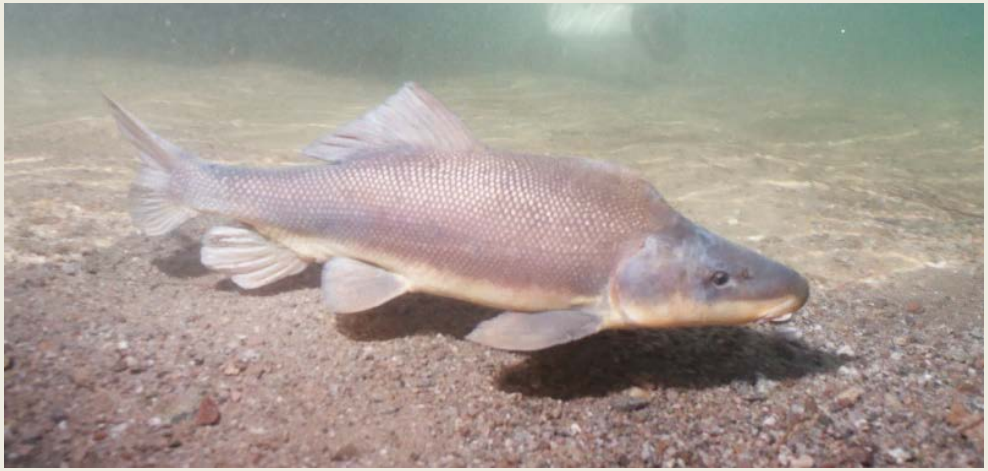


Background

Bonytail chub

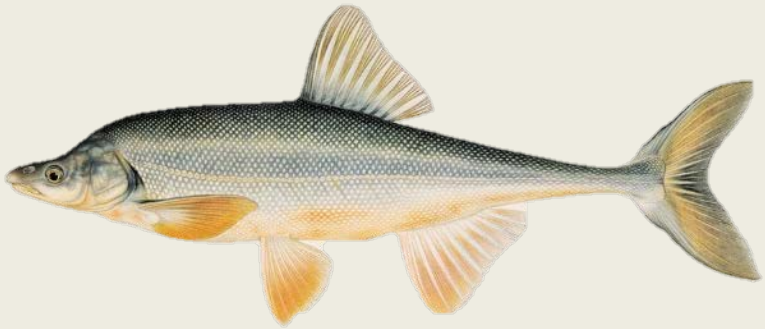
Gila elegans



Razorback sucker

Xyrauchen texanus

Background



Bonytail chub

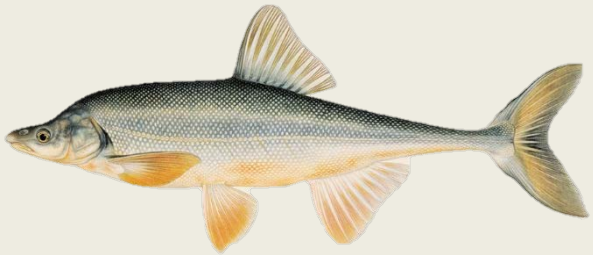
Gila elegans

Razorback sucker

Xyrauchen texanus

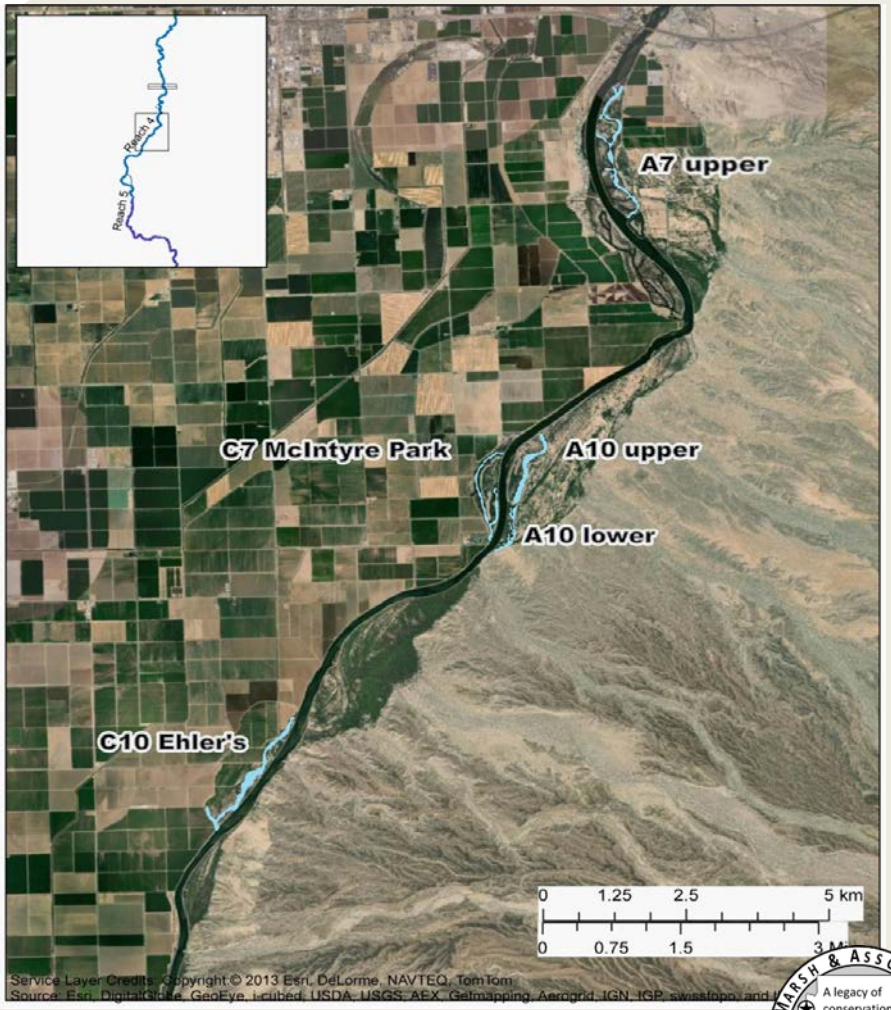
Illustrations by Joseph R. Tomelleri

Background



28,262 released since 2007

37,491 released since 2007



Objective

Use telemetry and remote PIT scanning to assess dispersal, habitat preferences, seasonal movements, and survival of stocked bonytail and razorback sucker in Reach 4/5 of the Colorado River

Methods

- 8 five-day sampling trips from October to March each year (one trip per month, except two trips each in January and February)

- Field seasons:
  - SY1 – October 2016 to March 2017 - completed
  - SY2 – October 2017 to March 2018 - completed
  - SY3 – October 2018 to March 2019 - completed
  - SY4 – October 2019 to March 2020 – in progress
  - SY5 – October 2020 to March 2021

