Avian Predation in the Columbia River Basin: A System-wide Evaluation

AFEP Annual Review
January 23, 2024

REAL TIME RESEARCH

OSU
Oregon State
UNIVERSITY

Acknowledgements

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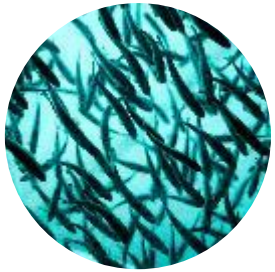
BONNEVILLE POWER ADMINISTRATION

Grant PUD & PRCC PR Coordinating Committee

Background

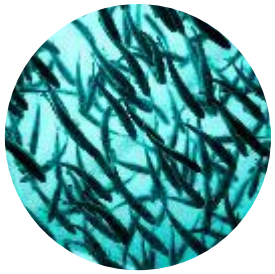




- Avian predation research initiated in 1996
- Four primary species identified (Caspian terns, double-crested cormorants, California/ring-billed gulls, American white pelicans)
- Diversity of study topics
  - *Nesting-ecology (colony size, productivity, dispersal and connectivity, and limiting factors)*
  - *Predation impacts (diet composition, number of prey consumed, predation rates)*
- Over 50 technical reports and 40 peer-reviewed scientific journals (see www.birdresearchnw.org)

Background



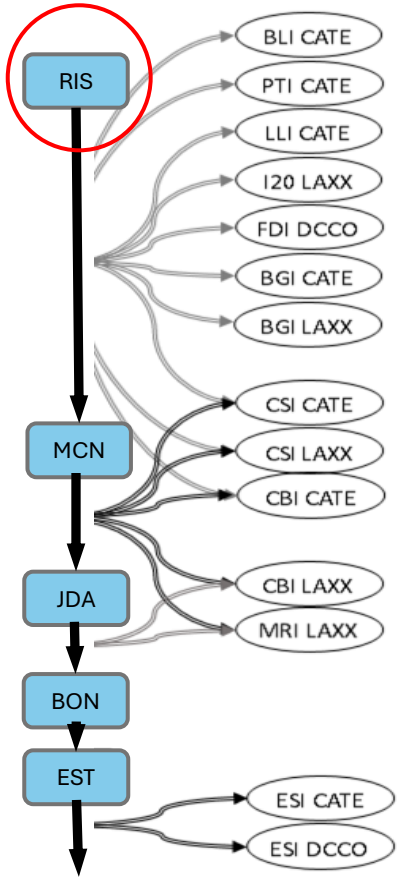


- Previous studies focused on colony-specific predation effects
- Some salmonid populations out-migrate through the foraging range of multiple avian predator species and colonies (e.g., Upper Columbia River and Snake River smolts)
- PIT-tagged smolts provide recapture-recovery histories of fish during out-migration
  - Recapture of live fish at dams and other sites
  - Recovery of dead fish on bird colonies

Study Goals

- Identify colony locations and sizes in 2023
- Estimate cumulative, system-wide effects of avian predation on Upper Columbia River and Snake River smolts in 2023
- Comparisons of cumulative predation in 2023 relative to years past
- Estimate reach-specific predation effects in 2023
- Comparison of predation and survival within and across salmonid species, river-reaches, weeks, and years
- Estimate the relationship between predation and survival (additive effects)

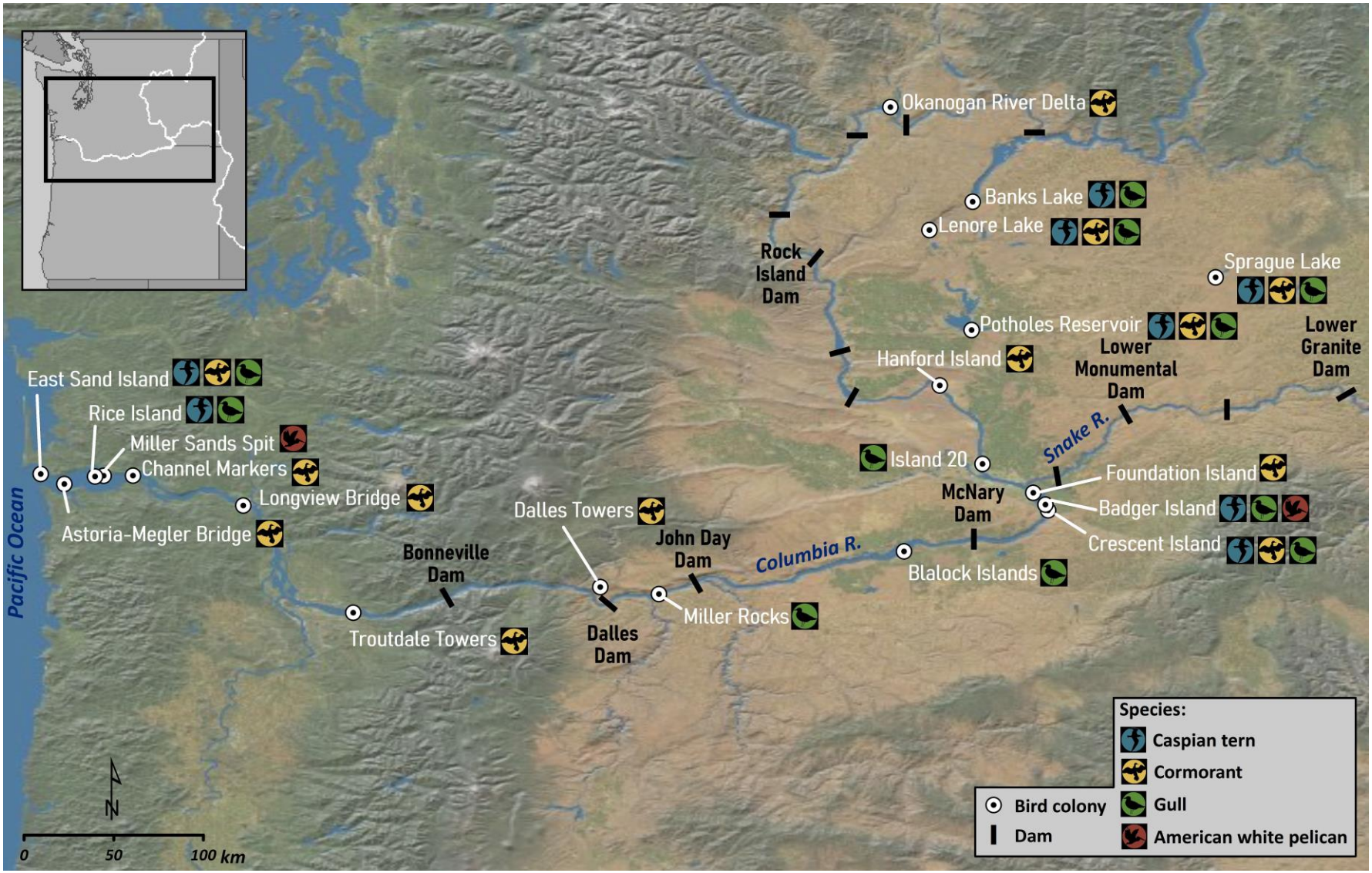
Jointly Modelling Mortality and Survival (JMS model)



