Facilitated passage and movement patterns of Razorback Suckers in the San Juan River

M. R. Bogaard, B. A. Hines, K. B. Gido, M. C. McKinstry, C. A. Pennock, A. Barkalow, S. Bonjour, J. Bowman, K. Creighton, B. J. Schleicher, and T. K. Yazzie

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Overview

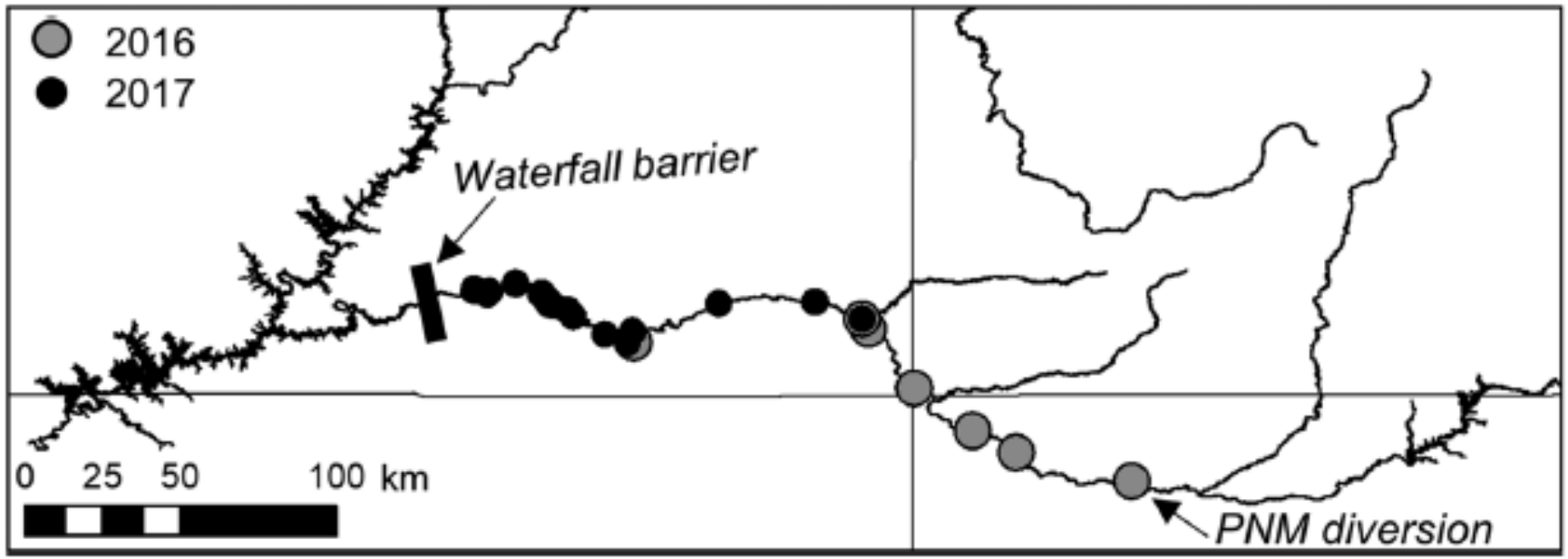
- Purpose and Background
- Fish Tagging and Translocation
- Data Analysis
- PIT Detections (Brian Hines, UDWR)
- Results
- Discussion

Barriers to upstream movements

Piute Farms Waterfall (PFW)

Public Service Company of New Mexico (PNM) weir

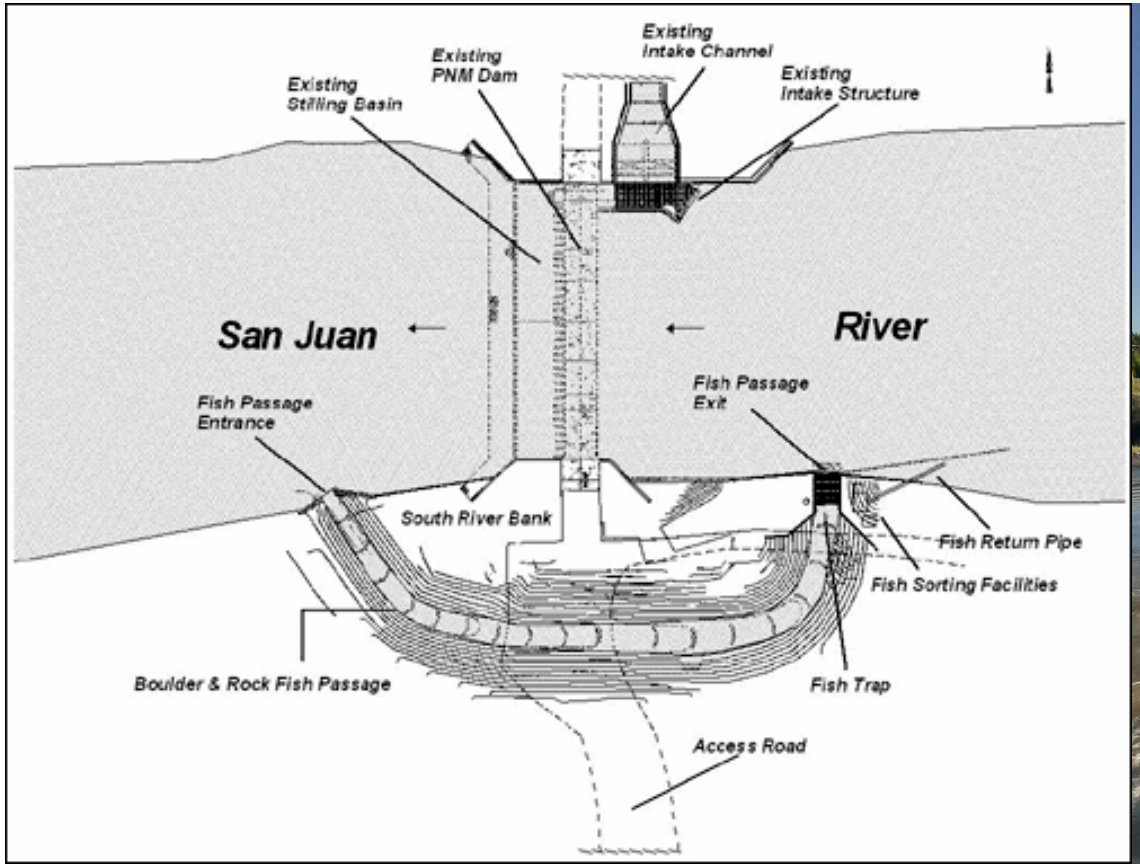
Razorback Sucker translocation



Encounter locations of razorback sucker that were translocated upstream of PFW (Pennock et al. 2020).