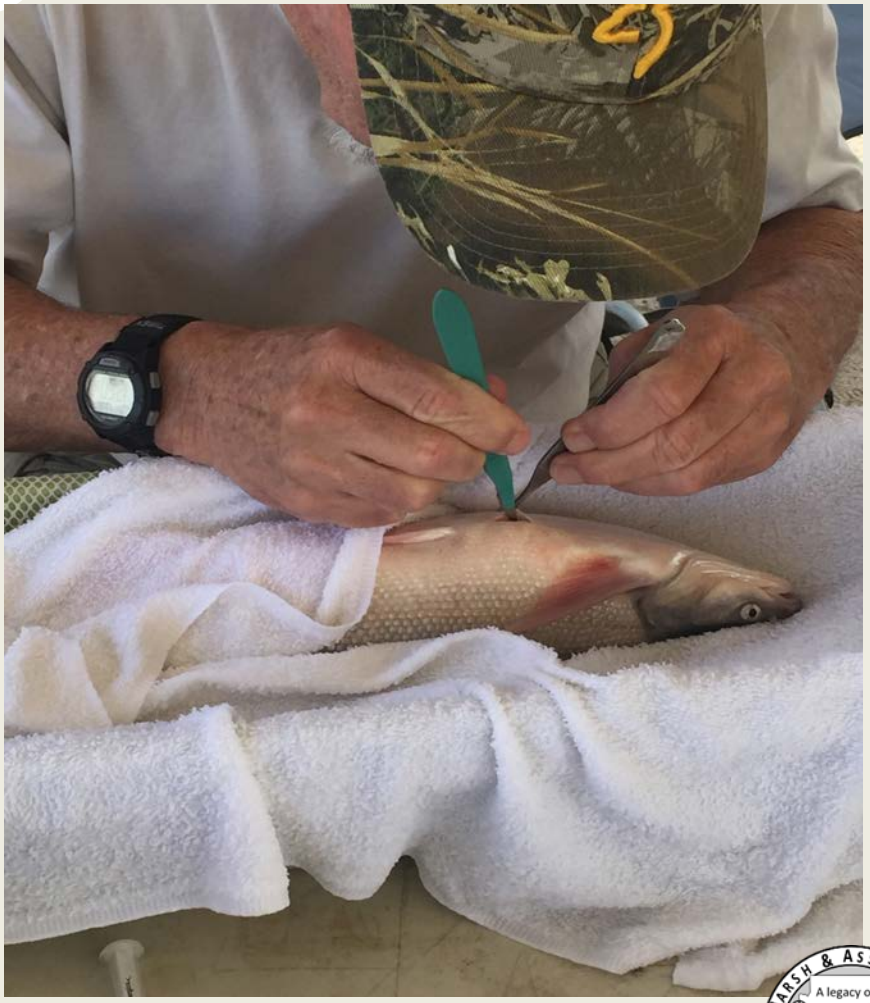
- Telemetry and PIT scanning

Methods – PIT scanning

- All stocked fish released with a PIT tag
- 20 - 4 ft. x 2 ft. PIT tag scanning antennas deployed throughout each trip
- A minimum of two per backwater, with the rest put in suitable habitat in the river

Methods - Telemetry

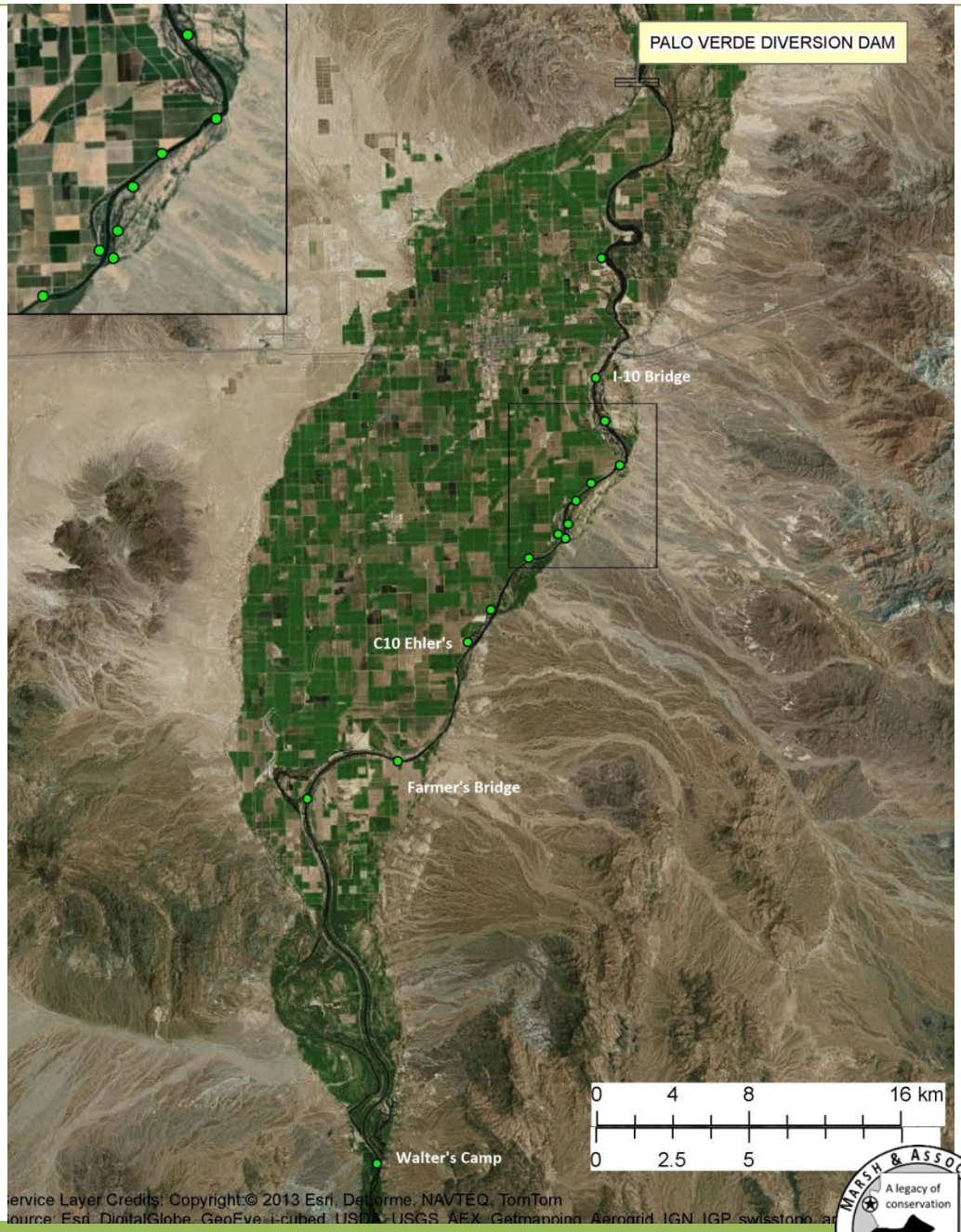
- Select fish were surgically implanted with acoustic transmitters
- Subadults from hatcheries were given small 3-month transmitters
  - 20 bonytail each year
  - 20 razorback each year
- Adults (preferentially shocked from river) were given 3-year transmitters
  - 10 razorback each year



Methods - Telemetry

- Submersible Ultrasonic Receivers (SURs) deployed throughout the backwaters and river
- Manual tracking

- 18 SURs currently in place
- At least one in each backwater
- Remaining SURs are spaced out throughout river