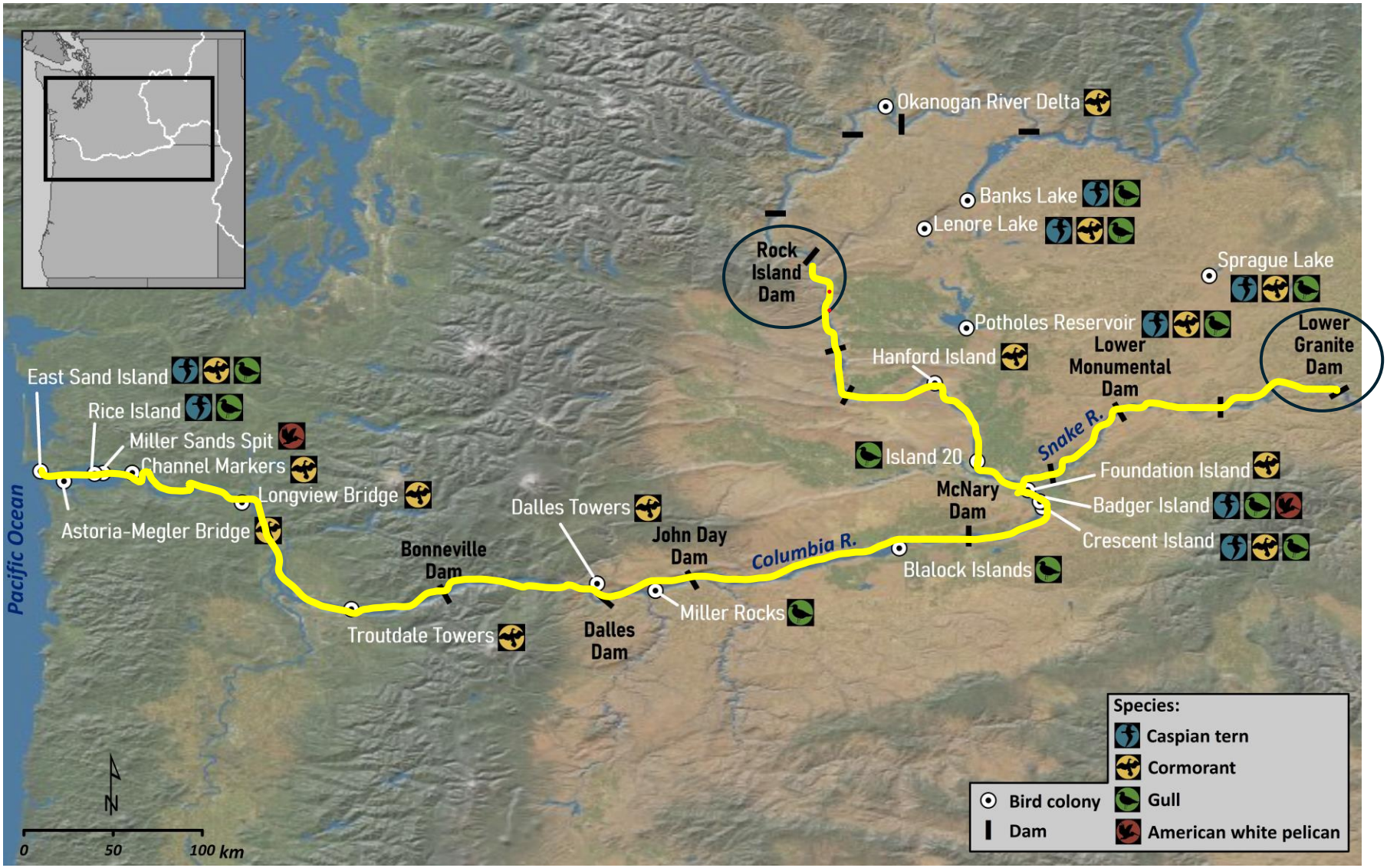
Payton et al. 2019

- Cause-specific mortality rates
  - Applicable to all mortality
  - Colonial waterbird predation only herein
- Simultaneous estimation of survival and mortality
  - Aggregation among colonies and across river segments
  - Relative comparisons of predation and survival

Colony Locations

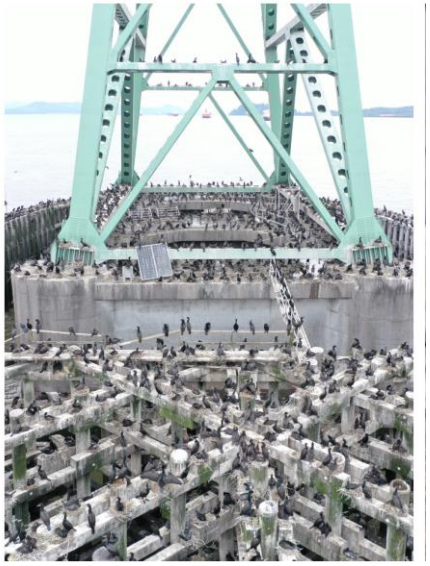


Colony Locations



2023 Preliminary Results – Predator Composition

- 19 active breeding colonies included in system-wide predation analysis
  - 6 cormorant colonies
    - 3 CR, 1 LCR, 2 CRE
  - 6 tern colonies
    - 2 MC, 2CR, 2 CRE
  - 5 gull colonies
    - 1 MC, 4 CR
  - 2 pelican colonies
    - 1 CR, 1 CRE