- Long distance movements of Razorback Suckers between river and reservoir habitats were detected
- >80% of Razorback Suckers were encountered below the waterfall following passage

Study Site:
Public Service Company of New Mexico (PNM) weir



Questions

(1) How long do translocated individuals remain upstream of a barrier?

(2) Do translocated Razorback Suckers aggregate in upstream habitats during the spawning season?

M. McKinstry

Fish capture and tagging

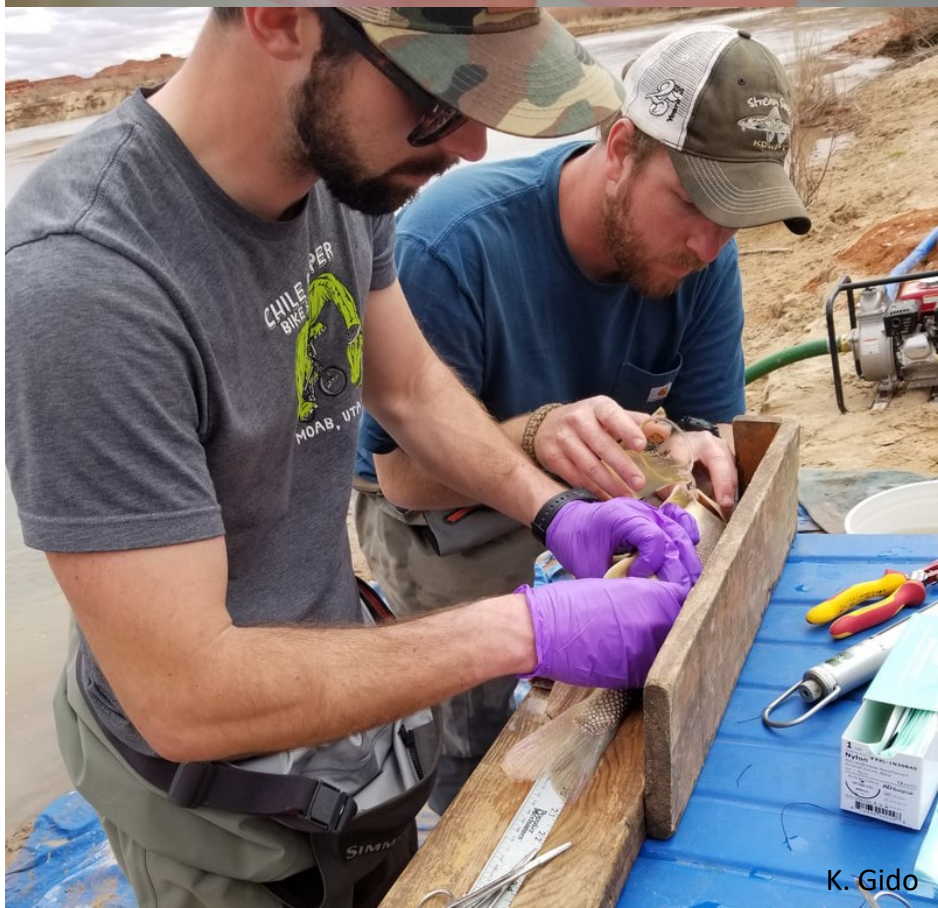
Razorback Suckers were captured early March and April within 1.5 km below each barrier

Transported 2-4 km upstream

Fish capture and tagging

Razorback Suckers were surgically implanted with coded radio transmitters with internal coil antenna

- Anaesthetized with 125 mg/L tricaine methanesulphonate (MS-222)
- Transmitter battery life ~300 days
- Transmitters produce mortality indicator