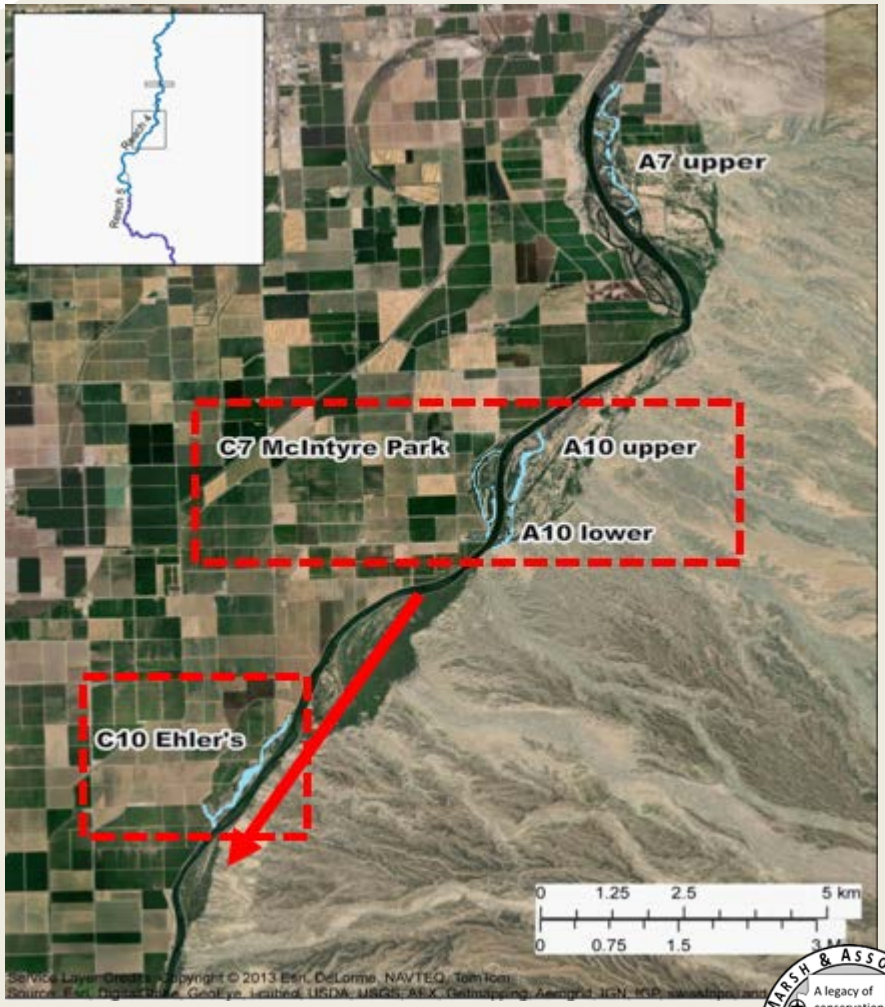
Results - Telemetry

Dispersal / Last known location

1) Only contacted in release backwater
2) Stayed in A10/C7 area
3) Went DS from A10/C7 area
4) Went to C10
5) Other locations

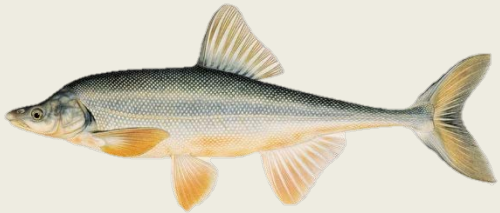
Days-at-large at last contact

→ Typically much lower than tag life



Results - Telemetry

Subadults



Days-at-large at last contact		
< 30 days	50 (78%)	14 (25%)
30 to 90 days	10 (16%)	29 (52%)
> 90 days	4 (6%)	13 (23%)
Average	~22 days	~43 days

Results - Telemetry

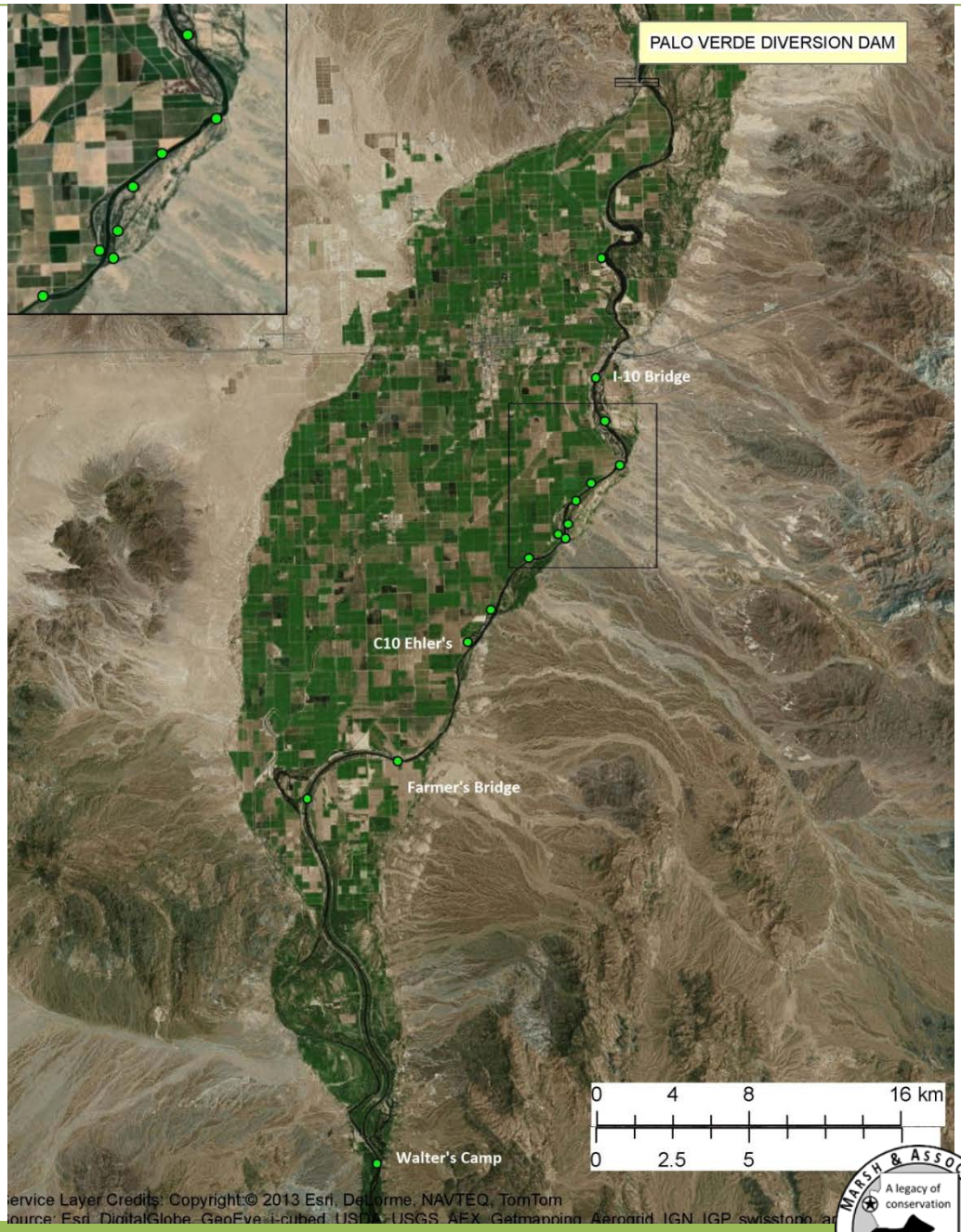
Adults

Days at large at last contact	SY1	SY2	SY3
< 90 days	1	5	8
90 to 365 days	4	5	2
365 to 730 days	4	1	NA
> 730 days	1	NA	NA
Average	**350**	**131**	**86**

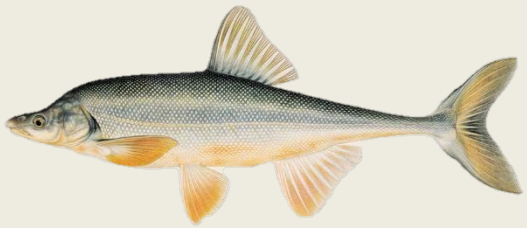
Issue with telemetry – fish not contacted for duration of tag life

