Update on the 2016 Edwards Aquifer Habitat Conservation Plan Activities

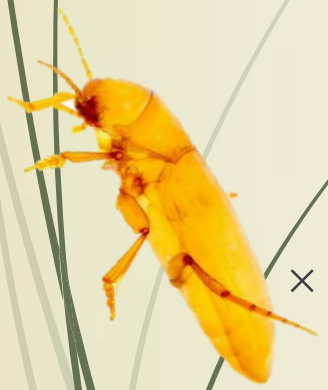
March 23, *2017 Guadalupe River Basin and Lavaca-Guadalupe Coastal Basin Clean Rivers Program Steering Committee Meeting*

Selected 2016 Activities

- Annual Take Report
- National Academy of Sciences, Report 2
- USFWS-EAA Refugia for Covered Species
- Old Channel Comal River Bank Stabilization
- Comal Springs Riffle Beetle Life History Study

INCIDENTAL TAKE ANNUAL REPORT

COMMON TERMS



- **"Take"** is defined in Section 3(18) of the Federal Endangered Species Act as an activity that will harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or the attempt to engage in any such conduct.
  - **"Harass"** is further defined as an intentional or negligent act or omission that creates the likelihood of injury to a listed species by annoying it to the point as to significantly disrupt normal behavioral patterns (breeding, feeding and sheltering).
  - **"Harm"** is further defined to include significant habitat modification or degradation that results in injury or death to listed species by impairing normal behavioral patterns.
- Basically, if you do anything (intentionally or unintentionally) that disrupts the routine activities of a listed species, you have committed a "take" of that species.
- **"Incidental Take"** is a taking that results from, but was not the intended purpose of, an otherwise lawful activity.
- **Incidental Take Permit (ITP)** is a specific permit issued under Section 10 of the Federal Endangered Species Act to private parties that are conducting otherwise lawful activities that might result in the taking of an endangered or threatened species.

INCIDENTAL TAKE ANNUAL REPORT
2016

- **Review and Methods**
  - Same methodology used since 2013.
  - Document baseline area of occupied habitat for the covered species.
- **HCP Mitigation and Restoration**
  - Determine how much occupied area was disturbed during 2016.
  - No more than 10% of the covered species occupied habitat can be affected by HCP mitigation and restoration activities.
- **HCP Measures/Drought**
  - Determine how much occupied area was disturbed during 2016
- **Incidental Take Assessment**
  - Calculate incidental take of covered species

EAHCP Covered Species

EAHCP Covered Species

Species in the Incidental Take Permit

Authorized for Take

1. Fountain Darter
2. Comal Springs riffle beetle
3. Comal Springs dryopid beetle
4. Peck's cave amphipod
5. San Marcos salamander
6. Texas blind salamander

Take does not apply at this time

1. Texas cave diving beetle (NL)
2. Texas troglobitic water slater (NL)
3. Comal Springs salamander (NL)
4. San Marcos gambusia (likely extinct)
5. Texas wild-rice (plant)

NL = Not listed as endangered or threatened at this time.

EAHCP Incidental Take - 2016

COVERED SPECIES PER SYSTEM	HCP Mitigation / Restoration		HCP Measures / Drought	Combined Impacted Habitat 2016 TOTAL (m^2)	INCIDENTAL TAKE		2016 **INCIDENTAL TAKE TOTAL**	ITP Maximum Permit Amount	ITP Permit Maximum minus (combined first four years)
	IMPACTED HABITAT (m^2)	NET Disturbance % OF TOTAL Occupied Habitat	IMPACTED HABITAT (m^2)		HCP Mitigation / Restoration	HCP Measures / Drought			
COMAL SYSTEM									
Fountain Darter	3,002	3.3%	3,637	**6,639**	4,503	5,456	**9,959**	797,000	748,386
Comal Springs Riffle Beetle	0	0.0%	0	**0**	0	0	**0**	11,179	8,933
Comal Springs Dryopid Beetle	0	0.0%	0	**0**	0	0	**0**	1,543	1,528
Peck's Cave Amphipod	0	0.0%	0	**0**	0	0	**0**	18,224	18,060
SAN MARCOS SYSTEM									
Fountain Darter	3,652	4.1%	3,697	**7,349**	5,478	5,545	**11,023**	549,129	496,190
San Marcos Salamander	0	0.0%	0	**0**	0	0	**0**	263,857	261,264
Texas Blind Salamander	0	0.0%	0	**0**	0	0	**0**	10	10
Comal Springs Riffle Beetle	0	0.0%	0	**0**	0	0	**0**	n/a	n/a