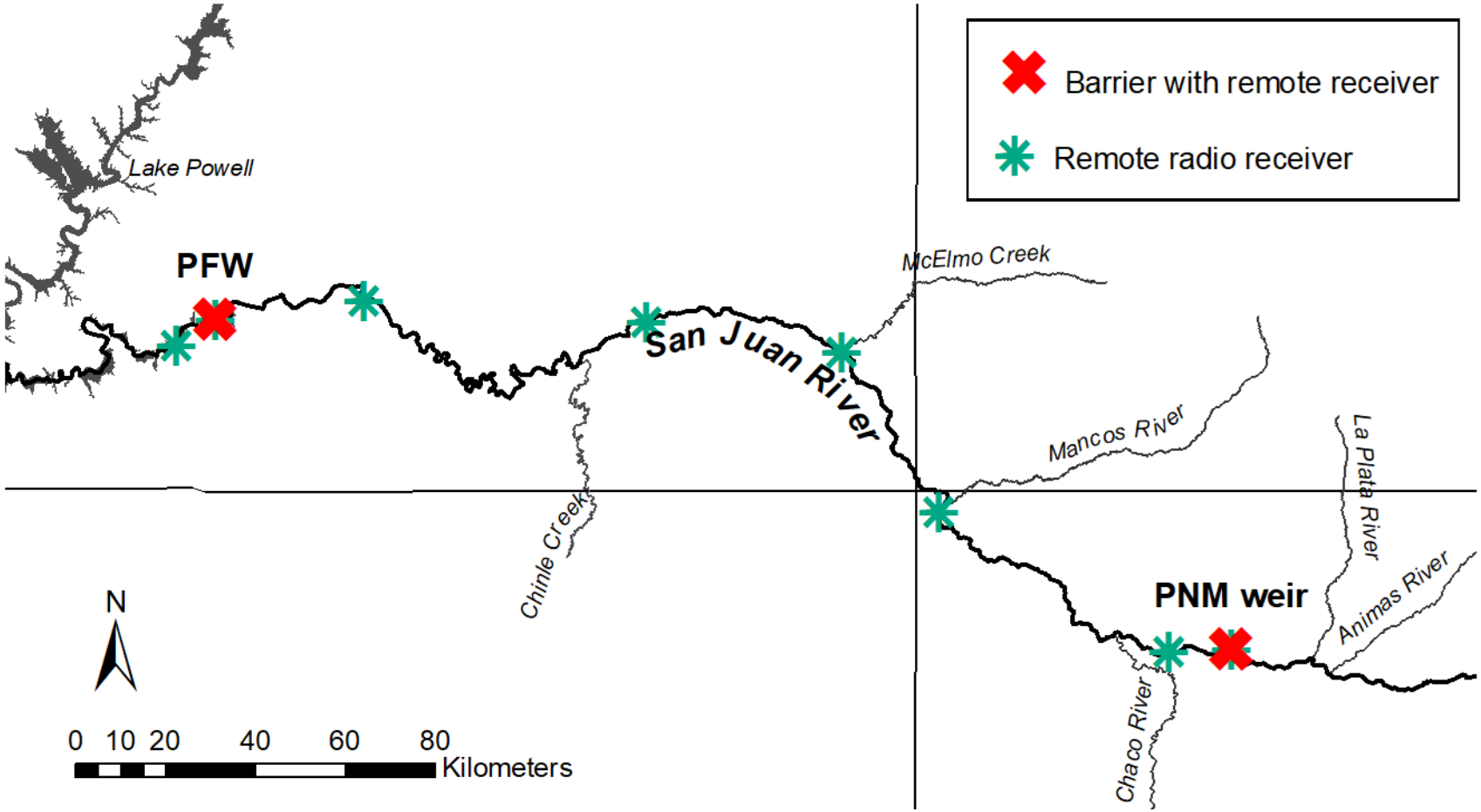
K. Gido

Fish capture and tagging

Site	Number of Razorback Suckers	2020	2021
PFW	Radio tagged female	23	28
	Radio tagged male	18	20
	Total radio tagged	41	48
	Total translocated	156	210
PNM	Radio tagged female		28
	Radio tagged male		12
	Total radio tagged		40
	Total translocated		100

Site	Species	2020	2021
PFW	Colorado Pikeminnow	5	29
	Flannelmouth Sucker	40	149
	Bluehead Sucker	47	85
PNM	Colorado Pikeminnow		5

Data Collection: Assessing translocation



Data Collection: Assessing translocation

- Mobile river-wide telemetry surveys every 2 to 5 weeks
- Recorded locations within 100m

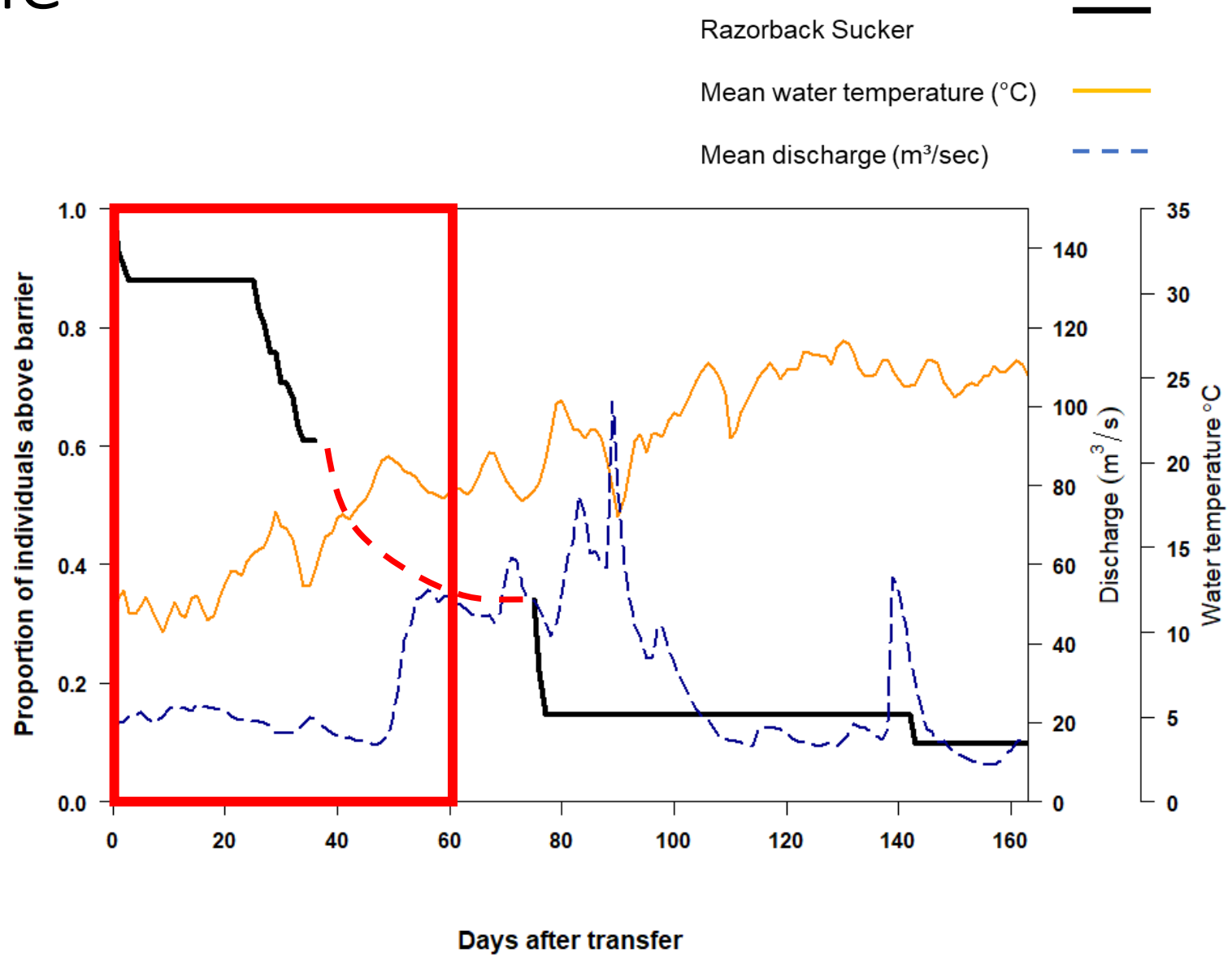
Data analysis

- Quantify upstream PIT detections
- Calculated residency time above each barrier
- Quantified upstream movements following translocation
- Identified aggregations during the spawning season
  - Determined 50% spawning season core range
  - Delineate aggregations where core ranges overlap for at least a week