Gaps in SUR coverage

Low survival



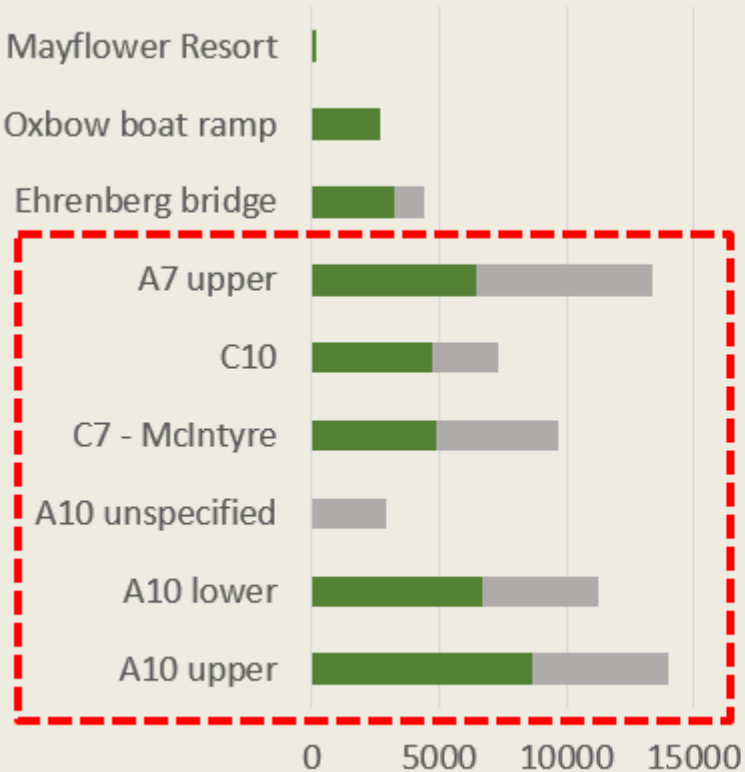
Results – PIT scanning



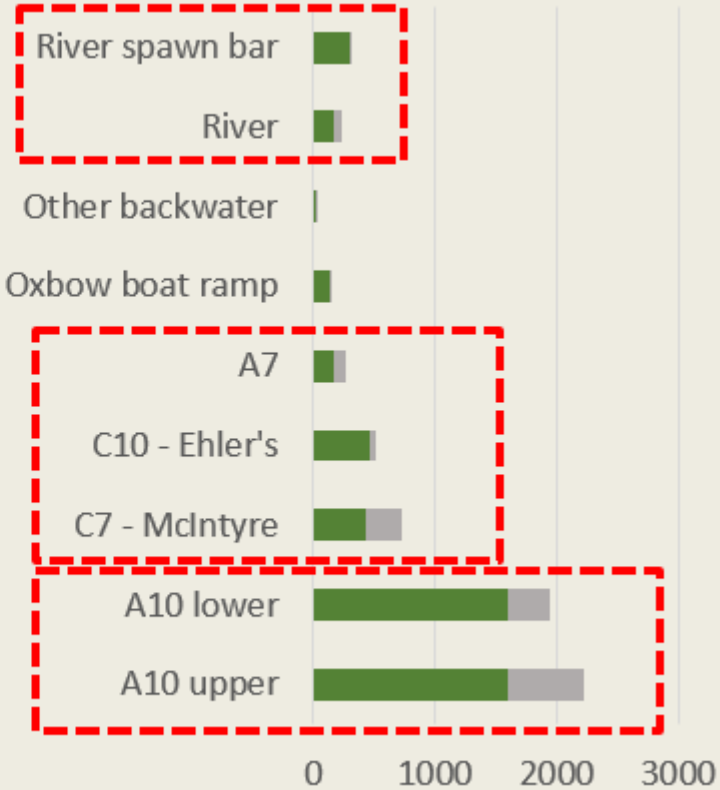
Released since 2007:	28,262	37,491
Individuals contacted:	1,420 (~ 5%)	4,177 (~ 11%)
Contacted at least one year-at-large:	1	516 (~ 1.4%)

