Improving summer survival of Rio Grande Silvery Minnow by identifying high-density locations at risk of channel drying

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Disclaimer

- All data and analyses are preliminary and subject to revision
- The findings and conclusions in this presentation are those of the authors and do not necessarily represent the views of the U.S. Fish and Wildlife Service
- Report and all data are freely available on program portal or Mendeley

- Archdeacon, T. A. and Bedwell Boro, M. E. 2023. Prioritizing locations for irrigation infrastructure to create drought refuge habitats. U.S. Bureau of Reclamation Interagency Agreement No. R23PG00039. Report to Bureau of Reclamation, Albuquerque, New Mexico. http://dx.doi.org/10.13140/RG.2.2.15693.61924

Goals, Objectives, and Strategies

- Goal: Improve summer survival of silvery minnow by reducing mortality associated with stranding in isolated pools
- Objective: Identifying high-abundance patches of RGSM at risk of stranding
- Strategy: Use fish rescue data to estimate the spatial contribution to variability in numbers of RGSM

Key

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10%

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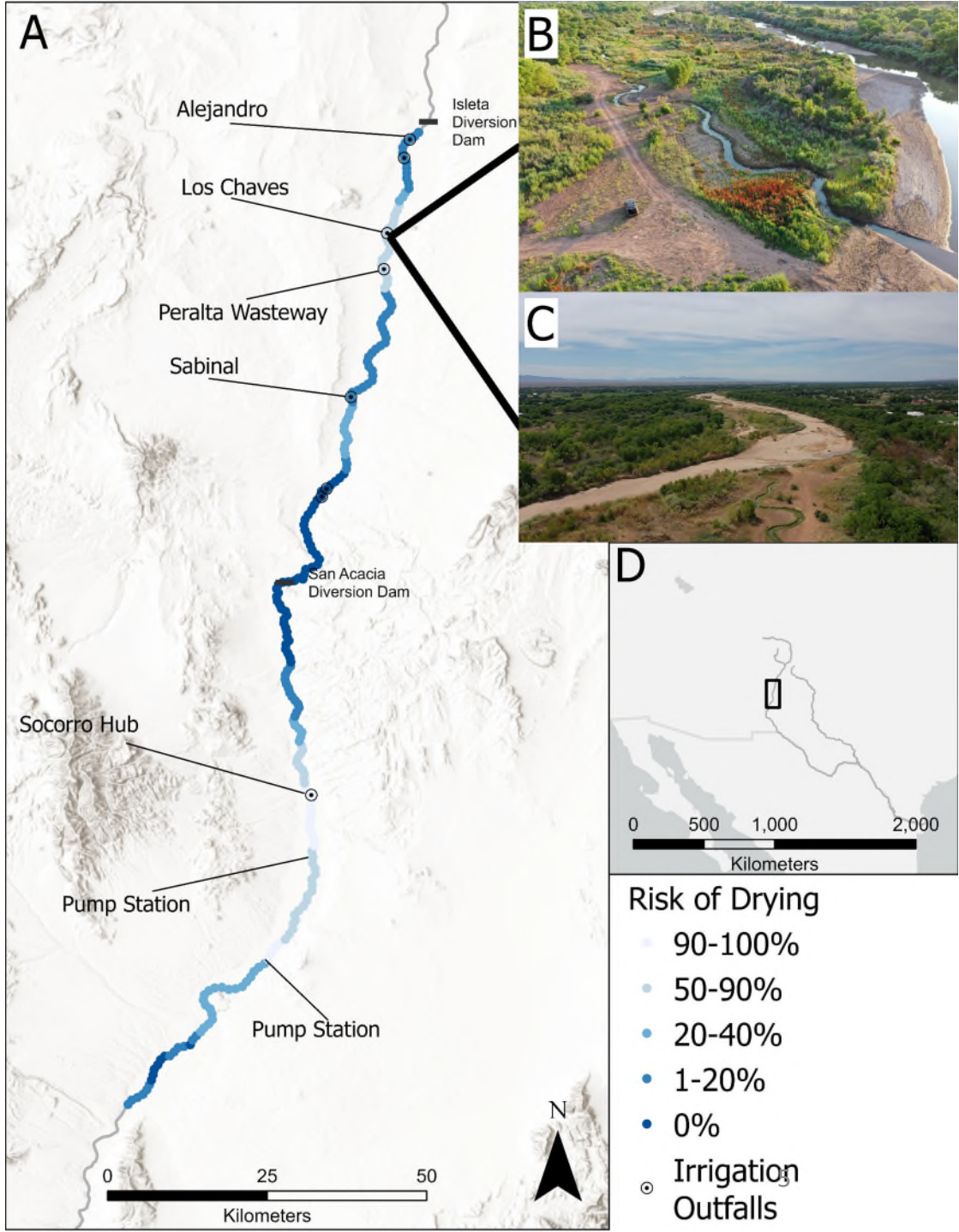
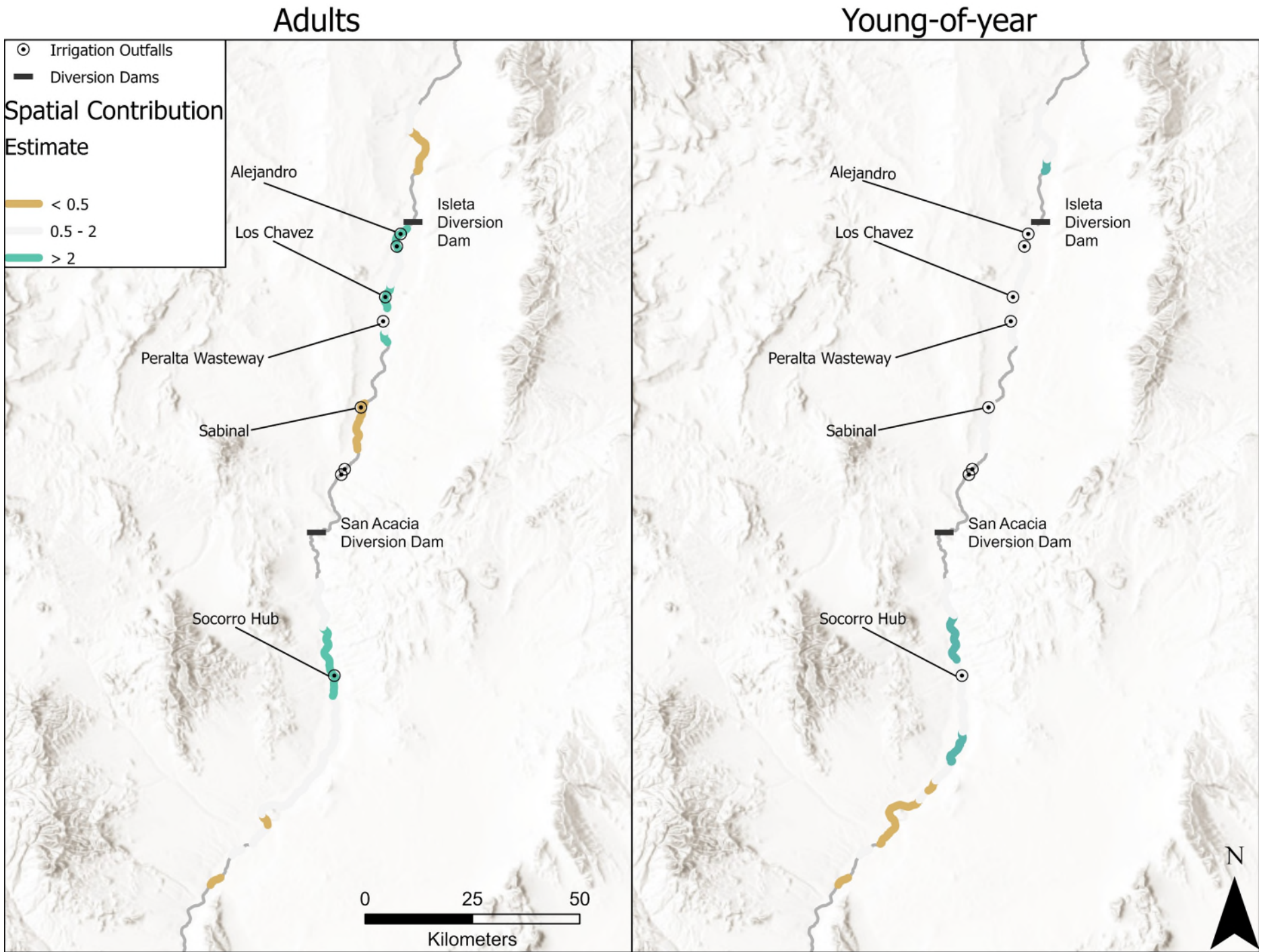
Data

- River Eyes (2007-2022)
- Fish Rescue (2009-2023)
- Results are average of 2009-2023



