# Comal Springs riffle beetle pupation enhancement



#### BIO-WEST, Inc.







#### Re-cap from 2019

- Tested effectiveness of large flow-through tube housing
- Make use of biological information (Houston and Gibson 2015)
  - Pupae float
  - Pupae require air
- Investigated different packing strategies
- Identified flow regimes that were successful



## Work from 2020 – build off of 2019 observations

- 1. Continued flow-through tube treatments to accommodate a CBD
  - Large larvae
- 2. Examination of trials that incorporated earlier instars
  - Medium sized
  - Small sized (newly hatched)
- 3. Adult fitness
  - Track female fecundity and longevity
- 4. Future outlooks
  - Consider building life table for captively reared colony
  - Develop better housing aquaria for maintaining colonies



## Continued flow-through treatment

- Two factors
  - Material packing
    - Wood, cotton, leaf with a plastic-mesh roll in center
    - Plastic mesh around circumference with rock and leaf in center
  - Tube position
    - Up-right
    - Horizontal
- Other variables
  - Degree days
  - Flow





## **Continued flow-through treatment**

- Run for 77 101 days (92 day average)
- Degree days ranged 1771.1 2517.0 (2137.5 ± 234.7)



- 2-Way ANOVA
  - Tube position (*F*-value = 10.279; *p*-value = 0.0107)
  - Material packing (F-value = 0.084; p-value = 0.7791)

 $\rightarrow$  Horizontal position more successful (0.325 ± 14.7%) vs upright tubes (4.2 ± 5.3%)

## Examination of trials with earlier instars

- Horizontal position packed with wood, cotton, leaf with a plasticmesh roll in center
- Medium sized
  - 22 individuals
  - Mean HCW ~ 0.26 mm
  - 183 days
- Small sized
  - 2 launches (53 & 63 inds)
  - Mean HCW ~ 0.16 mm (first second instars)
  - 211 & 228 days



## Examination of trials with earlier instars

- Medium sized
  - 5 pupation events (23%)
- Small sized
  - First trial  $\rightarrow$  15 pupation events (24%)
  - Second trial  $\rightarrow$  2 pupation events (4%)
    - 64% of individuals are still living larvae



#### Post – treatments

- Post-treatment
  - Various
  - ~25% of 95 individuals pupated
- Across all larval stages and treatments
  - 90 pupation events (out of 498 larvae)



### Adult fitness

- Tracked 23 females (11 additional still being tracked)
- Females iteroparous
- The longer females live and mate, more larvae produced
  - Larvae not produced if males not present



## Adult fitness

- 664 larvae produced
  - Larvae / Female = 28.9 ± 37.3
  - Min / max = 0 121
  - 90 days ~ 30 larvae



#### Hypothetically:

- Start with 10 females surviving 50 days with access to mates
- Produce 156 larvae
- 14% survival
- 22 adults  $\rightarrow$  11 females

## **Future outlooks**

- Finish final trial
- Run more early instar trials
  - Produce a life table



- Investigate better captive rearing strategies
  - Aquarium designs
    - Flow
    - Maintain all life stages
  - Nutritional requirements