Results – PIT scanning

Release locations for all fish

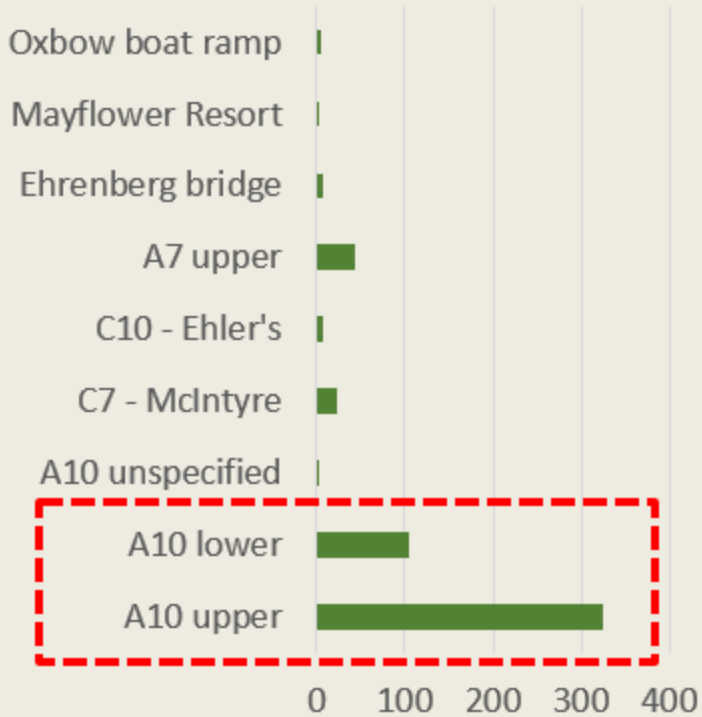


Scanned locations

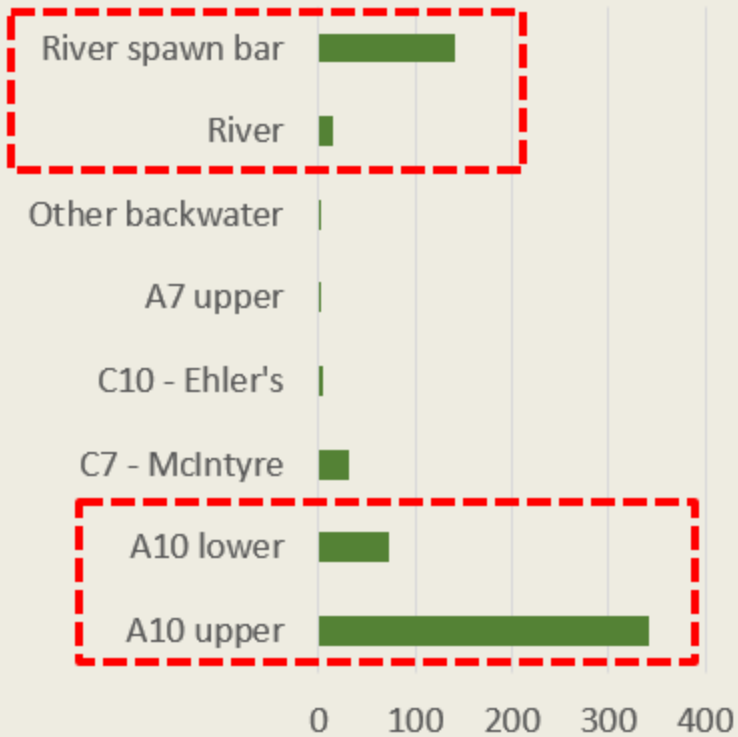


Results – PIT scanning

Release locations for fish > 1 YAL



Scanned locations



At least one year at large

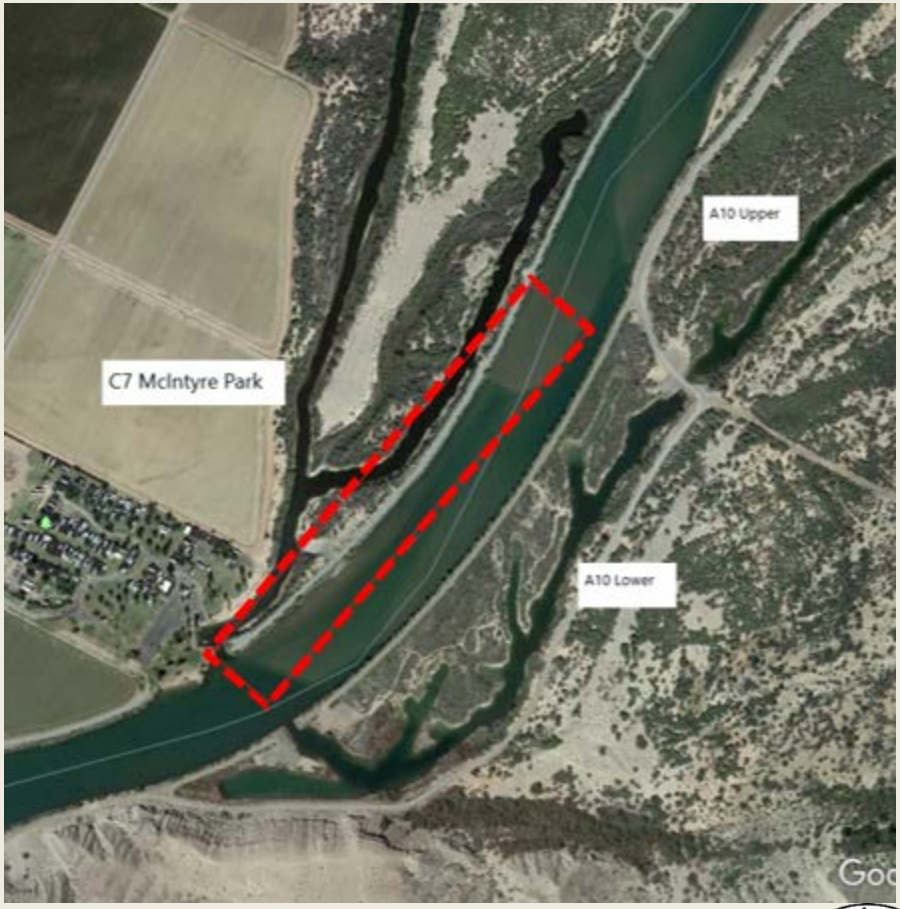
River at C7 spawn bar

Spawn bar

- Scanning from Jan-Mar 2019
- 305 razorback, 3 bonytail
- 142 razorback at least one year at large

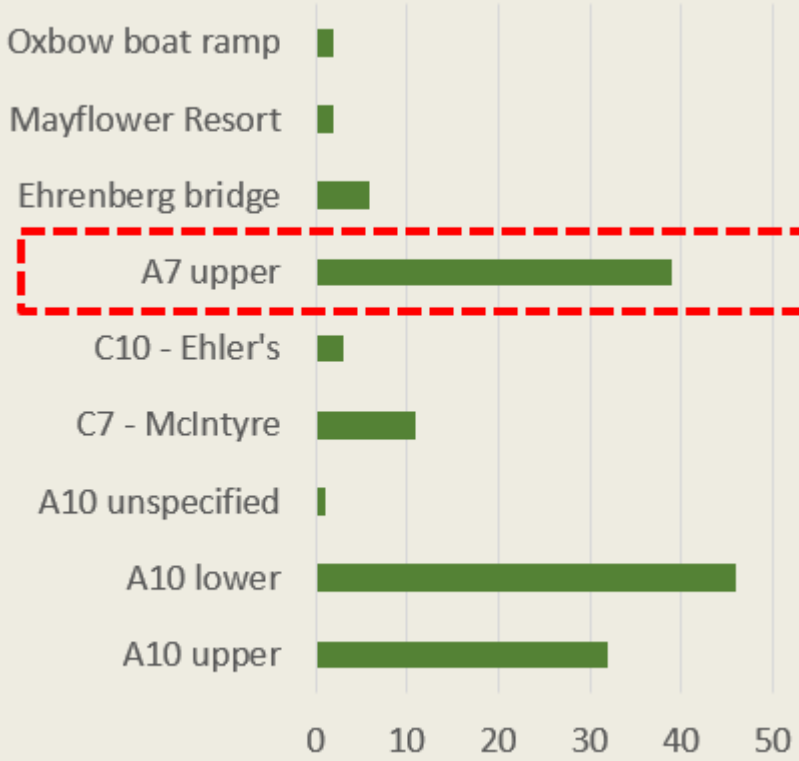
All other river contacts

- 167 razorback
- 15 razorback at least one year at large

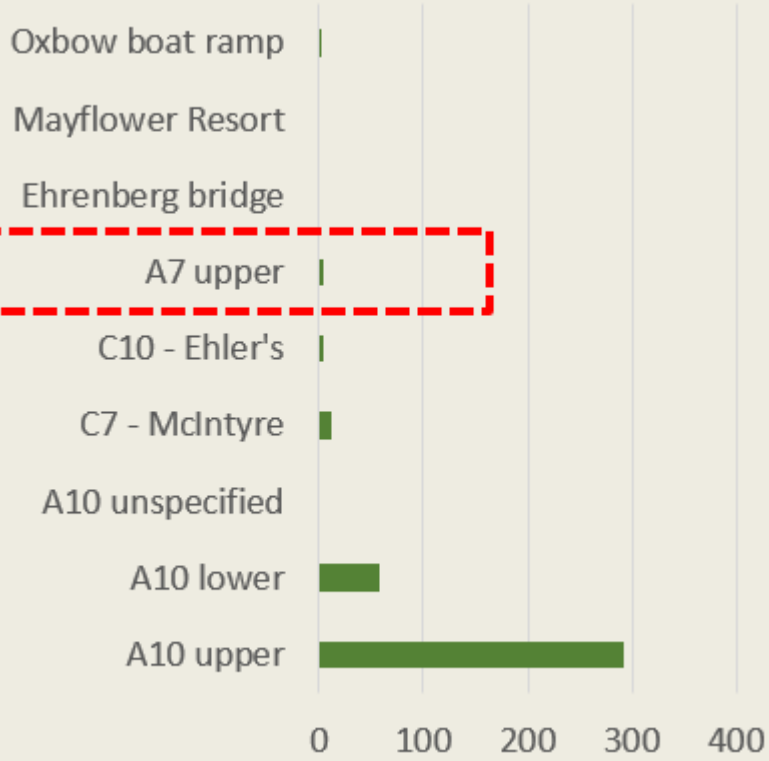


River at C7 spawn bar

Release locations for spawn bar fish



Release locations for all other fish



At least one year at large

Results – PIT scanning GAM

At least one year at large

Generalized additive model (GAM)