Results: Residency time

Residency upstream of a barrier following translocation: PFW 2020

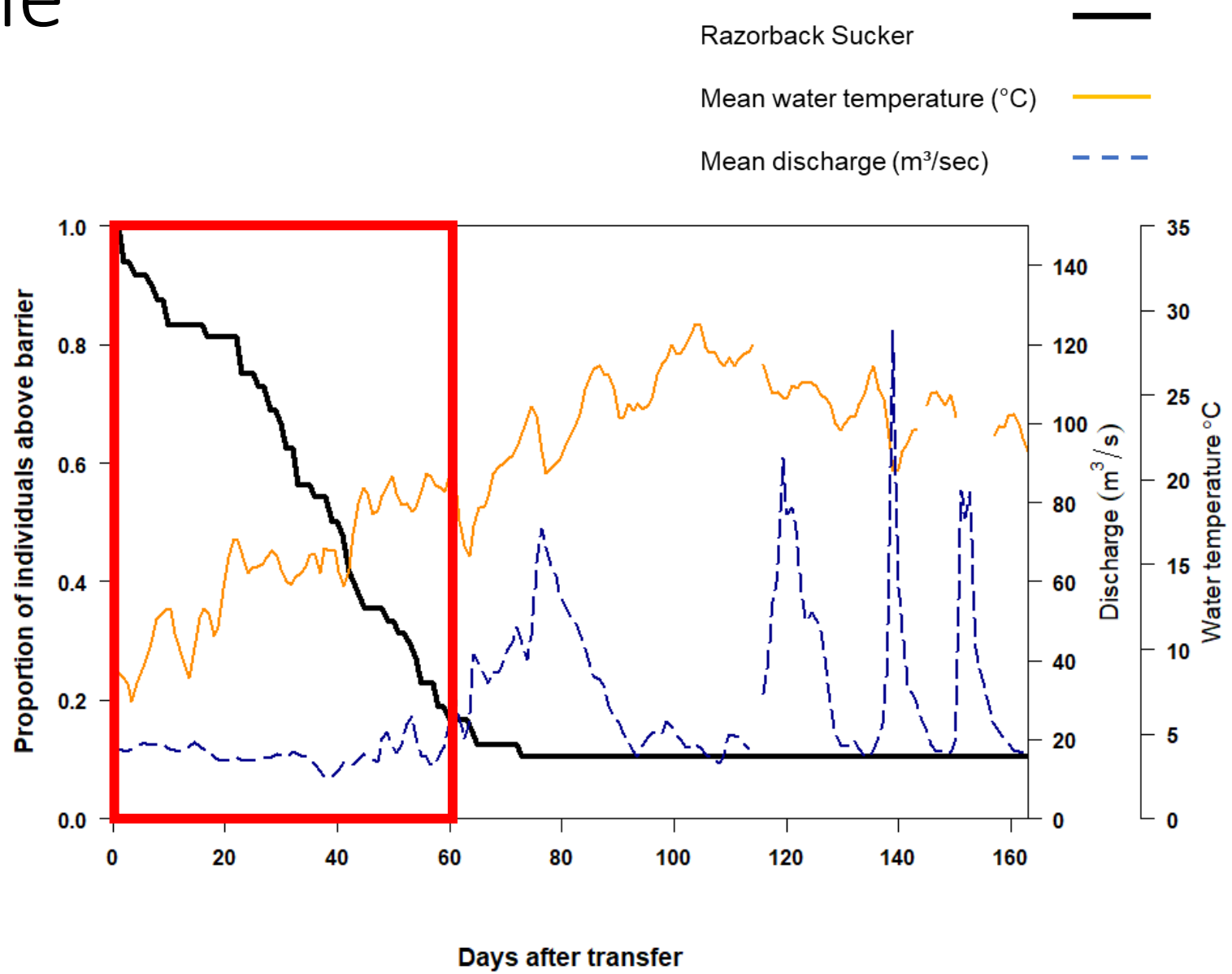
- Remote receiver malfunctioned days 37-73 following transfer
- >80% of individuals remained upstream for 26 days



Results: Residency time

Residency upstream of a barrier following translocation: PFW 2021

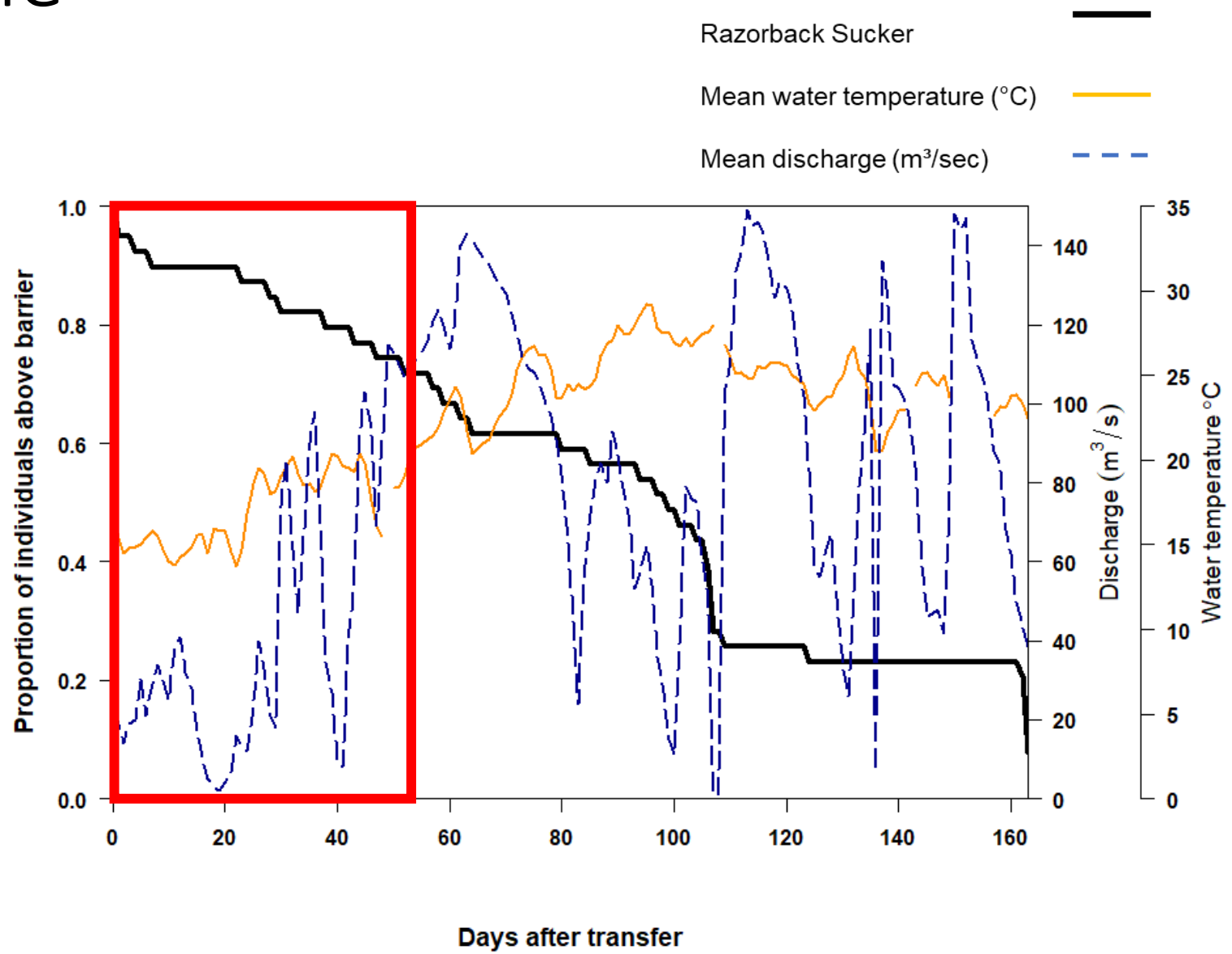
- >80% of individuals remained upstream for 23 days