2023 Preliminary Results - Colony sizes (CRP)

Colony [1]	Gulls	Pelicans	Cormorants	Terns
Miller Rocks (CR)	3,951			
Blalock Islands (CR)	2,005			
Crescent Island (CR)	3,892		199	88
Badger Island (CR)	2,816	2,593		274
Foundation Island (CR)			380	
Island 20 (MC)	6,488			
Hanford Island (MC)			109	
Goose Island (Off-river)				12
Shoal Island (Off-river)				81

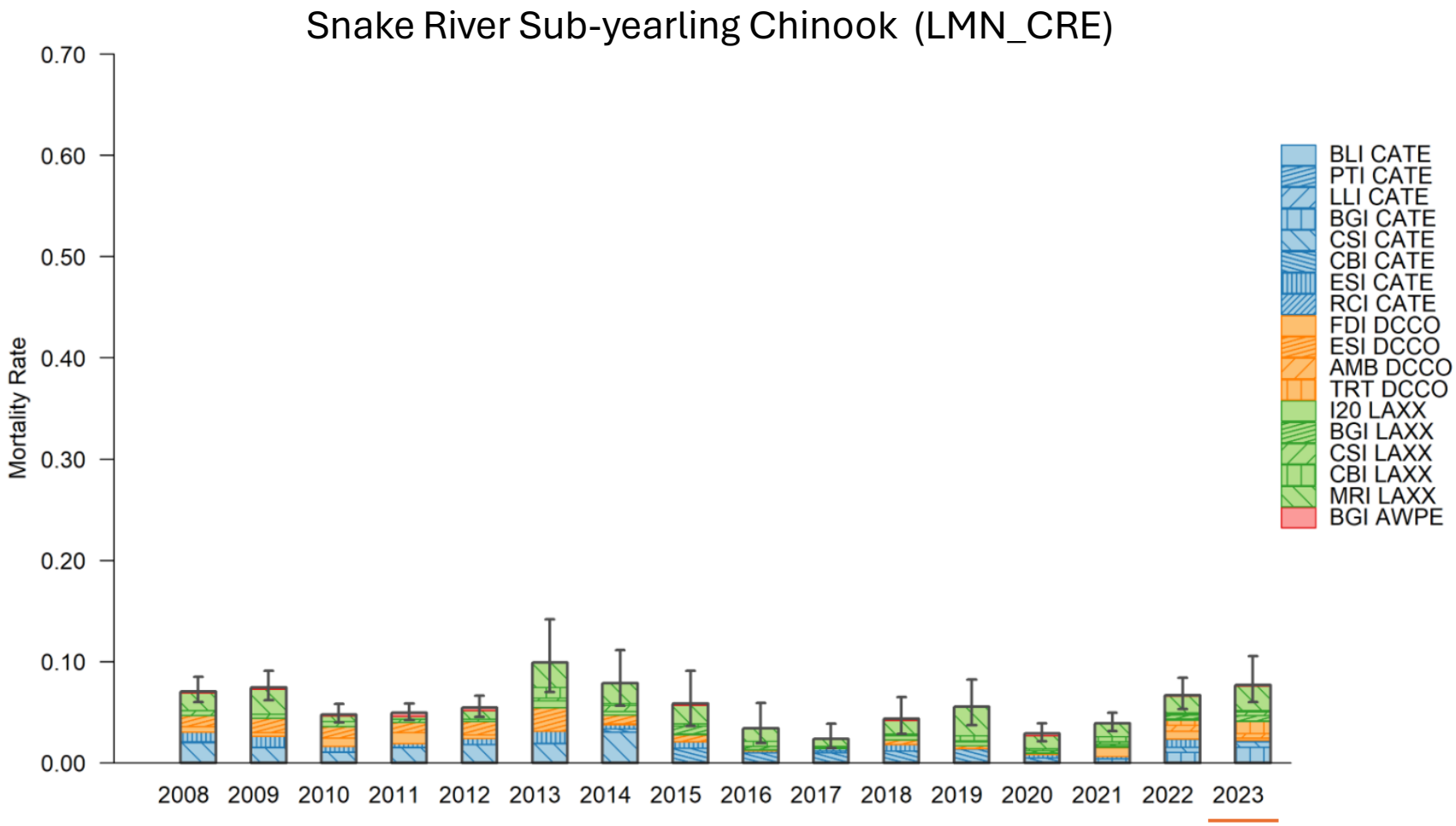
[1] *Limited to colonies included in system-wide predation analysis*

2023 Preliminary Results - Colony sizes (CRE & LCR)

Colony [1]	Pelicans	Cormorants	Terns
East Sand Island [2] (CRE)		241	523
Astoria-Megler Bridge (CRE)		5,153	
Rice Island [2,3] (CRE)			Active
Miller Sands Spit (CRE)	1,272		
Troutdale Transmission (LCR)		401	

[1] Limited to colonies included in system-wide predation analysis
[2] Data from USACE-FFU
[3] Attempted but failed to nest