Monthly scan probability ~

Months at large + Total length at release + Release location + Scanning month

Results – PIT scanning GAM

Monthly scan probability ~
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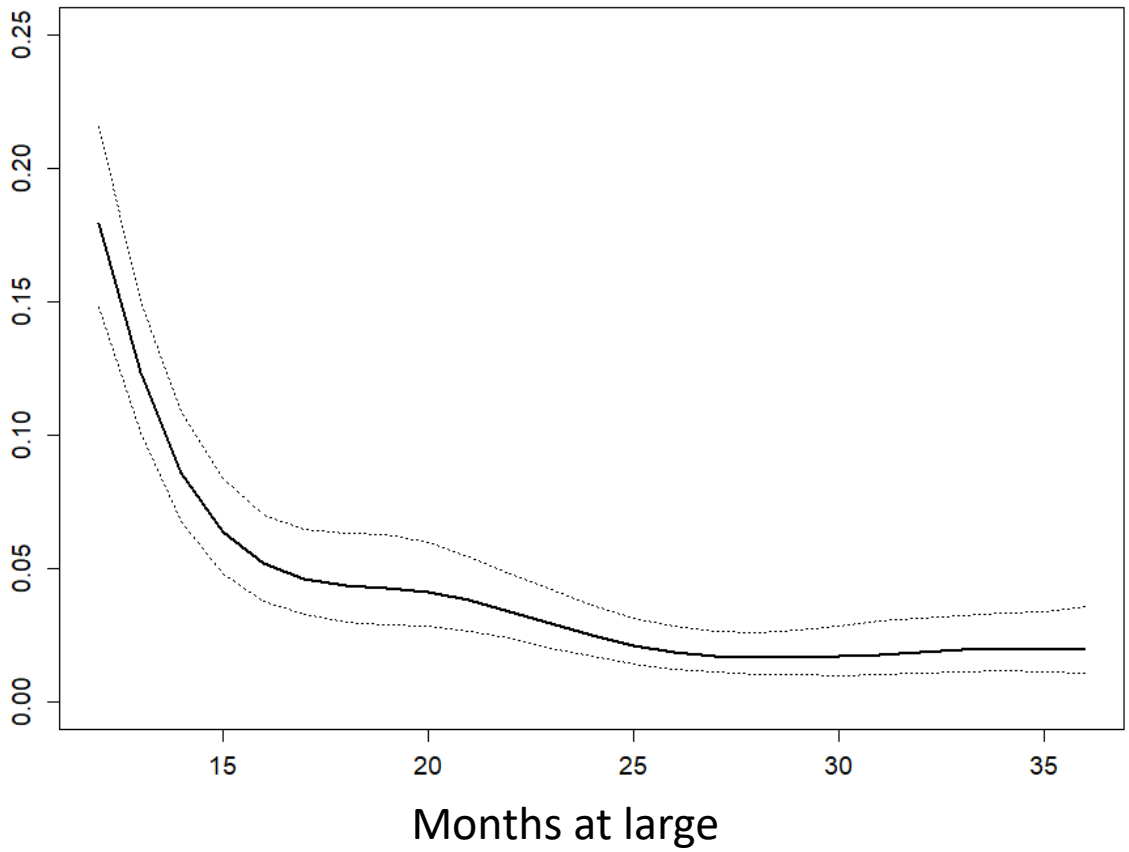
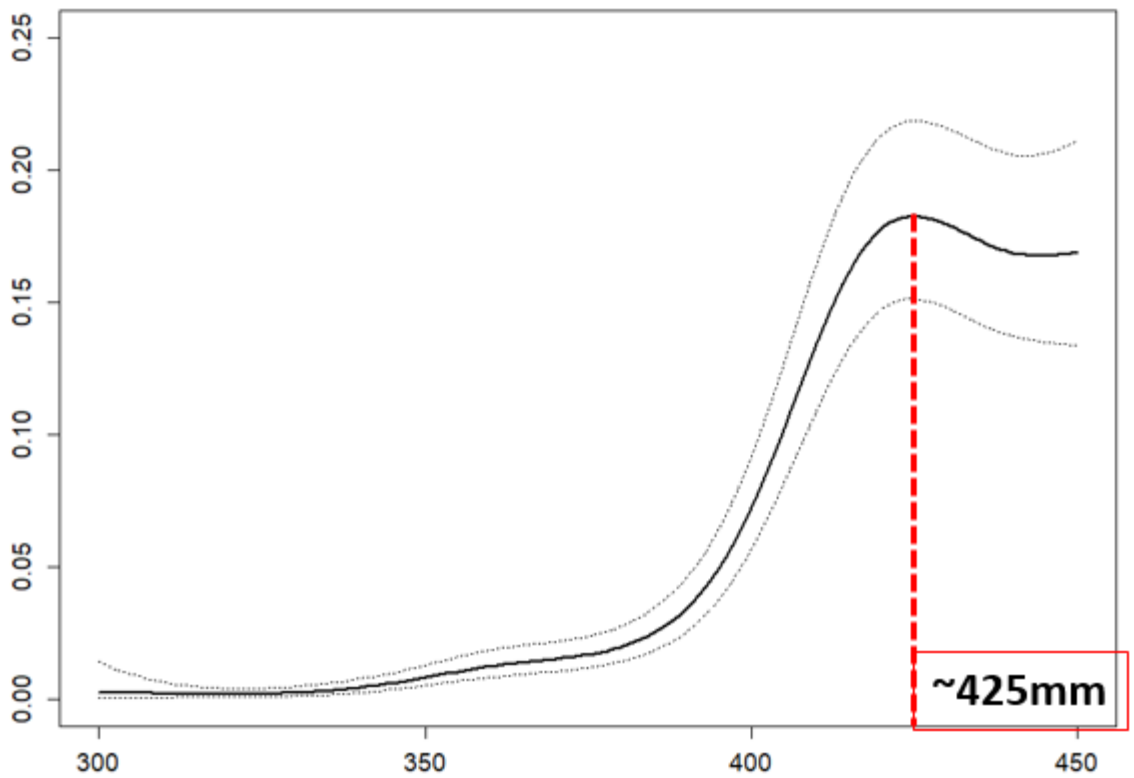


Results – PIT scanning GAM

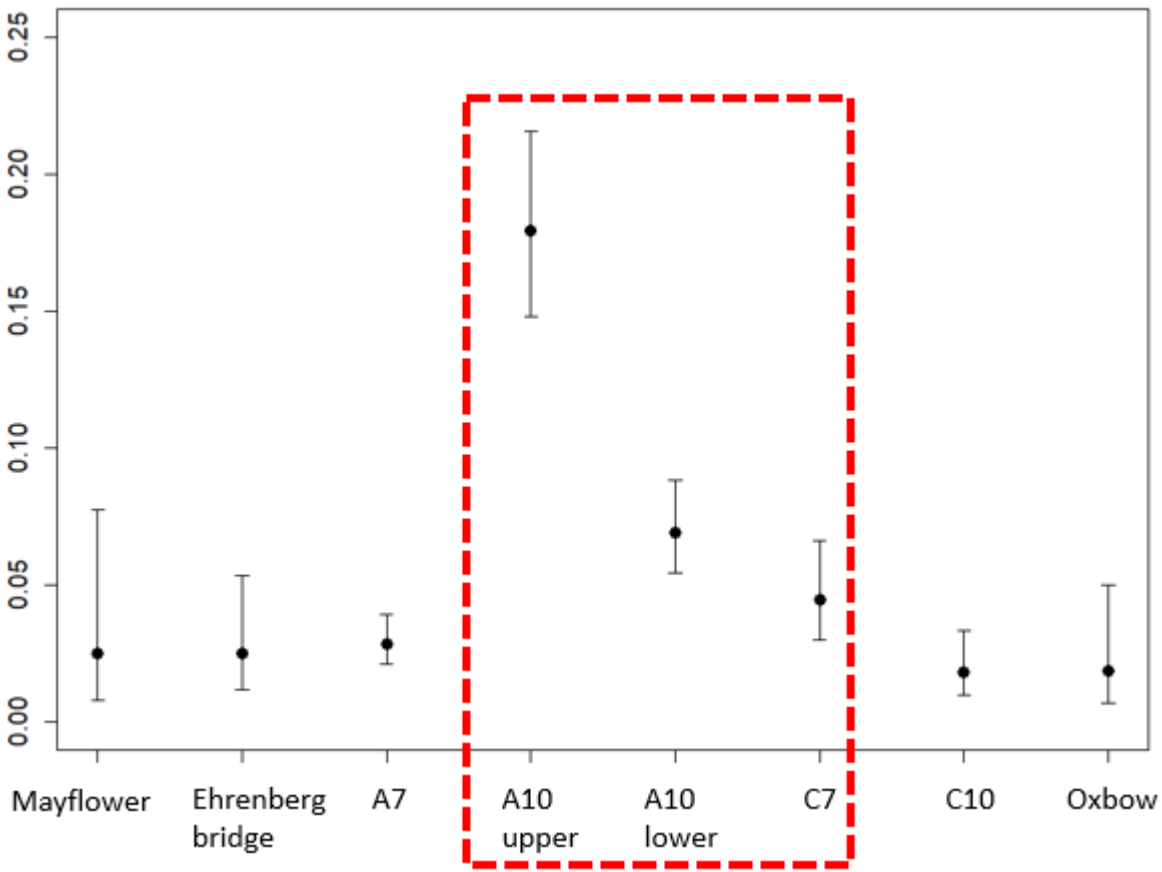
Monthly scan probability ~
Months at large + **Total length at release** + Release location + Scanning month



Total length at release (mm)