Results: Residency time

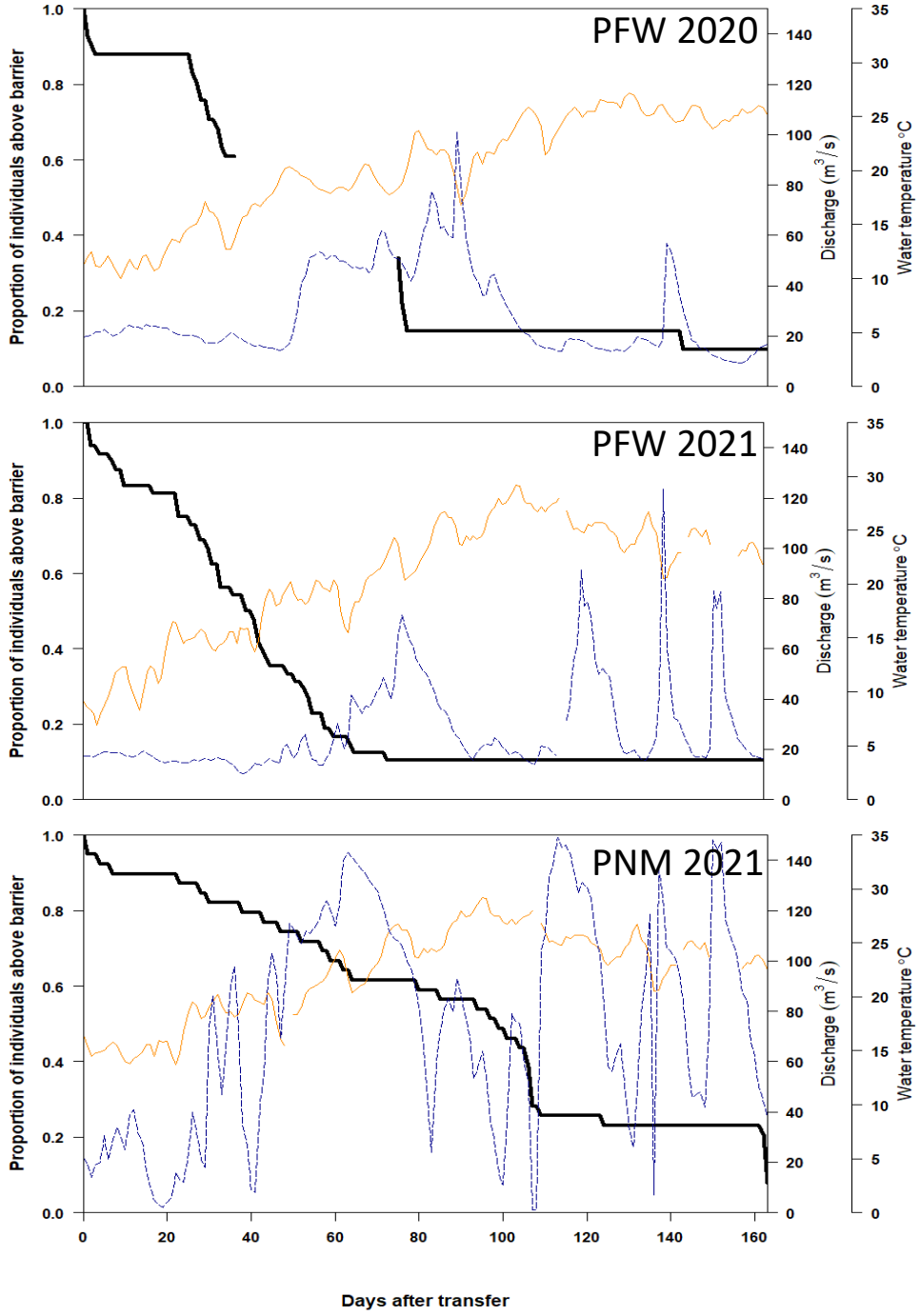
Residency upstream of a barrier following translocation: PNM 2021

- >60% of translocated fish remained upstream throughout the expected spawning season