Strategy:
Analyze fish rescue data to estimate patch contributions

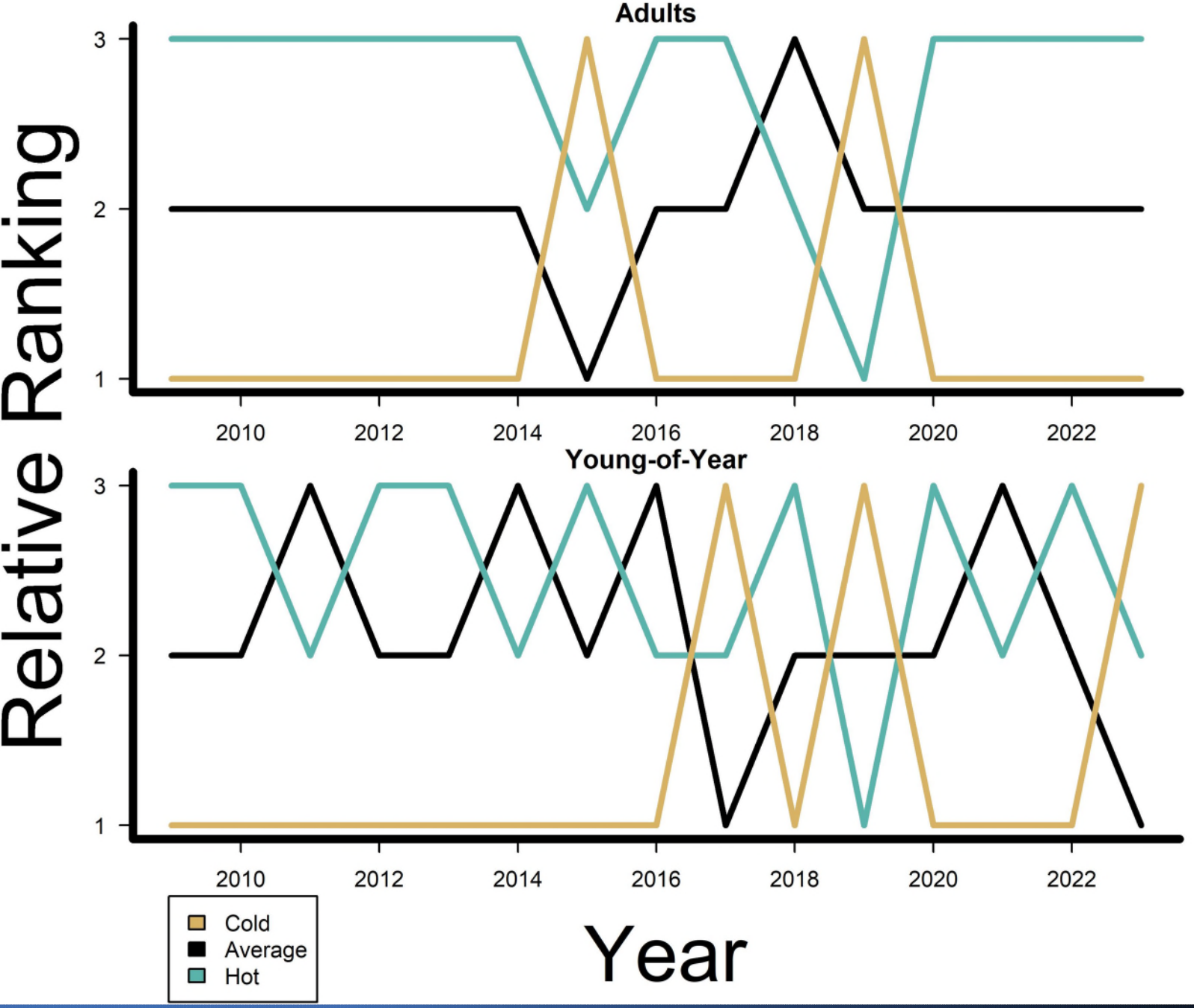
- Count per pool – “average” (adults or YOY) while accounting for
  - Recruitment (year as random effect)
  - Survival (day of year, censored for young of year)
- Estimating the number of *fish per pool,* on the log scale, odds-ratio (multiplicative)
  - Deviation from average count of fish per pool in a given year
- Any variance attributable to location?



- 2.5 km segments
- Adults
  - 10 Cold
  - 28 Average
  - 10 Hot
- YOY
  - 13 Cold
  - 24 Average
  - 11 Hot

