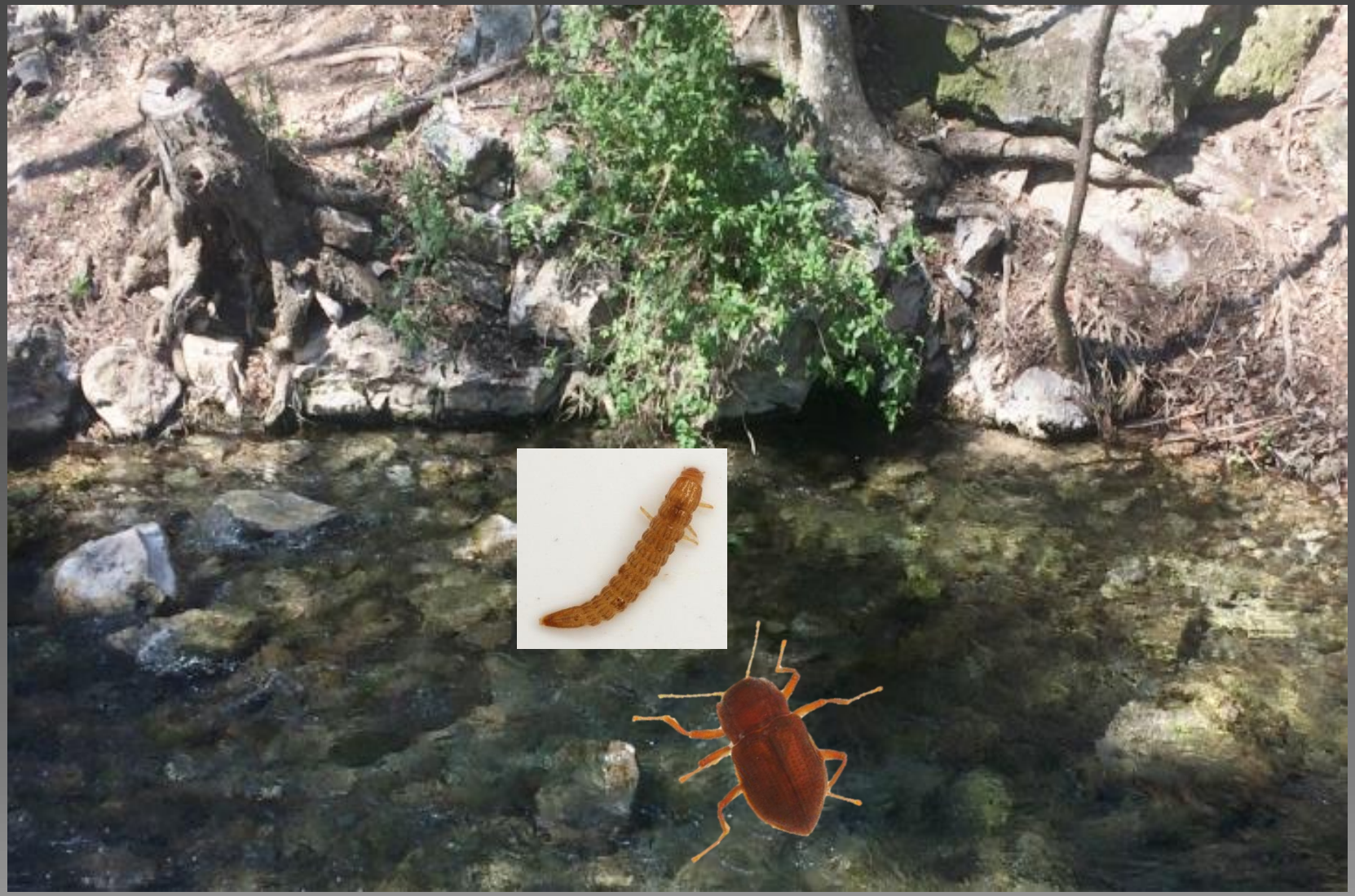
Evaluation of Life History of the Comal Springs Riffle Beetle