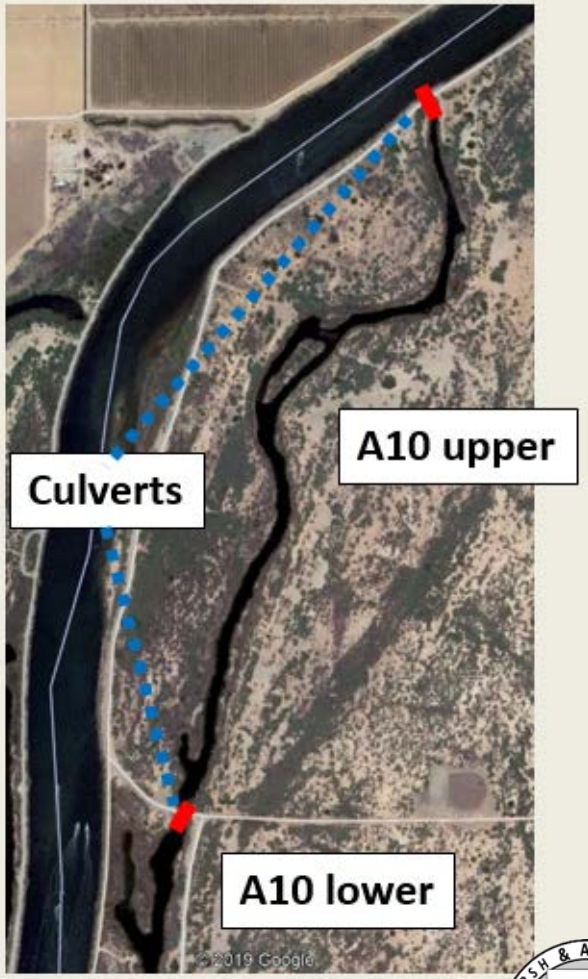
Results – PIT scanning GAM

Monthly scan probability ~
Months at large + Total length at release + **Release location** + Scanning month



Results – PIT scanning

Why A10 upper?



Population Estimates

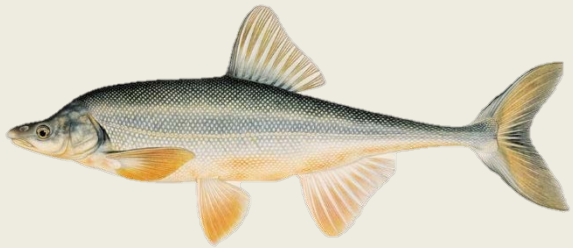
Mark-recapture population estimated based on the modified Peterson formula

$$N^* = \frac{(M+1)(C+1)}{R+1}$$ (Ricker 1975)

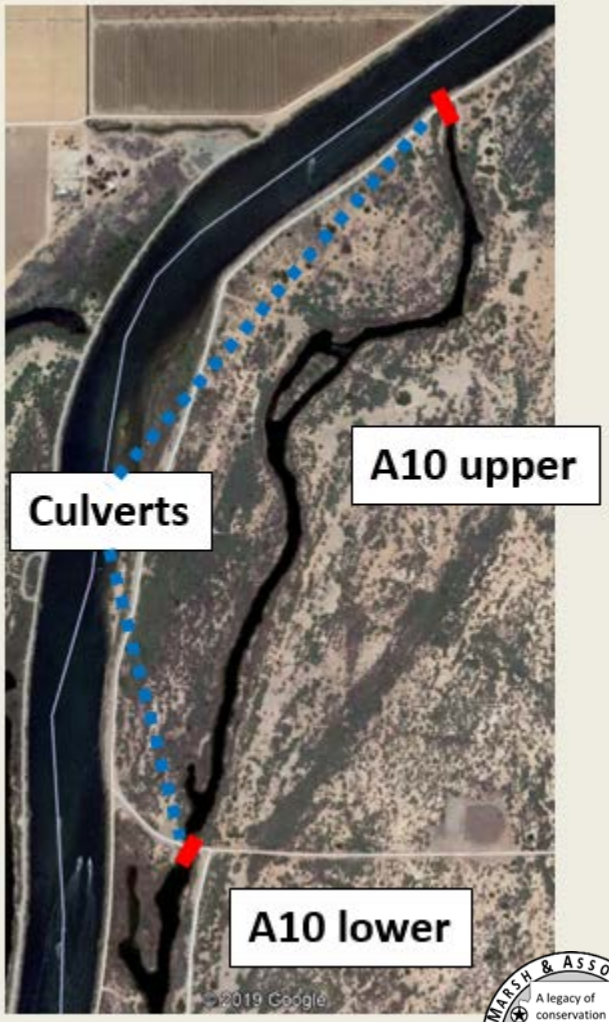
No spawn bar	**Population estimate**	**Only A10**
SY2: Oct 2017 – Mar 2018	**169** (95% CI 157 to 180)	**151** (95% CI 142 to 161)
SY3: Oct 2018 – Mar 2019	**147** (95% CI 123 to 171)	**97** (95% CI 84 to 111)

Spawn bar

Goals Going Forward…



Bonytail with bigger PIT tags in A10 upper, with culvert scanners



Goals Going Forward…

- Scanning at spawn bar
- More manual tracking in main channel
- Electrofishing main channel
- Mark-recapture analyses of PIT scanning data

Thanks to our partners for their support

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

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DEPARTMENT OF THE INTERIOR

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BUREAU OF LAND MANAGEMENT

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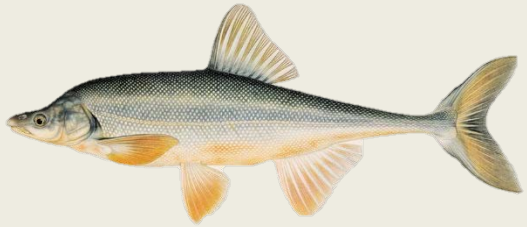
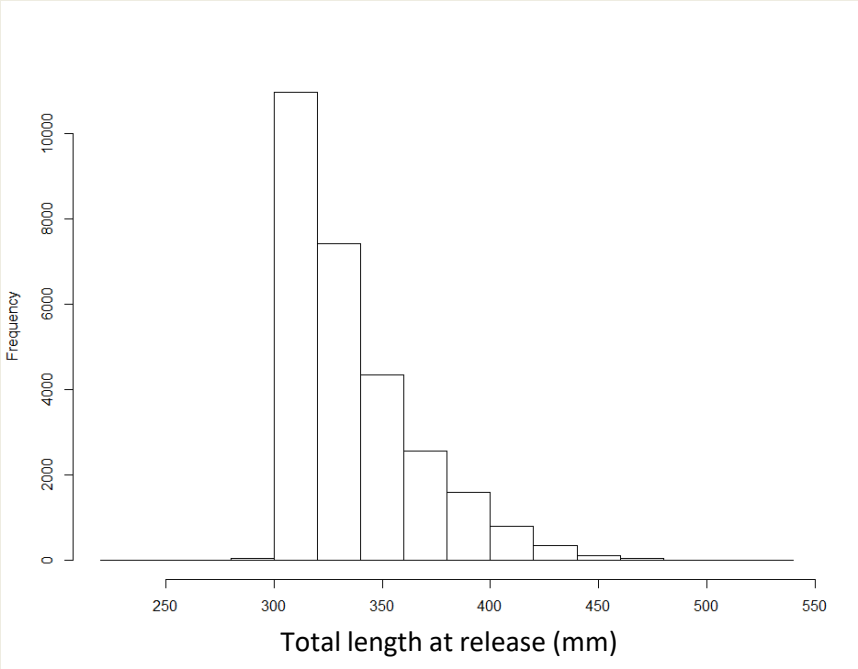
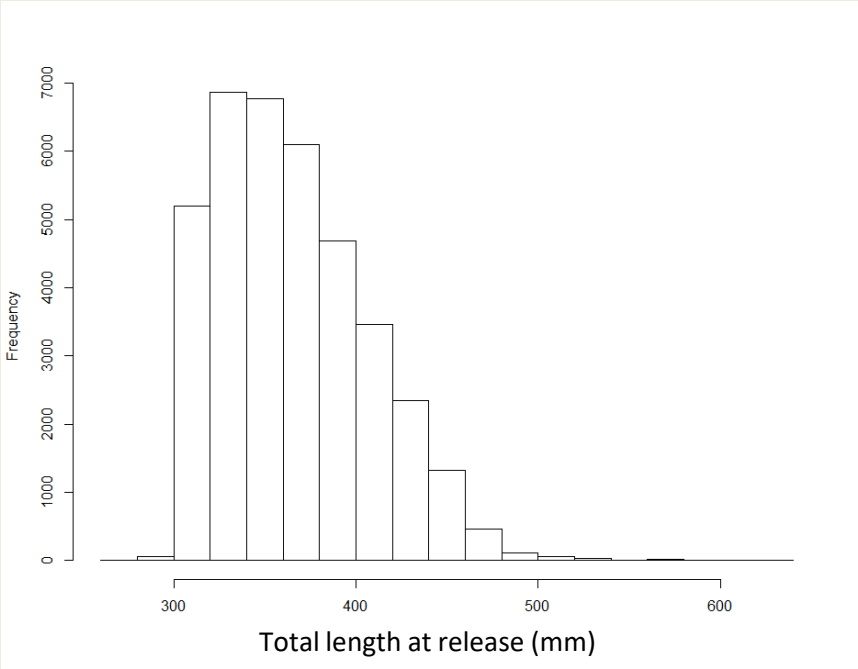
BUREAU OF RECLAMATION