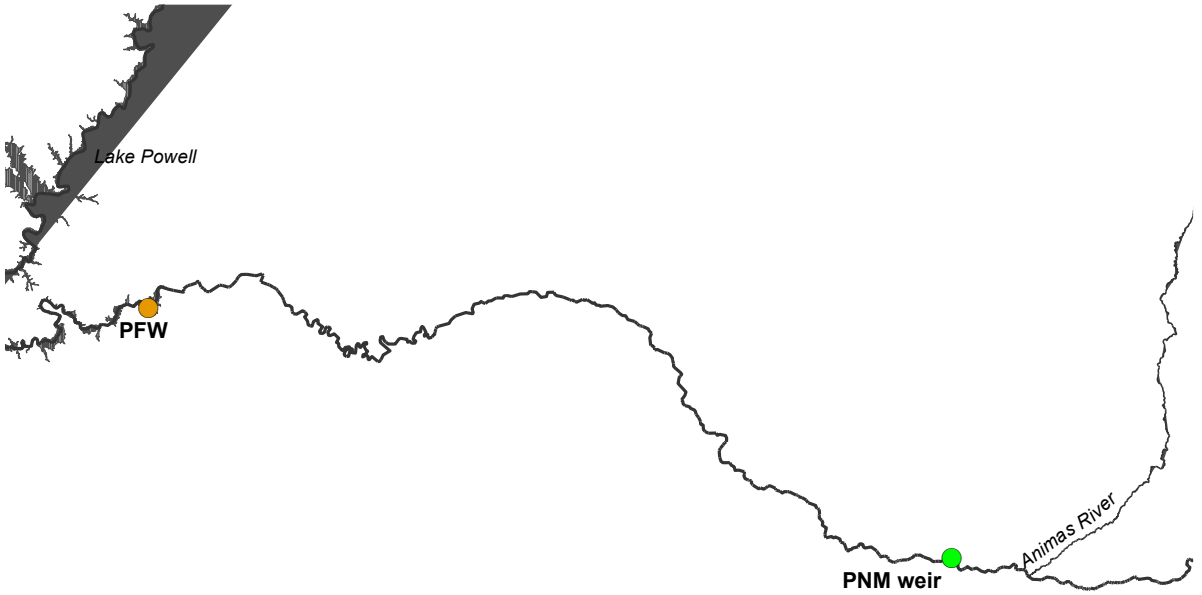
Results: Residency time

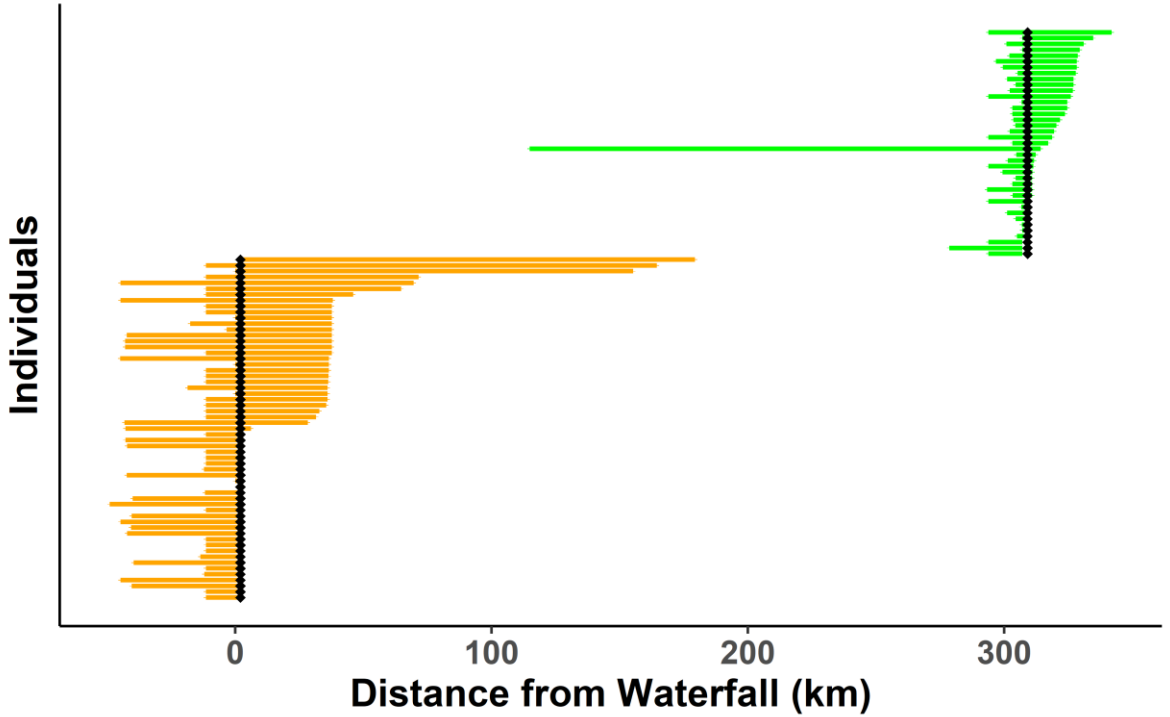
Site	Year	Number translocated	Number radio tagged	Residency time above barrier (Median, range days)
PFW	2020	156	41	56, 1 - >442
	2021	210	48	36, 2 - >135
PNM	2021	100	40	46.5, 1 - 435