Preliminary Results – Cumulative Annual Predation



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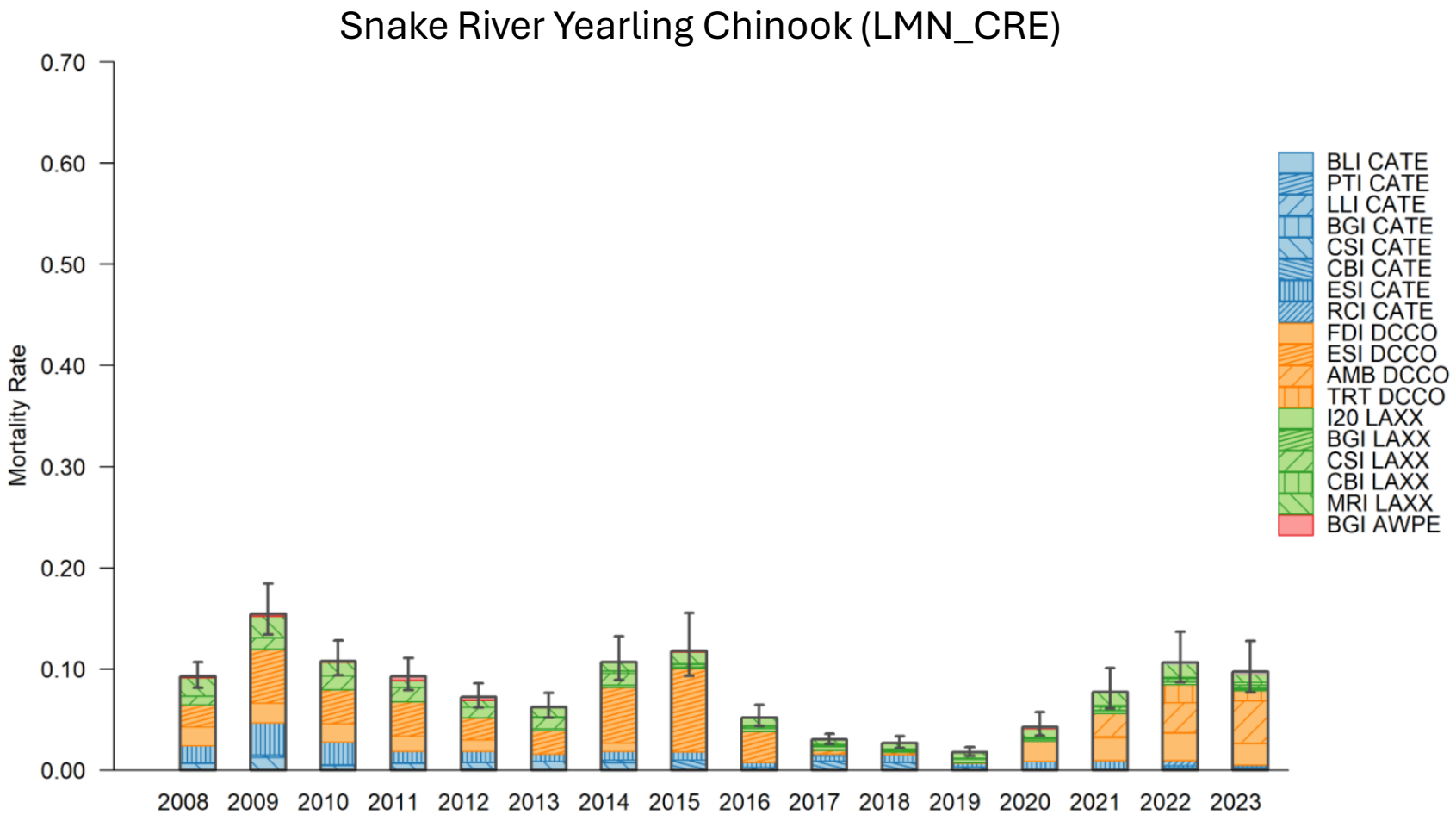

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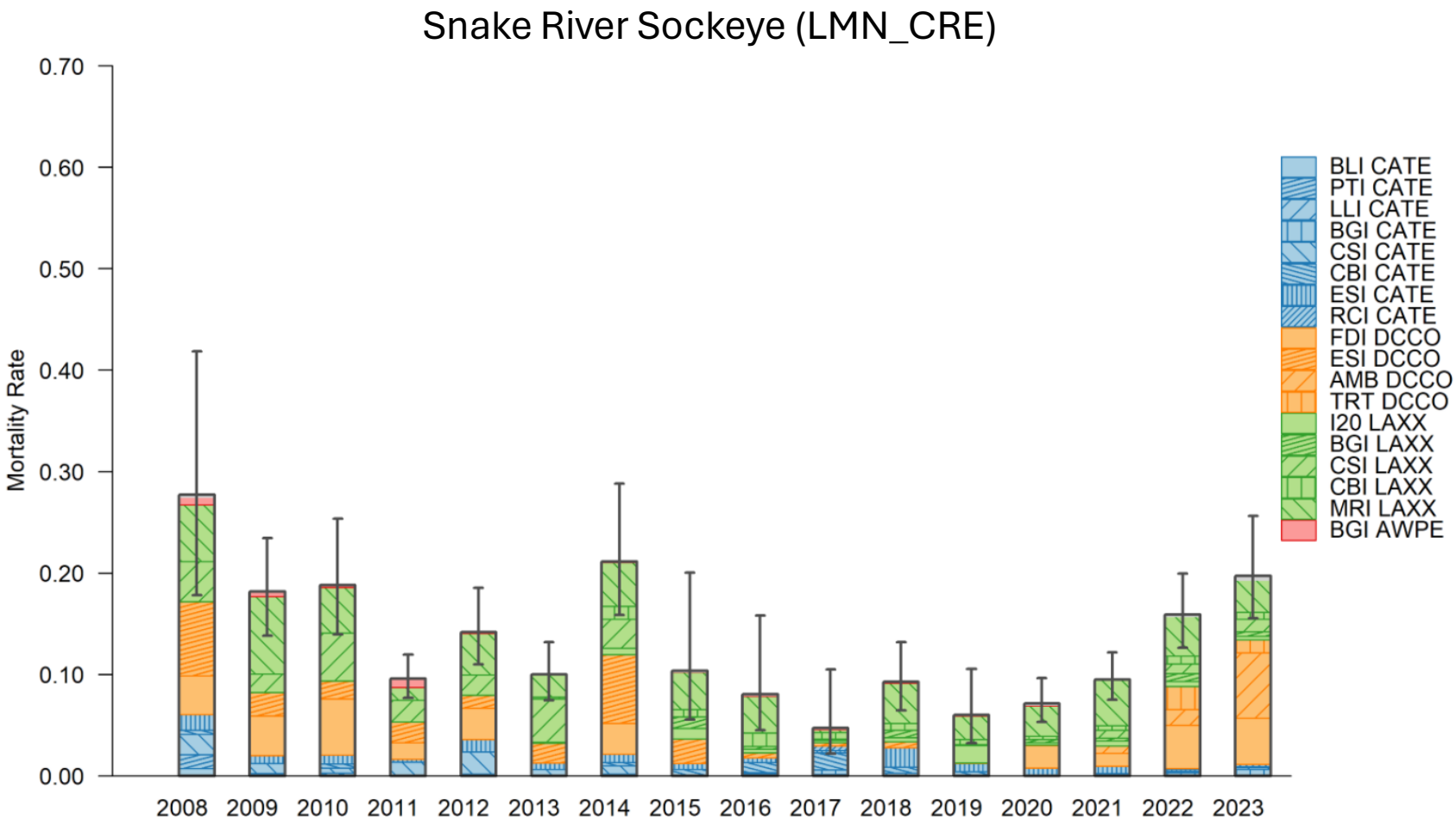