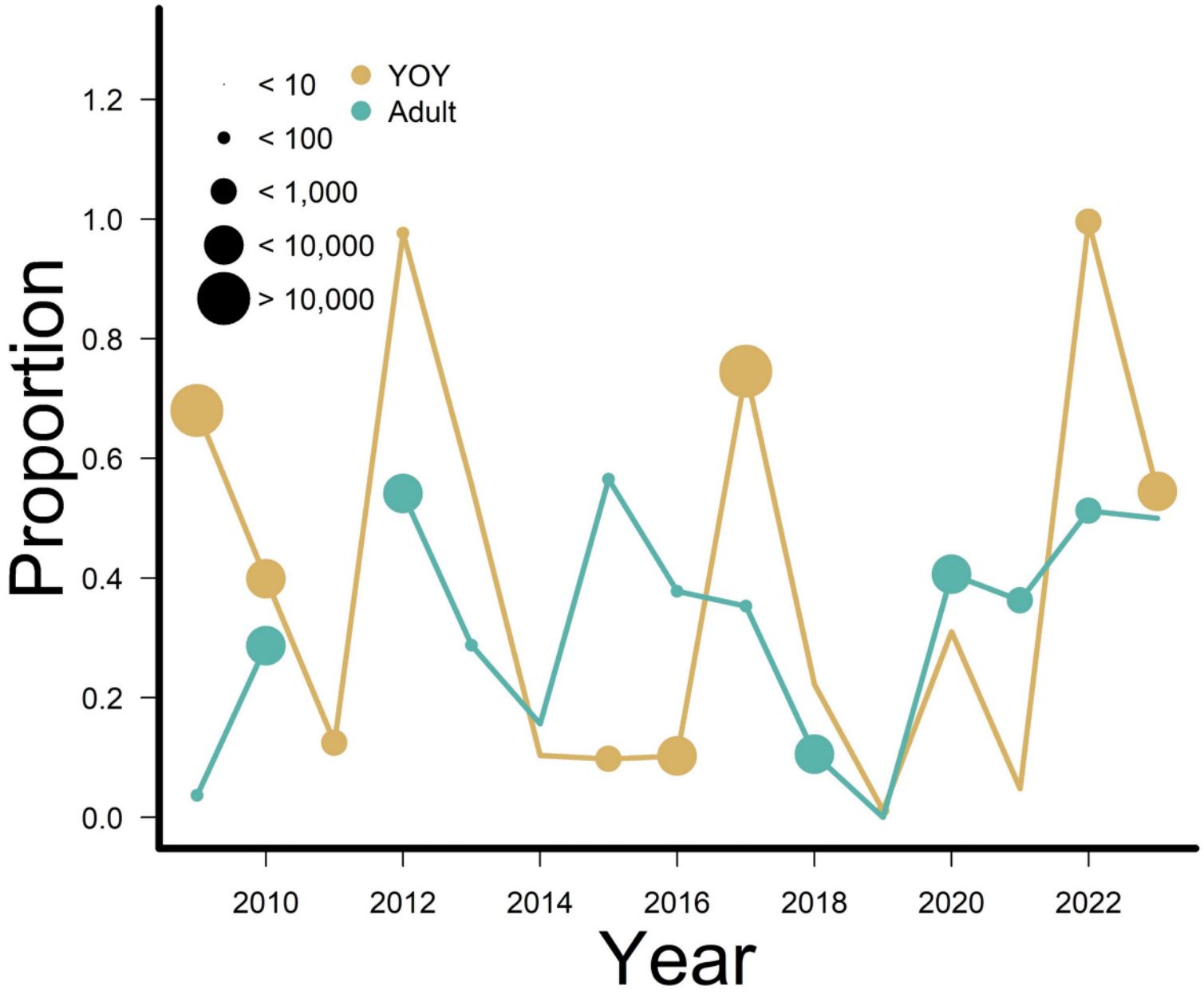
Validation

- Do the estimated high-density spatial units actually have more silvery minnow?
- Calculate average fish per pool per year in each category
- However, 3.5 times as many pools in “average” as “hot” areas



Relative Ranking by Year

- Correctly orders 8 out of 15 years for YOY
- 13 out of 15 for adults



Proportion by Year

- 25 km of “hotspot” for adults
- 27.5 km of “hotspot” for YOY
- 21-23% of drying
- 2023 ~25%

Summary

- Objective: There are hotspots!
- But the species is still dispersed throughout the Middle Rio Grande
- Hard to conserve and protect lots of fish with small amounts of water
- Adults and YOY hotspots don’t necessarily overlap
  - Adults – Socorro Hub and upstream, below IDD
  - Young of year – Upstream of Socorro Hub, north boundary Bosque del Apache
- Connectivity: longer sections better than multiple smaller sections

Next steps

- Goal: Improve summer survival of silvery minnow by reducing mortality associated with stranding in isolated pools
- Adaptive management approach
- Strategy: optimize return flows while balancing
  - Available water
  - Expected flow conditions
  - Intended life-stage to benefit
- Can stranding mortality be reduced enough to matter?
- Can refuge areas be large enough to improve species persistence?

Future of fish rescue – what is the value?

- Not as effective of a management tool as hoped
- May be useful in a subset of years
- Data are useful for exploring management options and data-driven analyses
- Transition to a monitoring protocol

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- Questions? thomas_archdeacon@fws.gov