Results: Upstream movement

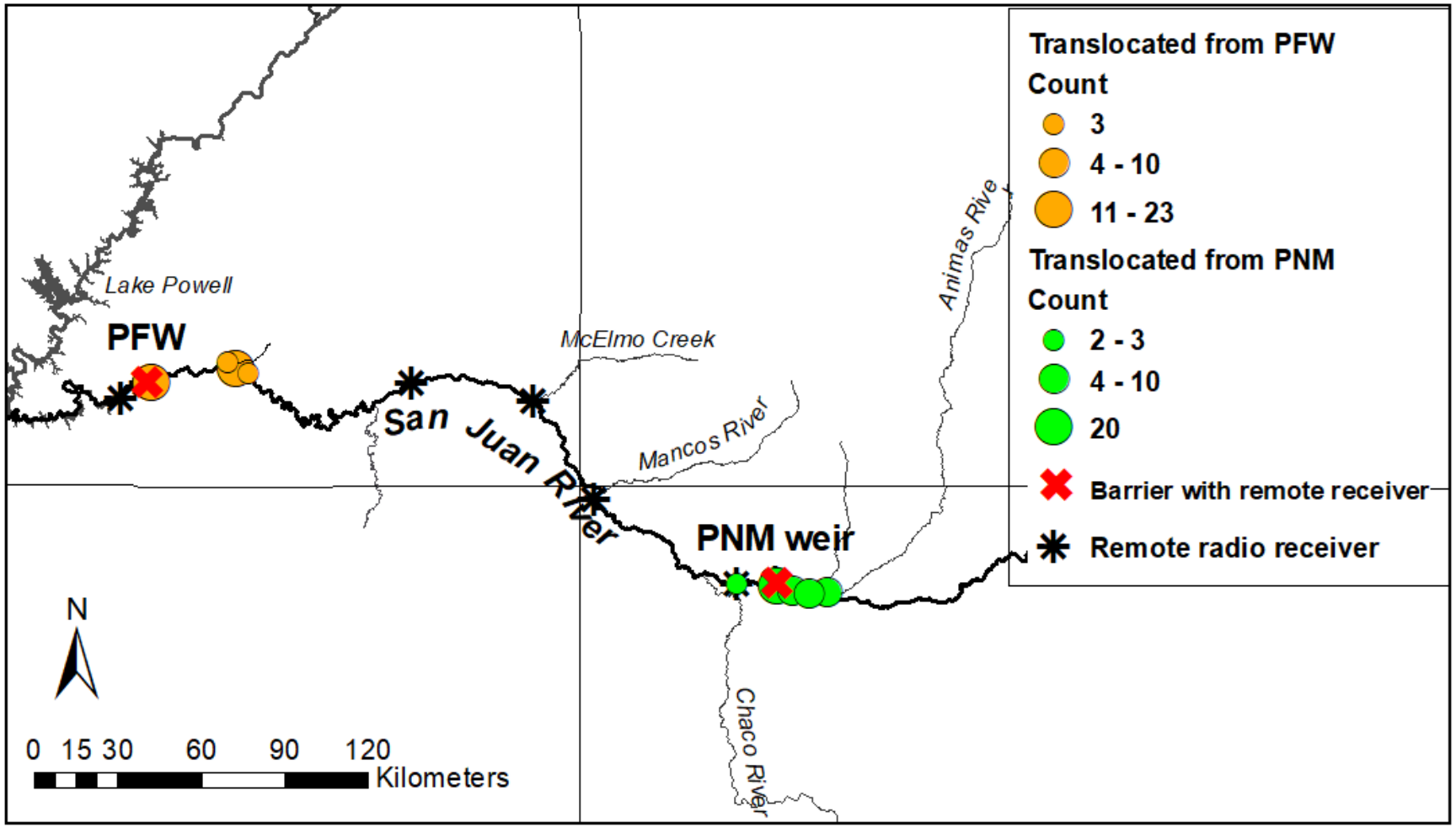
Site	Year	Number detected upstream	Maximum upstream detection (Median, range km)
PFW	2020	8	19, 2 - 141.9
	2021	45	36, 0.2 - 262.2
PNM	2021	37	11.6, 0.6 - 34.9





Results: Spawning aggregations

- Four distinct aggregations were detected above PFW
- Four aggregations were detected above PNM weir, while one was detected below



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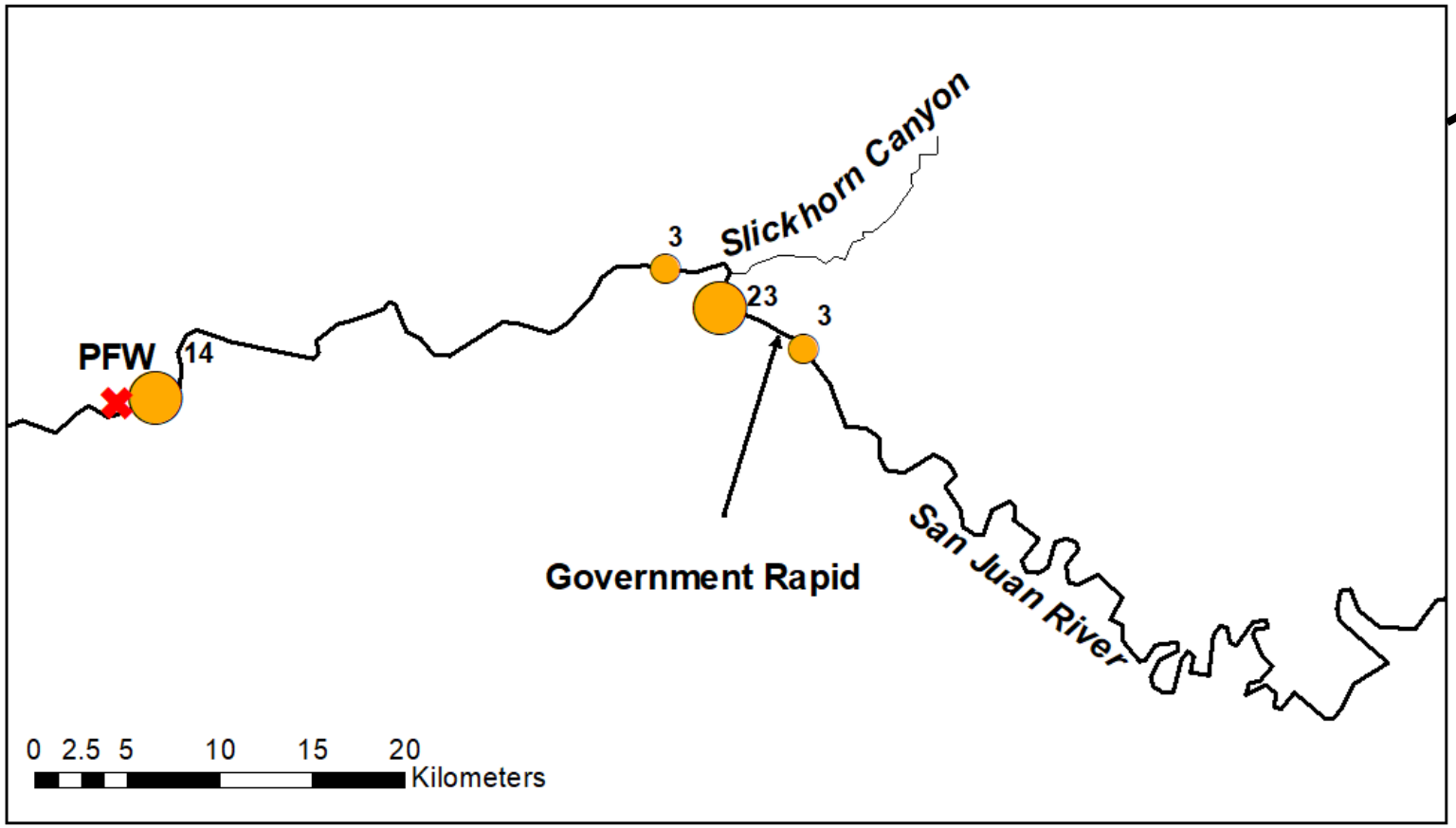