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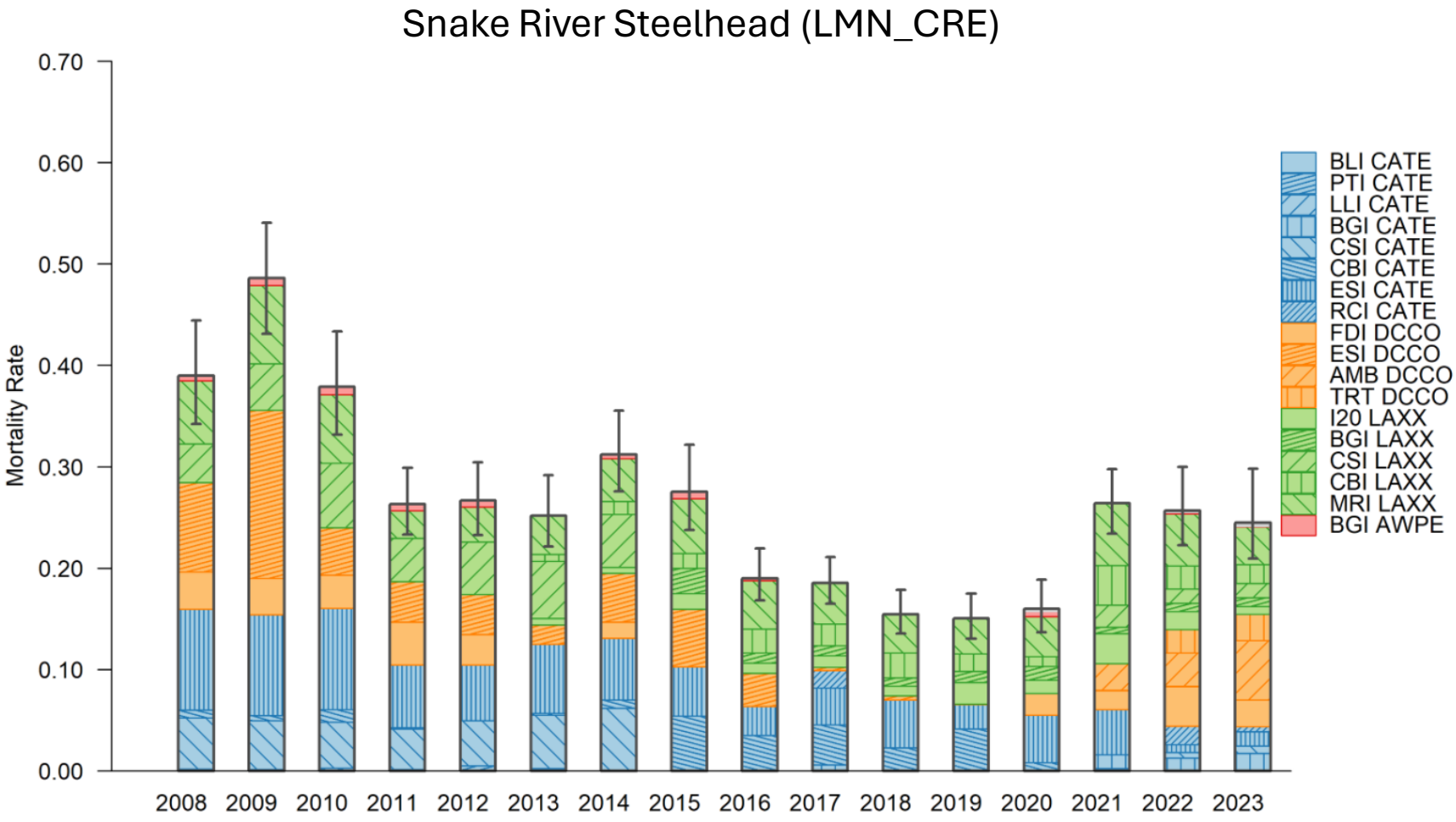