INCIDENTAL TAKE 2013 – 2016

System	Species (common name)	ITP Take Limit	2013 Take	2014 Take	2015 Take	2016 Take	Total Take	Remaining ITP Take
Comal	fountain darter	797,000	10,482	23,060	5,115	9,959	48,616	748,384
	Comal Springs riffle beetle	11,179	681	1,564	0	0	2,245	8,934
	Comal Springs dryopid beetle	1,543	13	2	0	0	15	1,528
	Peck's cave amphipod	18,224	81	82	0	0	163	18,061
San Marcos	fountain darter	549,129	16,698	11,909	13,295	11,023	52,925	496,204
	San Marcos salamander	263,857	1,053	482	1,059	0	2,594	261,263
	Texas blind salamander	10	0	0	0	0	-	10
	Comal Springs riffle beetle	n/a	0	0	0	0	-	n/a

Take Observations

- 2016 EAHCP mitigation and minimization activities did not exceed the 10% habitat disturbance rule.
- In the Comal, incidental take for fountain darters (9,959) was almost double that in 2015 (5,115) due to a pulse of flow from the Dry Comal that removed some SAV in the New Channel a month before mapping.
- In the San Marcos, incidental take for fountain darters (11,023) was about 2,000 less than 2015 (13,295) due to decreases in impacted habitat.
- There was no EAHCP incidental take of covered invertebrates or salamanders in 2016.
- Overall, the EAHCP is in good shape relative to the Incidental Take Permit.

National Academy of Sciences

The National Academy of Sciences (NAS) was contracted to provide an unbiased, outside scientific review of the EAHCP, its programs and its ability to achieve its goals and objectives.

Report #2 Contents

1. Introduction
2. Hydrologic Modeling-Ecological Modeling
3. Biological & Water Quality Monitoring
4. Applied Research Program
5. Minimization & Mitigation Measures

NAS Report 2

Highlights

- The Ecological model was developed on a scientifically sound basis.
- The EAHCP team adapted its procedures to provide more scientific input to better identify, solicit and review Applied Research Projects.
- The EAHCP team developed a database management system that provides greater data access for research and management of the systems.
- The water quality and biological monitoring programs were reviewed and modified by scientists and stakeholders, making it more efficient by being better integrated with existing programs (such as GBRA's CRP), and more targeted to the listed species and their habitat.
- The implementation of key minimization and mitigation measures are characterized by competent project teams, sustained effort, and adequate initial performance monitoring.

REFUGIA FOR EAHCP COVERED SPECIES

The HCP defines a refugium as:

"A population of a Covered Species, housed at a series of aquatic facilities, for the purpose of reintroduction of the Covered Species into the Comal or San Marcos systems, in the event the Covered Species go extinct in their native habitat."

EAA – USFWS Refugia Contract

- Approved by EAA board in November 2016. Contract began January 2017.
- Contract extends through duration of ITP – 2028.
- Scope of Work identifies six primary tasks:

Task 1. Provide refugia operations
  - *Standing stock & salvage stock*

Task 2. Research

Task 3. Propagation & Husbandry

Task 4. Reintroduction

Task 5. Reporting

Task 6. Meetings & Presentations

EAHCP Species Stocking Overview

(Listed)

Covered Species	Standing #	Standing + Salvage #
Fountain Darter (Comal)	1,000	2,000
Fountain Darter (SM)	1,000	2,500
Texas wild-rice	430	1,500
Texas Blind Salamander	500	500
San Marcos Salamander	500	500
Comal Springs Salamander	500	500
Peck's Cave Amphipod	500	500
Comal Springs Riffle Beetle	500	500
Comal Springs Dryopid Beetle	500	500
Edwards Aquifer Diving Beetle	500	500
Texas Troglobitic Water Slater	500	500