Results – PIT scanning







Background

- Reach 4-5
  - From the Parker Dam, south to the southern border of the Cibola National Wildlife Refuge.
  - River miles 85.9-192.3
  - The stretch includes numerous backwater habitats

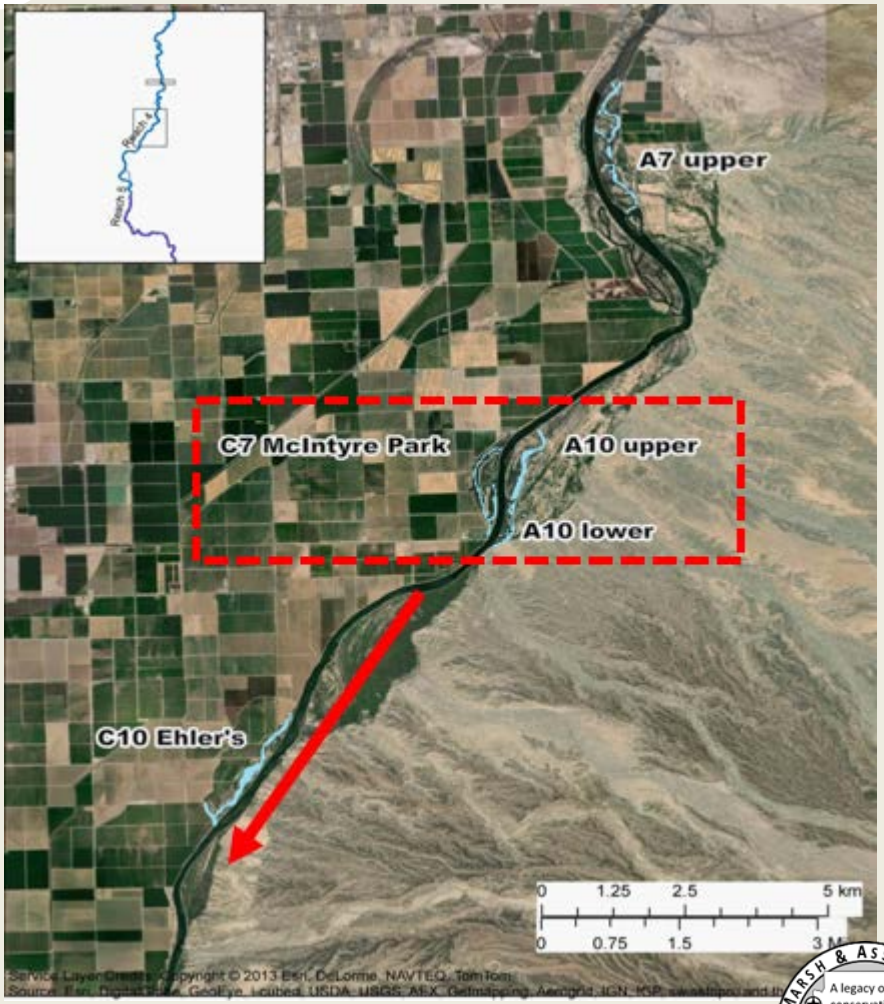
Issues With Survival

Results - Telemetry

Dispersal / Last known location

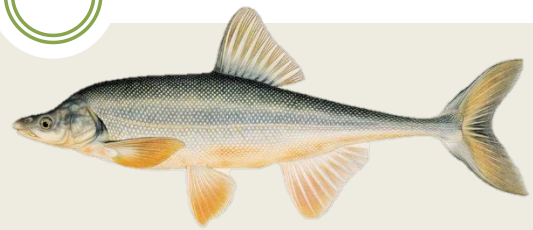
- Only contacted in release backwater
- Stayed in A10/C7 area
- Went DS from A10/C7 area
- Other locations

Days-at-large at last contact



Results - Telemetry

Subadults



Dispersal / Last known location

- 43 (67%) only contacted in release backwater
- 10 (16%) stayed in A10/C7 area
- 8 (12%) went DS from A10 area
- 3 (5%) went to C10

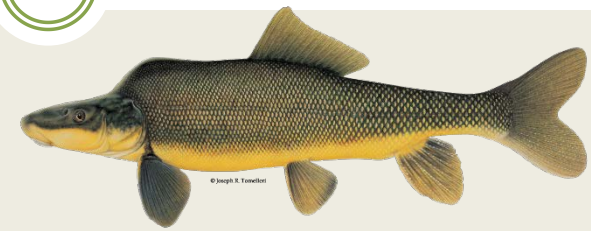
Days-at-large at last contact

- < 30 days: 50 (78%)
- 30 to 90 days: 10 (16%)
- > 90 days: 4 (6%)

- Average ~22 days
- 9 determined dead

Results - Telemetry

Subadults



Dispersal / Last known location

- 32 (57%) only contacted in release backwater
- 8 (14%) stayed in A10/C7 area
- 7 (12%) went DS from A10 area
- 3 (5%) went to C10
- 3 (5%) went in river from A7, then unknown
- 3 (5%) went US from C10 to river near A10

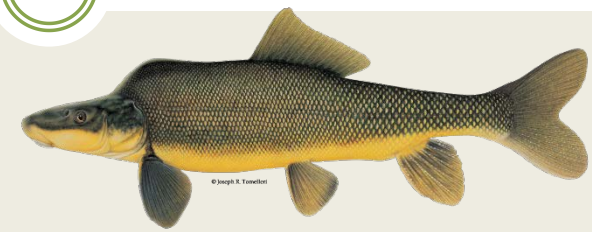
Days-at-large at last contact

- < 30 days: 14 (25%)
- 30 to 90 days: 29 (52%)
- > 90 days: 13 (23%)

- Average ~43 days
- 6 determined dead

Results - Telemetry

Adults



Last known location

- 17 (57%) A10/C7 area
- 7 (23%) river DS from A10/C7
- 3 (10%) C10
- 2 (7%) A7
- 1 (3%) river at A7

Days at large at last contact	SY1	SY2	SY3
< 90 days	1	5	8
90 to 365 days	4	5	2
365 to 730 days	4	1	NA
> 730 days	1	NA	NA
Average	**350**	**131**	**86**