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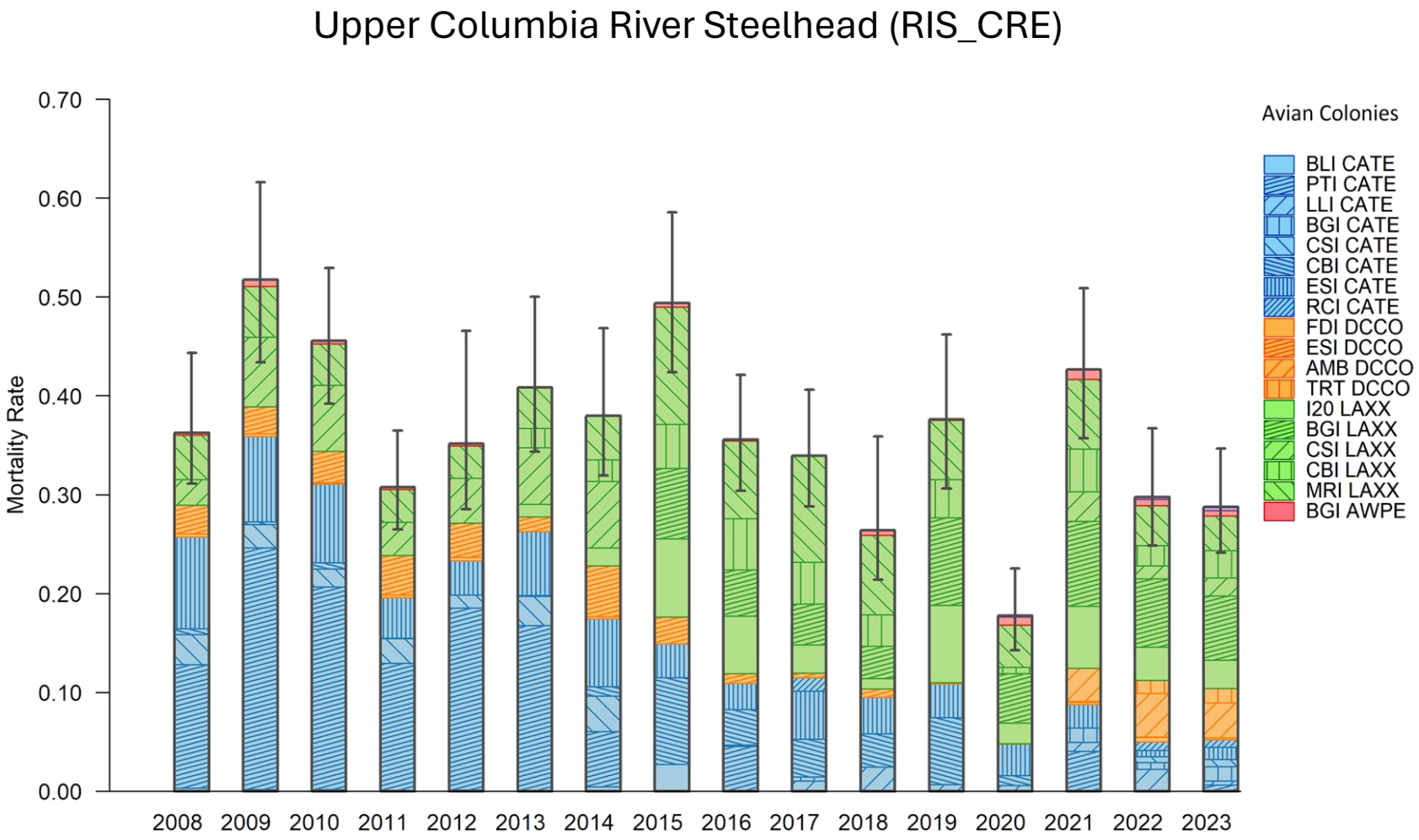
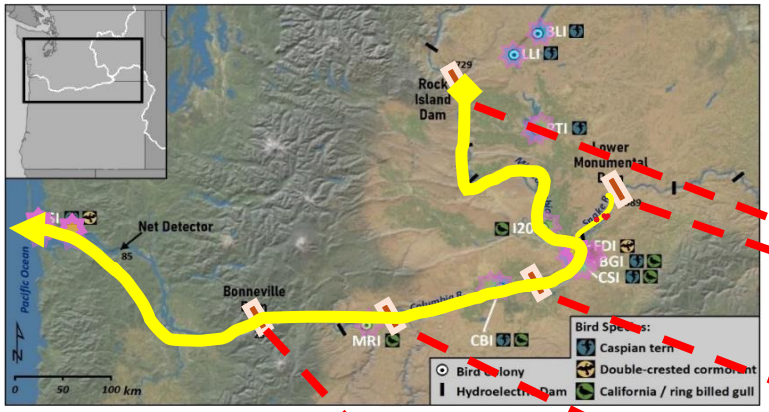
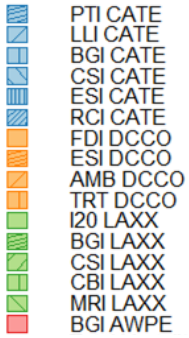
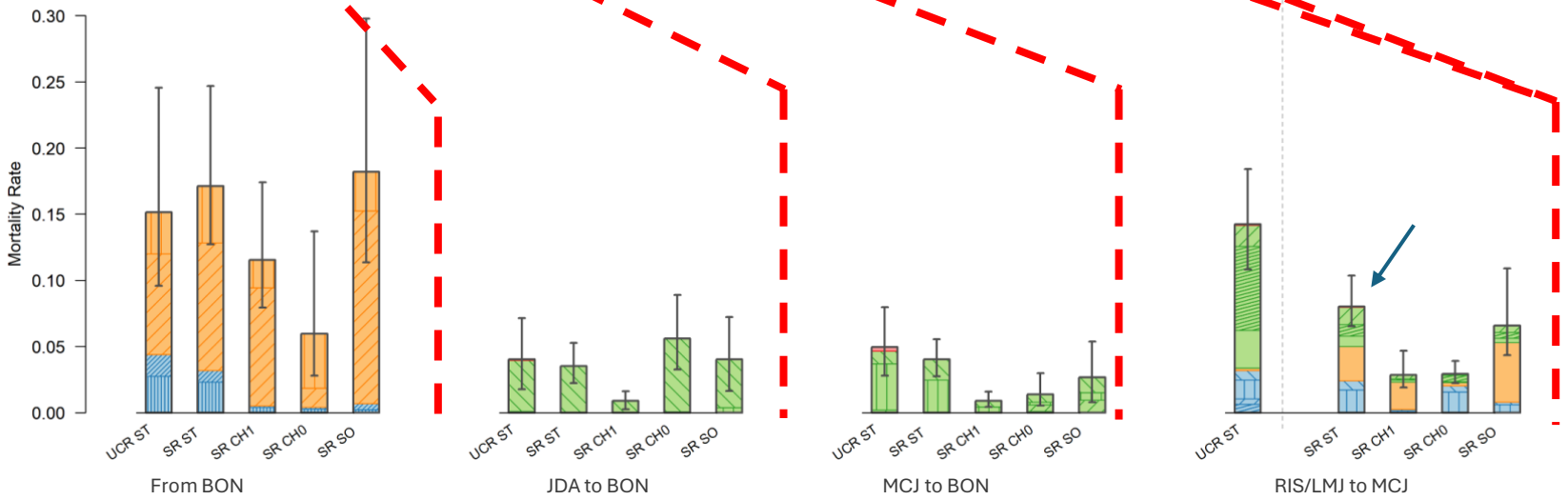