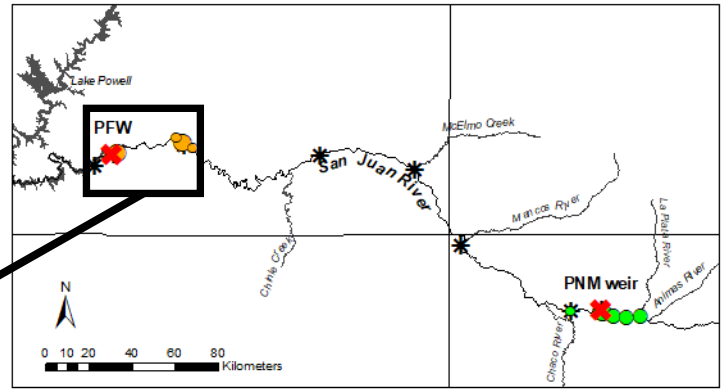

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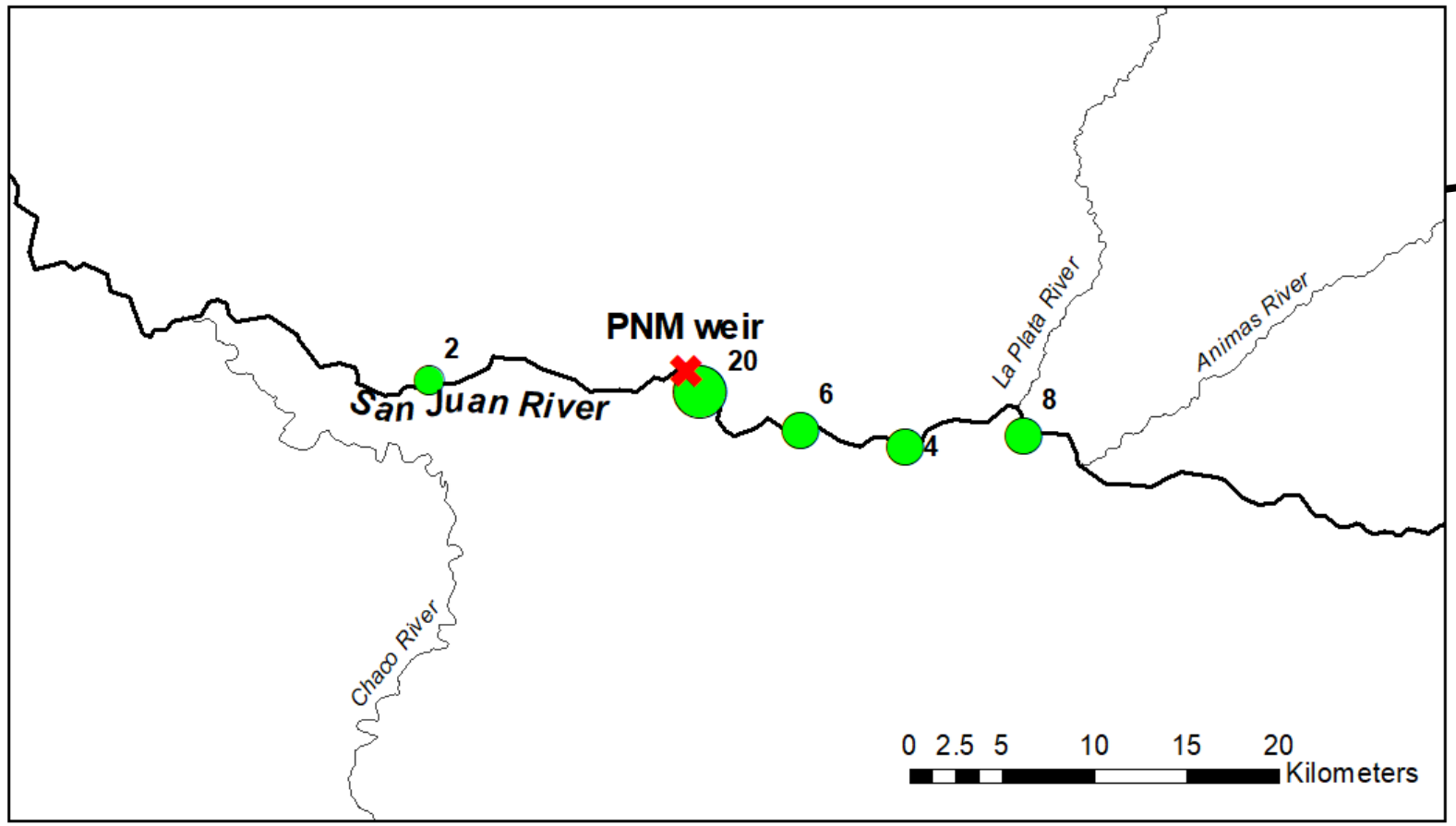

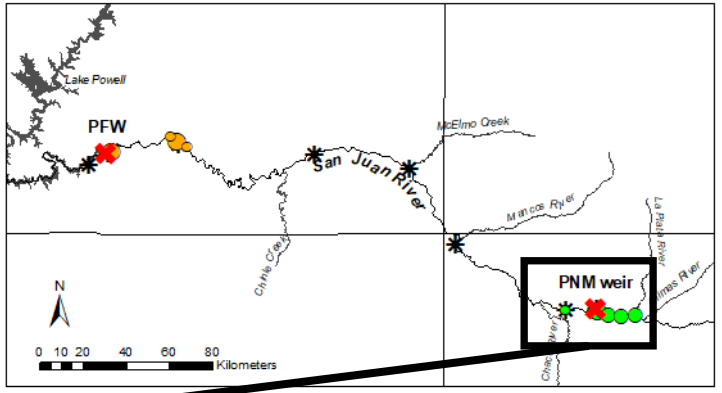

Conclusions: Assessing translocation

- Translocated Razorback Suckers stayed upstream of a barrier long enough to spawn, but returned downstream
- Upstream movements following translocation were common
- Distinct aggregations were detected within the spawning season

Further Considerations

- Individuals from PFW moved immediately back to Lake Powell, where PNM fish stayed upstream for longer
- PFW fish tended to travel further, but aggregated in a higher density
- Why do Razorback Suckers move upstream of PNM if spawning substrate exists downstream?
- No evidence that translocated fish successfully spawned
- If larvae were produced, they likely drifted downstream of barriers

Implications

- Empirical evidence that ~2000 endangered Razorback Suckers are annually affected by these barriers
- Improving access to spawning habitats could increase reproductive output
- Evidence of multiple movement strategies

Thank you

J. Caldwell