Population assessment and long-term analysis of the endangered Comal Springs Riffle Beetle, *Heterelmis comalensis*

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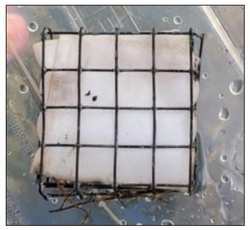
Comal Springs Riffle Beetle, *Heterelmis comalensis* (CSRB; Coleoptera: Elmidae)

- Endemic to two springs emanating from the Edwards Aquifer in central Texas
  - Comal Springs (primary population, our focus)
  - San Marcos Springs (much smaller population)
- Lacks functional wings and has slightly reduced eyes
- Listed as federally endangered in 1997 primarily due to the threat of overconsumption of water from the aquifer, along with other factors such as potential groundwater contamination

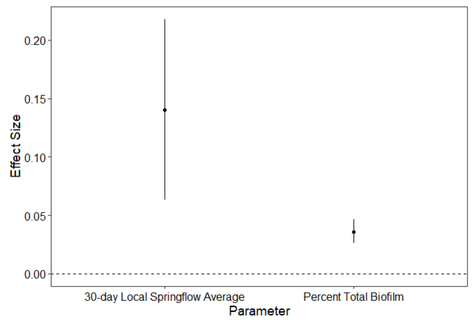
Edwards Aquifer Habitat Conservation Plan

- Provides funding for listed species research, habitat conservation/restoration, and the establishment of captive populations and breeding programs
- Has required semiannual CSRB biomonitoring since 2004
  - Conducted at 30 sites using cotton lures placed in spring openings for 30 days
  - Lures grow biofilm (food for beetles)
  - Additional monitoring is required during "low flow" conditions (<100 cfs; long-term historic average = 284 cfs, horizontal line below)
  - Lures are used for other projects (included in full dataset)
  - Co-occurring species are recorded, primarily the similar but widespread non-spring endemic species, *Microcylloepus pusillus*

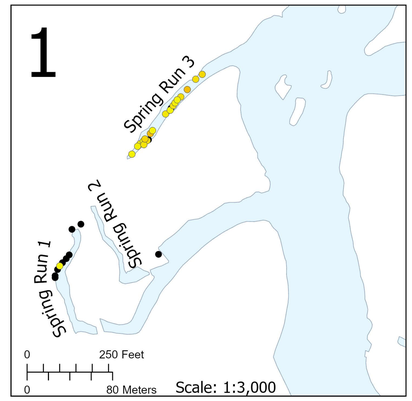


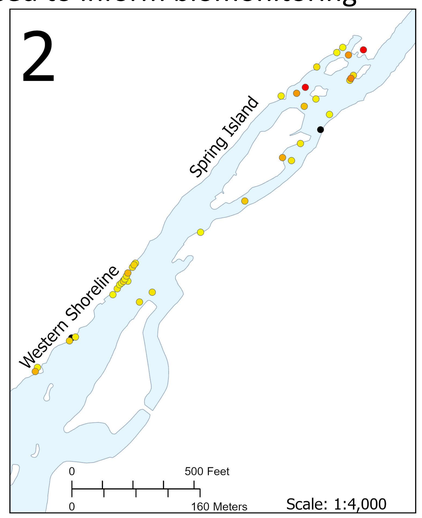
CSRB Population Assessment (2023-2024)

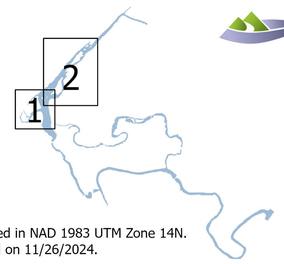
- Initiated to assess CSRB populations across Comal Springs, determine what environmental covariates relate to CSRB abundance, and develop relationships with relative abundance estimates that can be used to inform biomonitoring
- 83 sites monitored 5× in one year with ~20 potential covariates
- Only 30-day localized springflow (springflow from the regions labeled on maps) and % biofilm coverage on lures were related to relative abundance (both positive)



- *M. pusillus* responded positively to biofilm but had no relationship with springflow







Projected in NAD 1983 UTM Zone 14N.
Created on 11/26/2024.

CS Riffle Beetle Mean Total Abundance
- 0.2
- 0.2 - 22.6
- 22.6
- Empty Sites

Long-term abundance analysis (2004-2025)

- 2250 samples (lures) since 2004 with >18,000 CSRB and >14,000 *M. pusillus*; fewer available covariates
- Relative abundance of both CSRB and *M. pusillus* are currently at their lowest levels since monitoring began
- CSRB populations were again tied to localized springflow, but *M. pusillus* was linked to drought severity
- However, for both species, covariates do not account for all changes and both retain a significant temporal decline across most localities