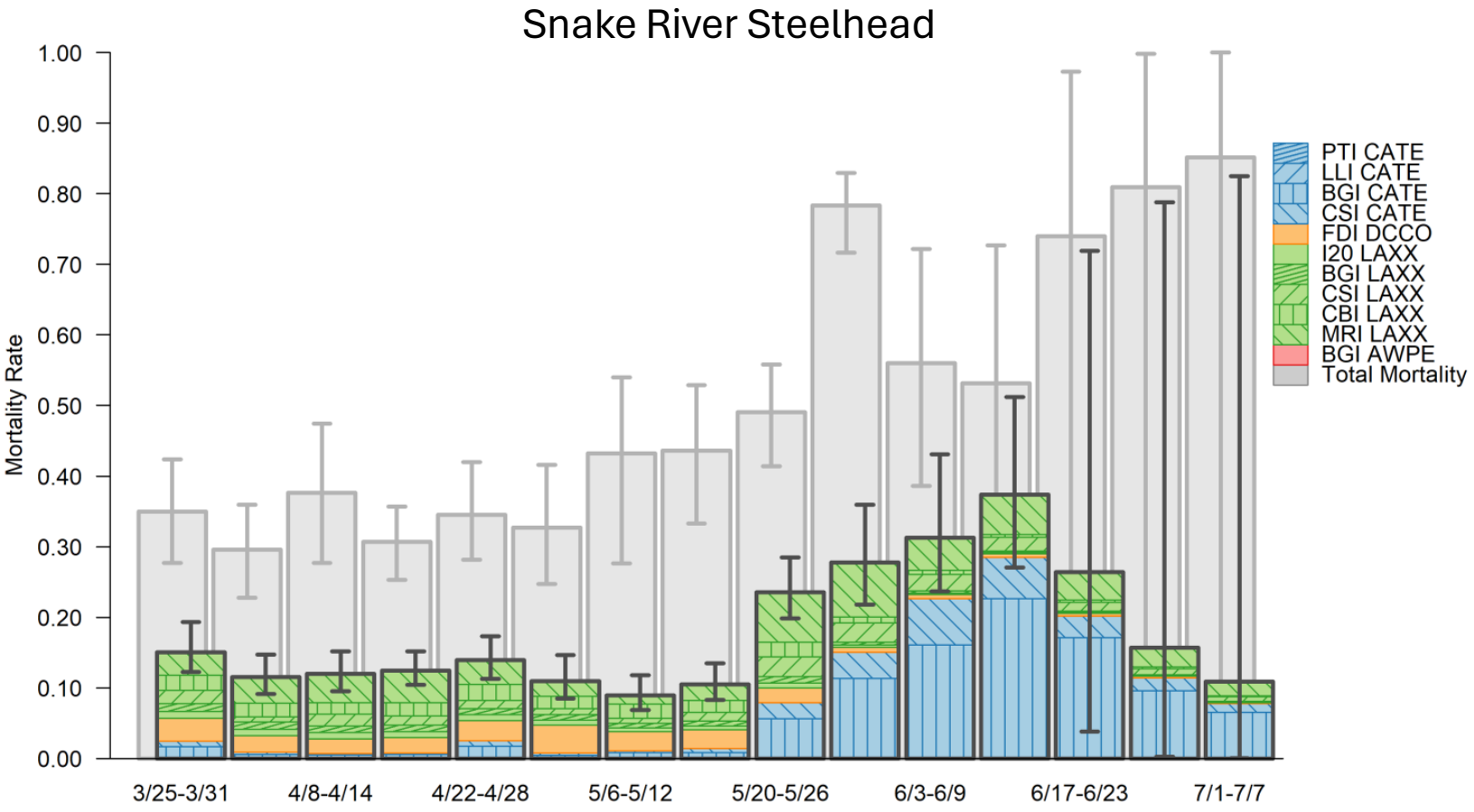
2023 Preliminary Results – Reach-Specific Annual Predation