Randy Gibson
Ed Oborny
Dr. Weston Nowlin
and
Dr. Don Sada

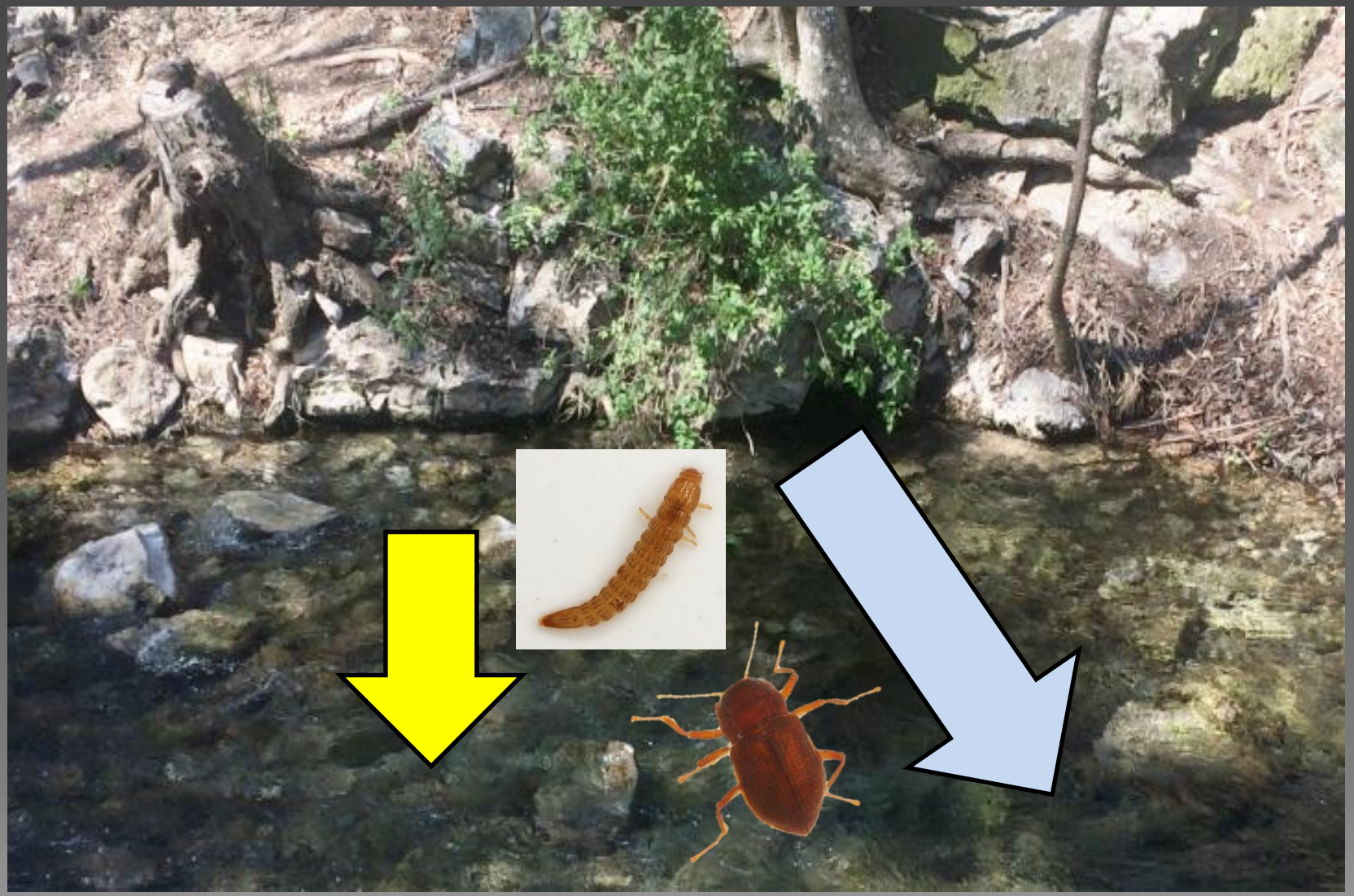
Background

- *H. comalensis* listed in the EA-HCP
  - Flow conditions should consider this organism
- As with other organisms, requires specific features and/or habitat characteristics for growth and reproduction
- Have been able to house *H. comalensis* in the lab as adults and larvae
  - Variety of field data indicate a suite of habitat variables that might be important
  - Difficulty in pupation and emergence as an adult in the lab

CSRB and Spring Association



CSRB and Spring Association



Cooke et al. (2015), SWAN

CSRB and Woody Debris/CPOM

BIO-WEST et al. (2015), EAA Report

Background

- General information known on the life history of CSRB
  - Specific information on the different conditions required to complete its life cycle remain unknown

- Limited distribution, sensitivity of habitats, small body size, and sampling issues make field study difficult

- Lab-based program to examine the life history of the CSRB
  - 2 year project (Year 1 work plan today)

- Rarely observed eggs in the lab and none in natural habitat
  - Large and ~10 eggs/female
  - No idea of deposition sites or hatch time
  - Other species = eggs hatch in 5-15 d
- After hatching, live as larvae for 6-8 instars across 6-36 months
  - ~ 7 instars
- Pupate to adults
  - Most Elmids pupate above the water line
  - CSRB pupation has been observed below the water line
  - No idea how long pupation period lasts
- Adult life span could be 12 - 36 months

Life History Project
Objectives and Timeline

- Year 1 will focus on studying factors contributing to egg production and larval development
- Also focus on building a knowledge base of the factors that contribute to CSRB condition
- Broken down into tasks which coincide with their development and progression through life history stages

Study Tasks and Timeline

- Collect adult beetles and bring back to SMARC
  - Currently underway
- Determine if we can identify sex (male *vs* female) through non-invasive/non-lethal means
  - Also underway
- Mating, reproduction, and egg production
  - Combine ~30 male/female pairs in suspended array set-ups with a variety of substrate/food items that are found in their habitats
  - Leaves, poly-cotton cloth, limestone rock
  - All combinations (including absence of all items)
  - Substrate materials checked 2x week for eggs (ANOVA)

Egg Incubation Phase

- Removed eggs will be placed into new containers with same substrate/treatment combinations
  - Determine hatching success (ANOVA)
- Subset of hatched larvae will be sent to DRI for condition index work
- The remaining larvae will be moved into the larval development portion of the project
- However, we will go back and make mating observations on adults in various substrate type combinations (ANOVA)

Larval Development Phase

- 1st instar larvae moved into one of 8 possible treatment combinations (held as individuals)
  - Leaves, poly-cotton cloth, rock (control with nothing)
  - Follow larvae though molts and ontogeny
  - Growth/molt rate (microscopy) (ANOVA)
  - Some larvae sent to DRI for condition index generation
- Other larvae of various stages at SMARC will be moved into group holding set ups to determine habitat preferences (sectioned container)
  - Leaves, poly-cotton cloth, rock (also control with nothing)
  - # of larvae found in each section at various times, pupation rate

CSRB Condition Index

- Adults, larvae and pupae (perhaps some eggs) will be used to make highly-detailed analyses of size/dimensions
- Determine if there are size-mass relationships for adults, larvae
  - Condition index

Year 2

- Second year will build on this year
- Will revisit the Science Committee to report findings from this year and to propose work in the 2nd year
- Anticipated we will perform
  - Pupation studies
  - Adult life span
  - Fecundity
  - Refine and finish developing condition index
    - Application to field and lab