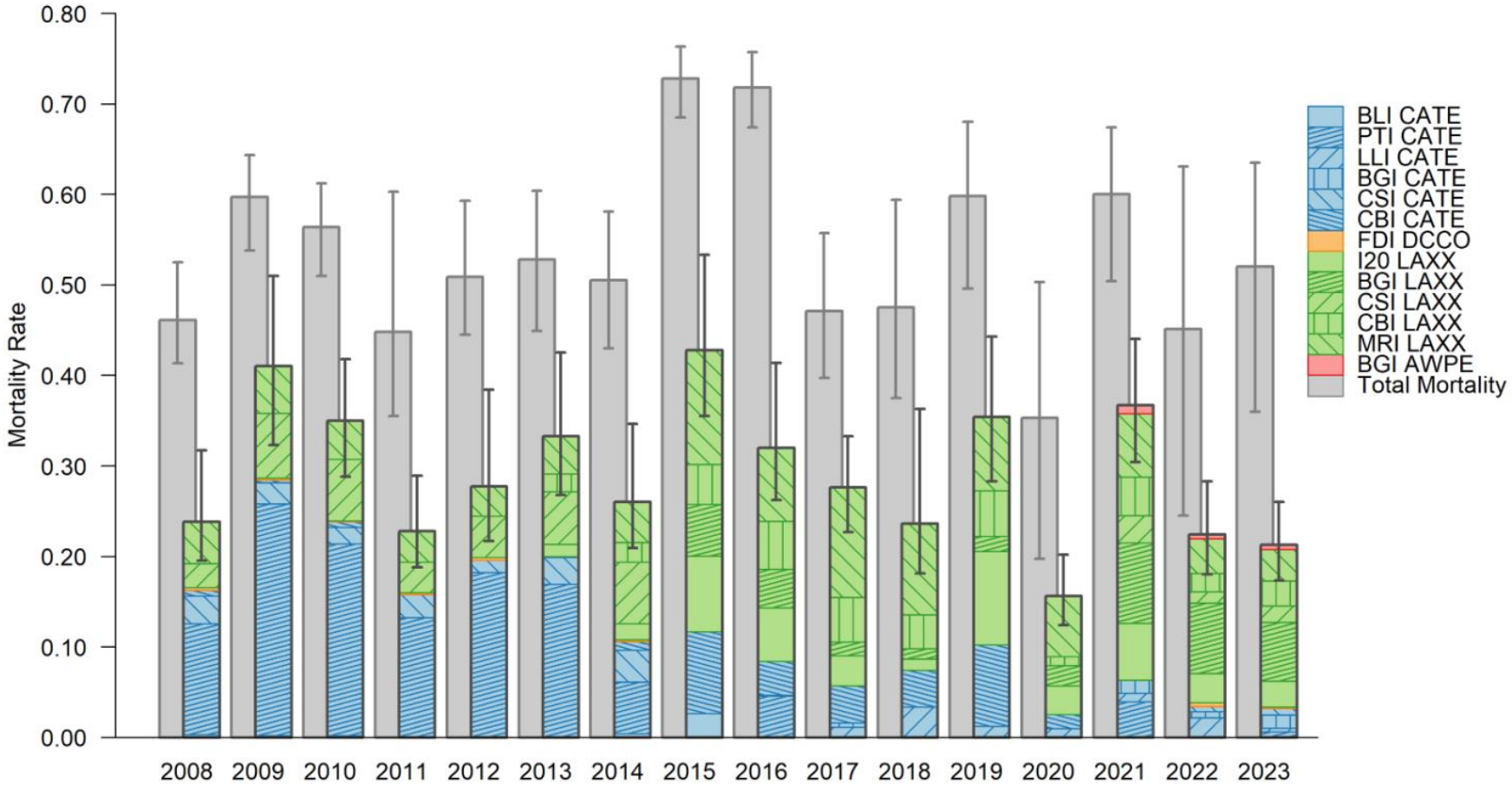


2023 Preliminary Results – Reach-Specific Weekly Predation & Survival (LMN_BON)



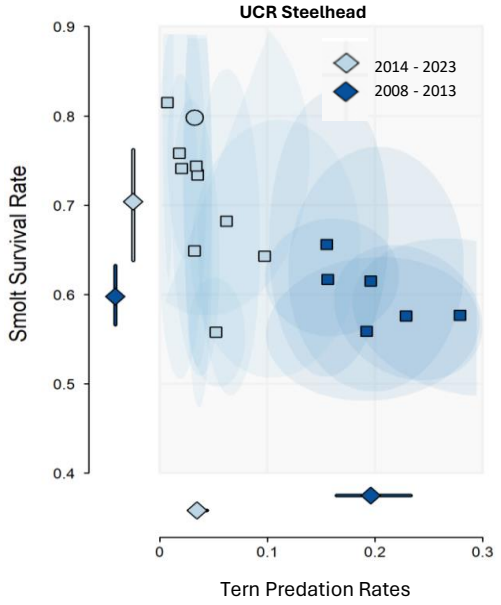
Preliminary Results – Reach-Specific Annual Predation & Survival (RIS_BON)

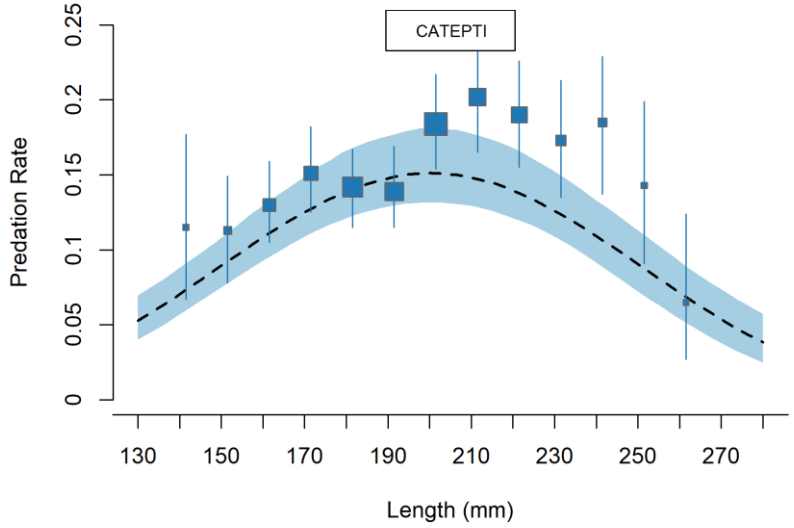
Upper Columbia River Steelhead



2023 Annual Report - Other topics

- Efficacy of avian management plans
- Additive predation effects
- Factors affecting smolt susceptibility to avian predation





Summary

- Cumulative predation
  - Highly variable (by salmon species, predator species, year, and week)
  - Not all colonies a threat
  - Steelhead most susceptible, especially to plunge-diving predators (terns, gulls)
  - Salmon most susceptible to cormorant predation
  - Cumulative effects in 2023 were average for most but not all SR and UCR smolts relative to years past

- Reach-specific predation effects in 2023
  - Highest in CRE, following by McNary Reservoir
  - Gull predation between McNary and Bonneville
  - Astoria-Megler-Bridge cormorant predation impacts consistently the highest

- More data, results, and discussion in will be available in 2023 Avian Predation Annual Report (March 2024)

Questions