Task 2 - Research

- Species Prioritization Identified in Contract
  1. Listed species the least is known about: TX Blind salamander, CSRB, CSDB, Peck's cave amphipod;
  2. Additional listed species: San Marcos Salamander, Fountain Darter, Texas wild-rice
  3. Non-listed species: Texas Cave Diving Beetle, Texas Troglobitic Water Slater, and Comal Springs Salamander

  <No work is planned for the San Marcos gambusia since it is probably extinct.>
- Research Categories Prioritized in Contract
  1. Collection
  2. Husbandry
  3. Propagation
  4. Reintroduction/Genetics

  <All 4 categories will be determined for the listed species before work with non-listed species.>

Infrastructure Additions

× SMARC

- 1,000 ft^2 quarantine building
- 2,500 ft^2 rearing bldg. for darters, salamanders, & invertebrates

× UNFH

- "Old Tank House" renovated into quarantine building
- 1,400 ft^2 of "New Tank House" renovated for invertebrates

Old Channel Comal River Bank Stabilization Project

Before

After

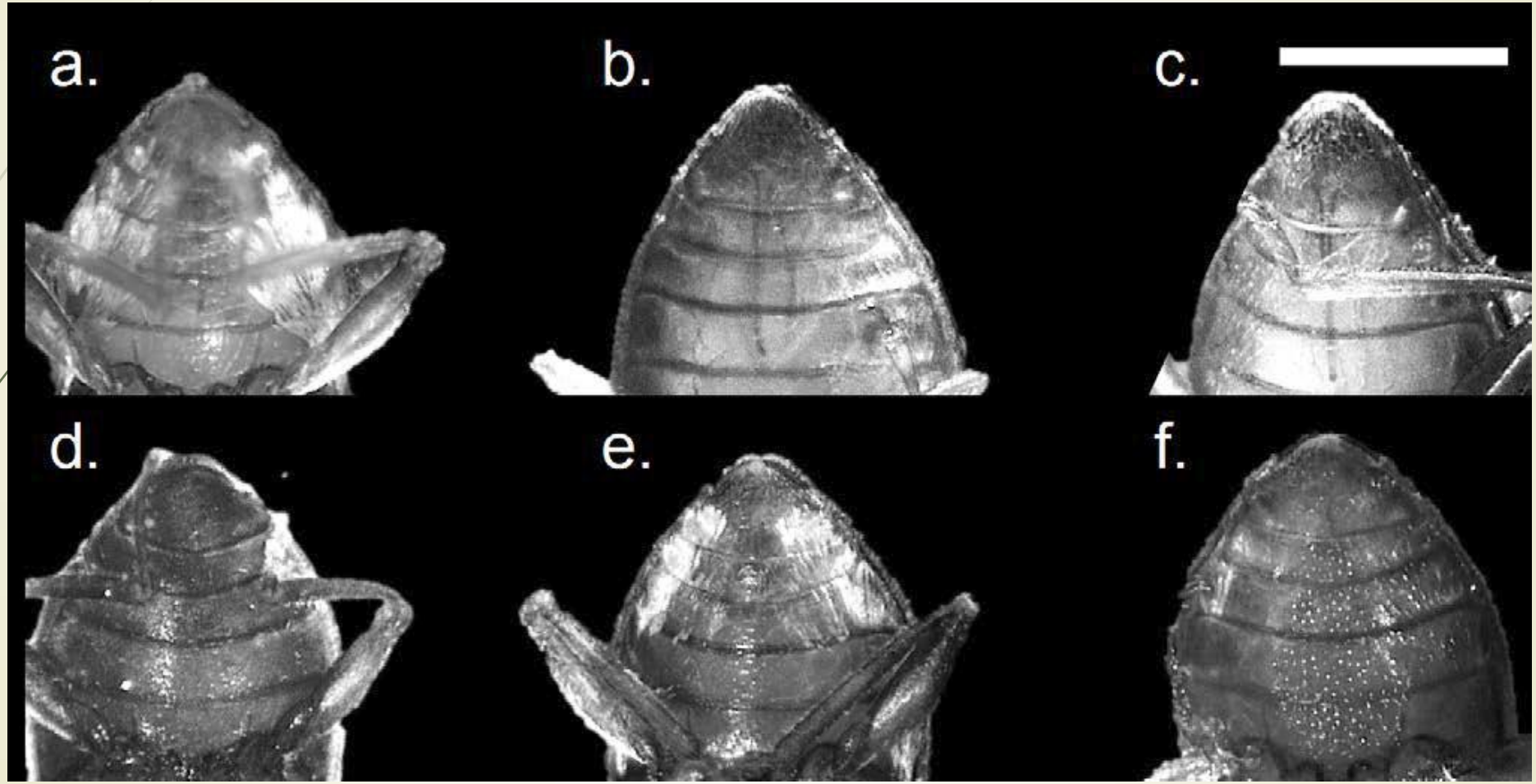
CSRB Life History Study

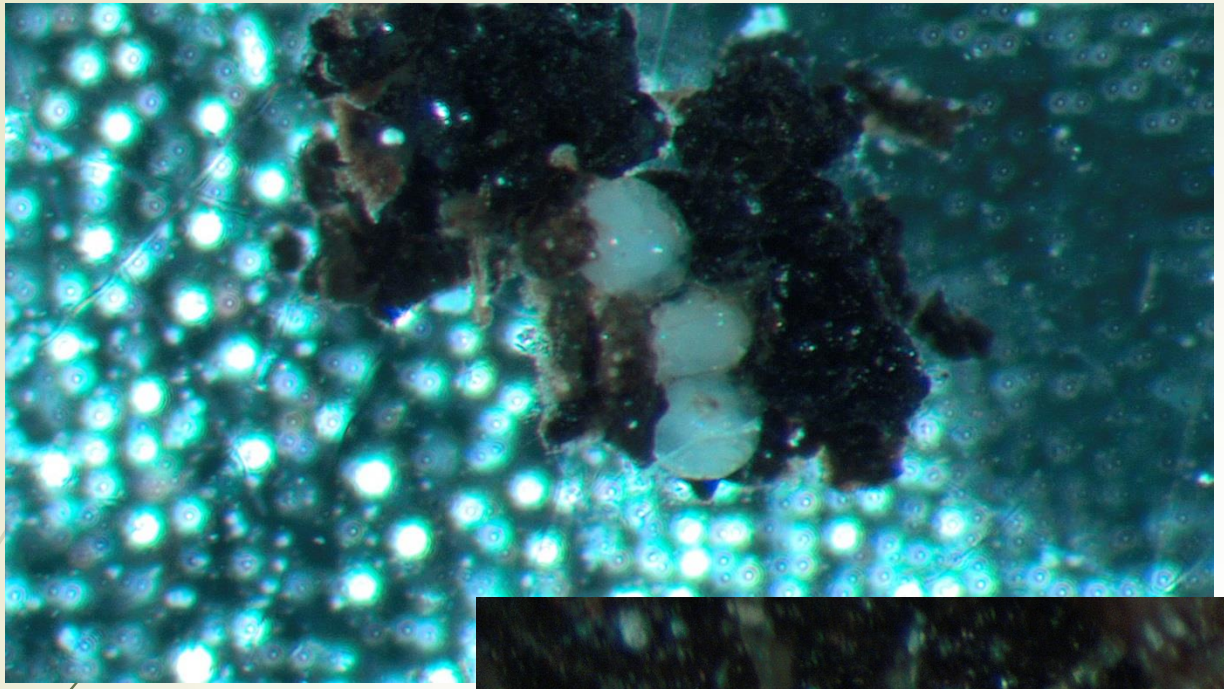
(yr-1 of 2-yr study)

Thirty-two pairs in randomly assigned experimental groups (8 groups, w/4 replicates), with different substrate combinations (leaves, rocks, cloth, bare). Same basic design being used to study egg deposition, hatching success and larval development. Major points so far:

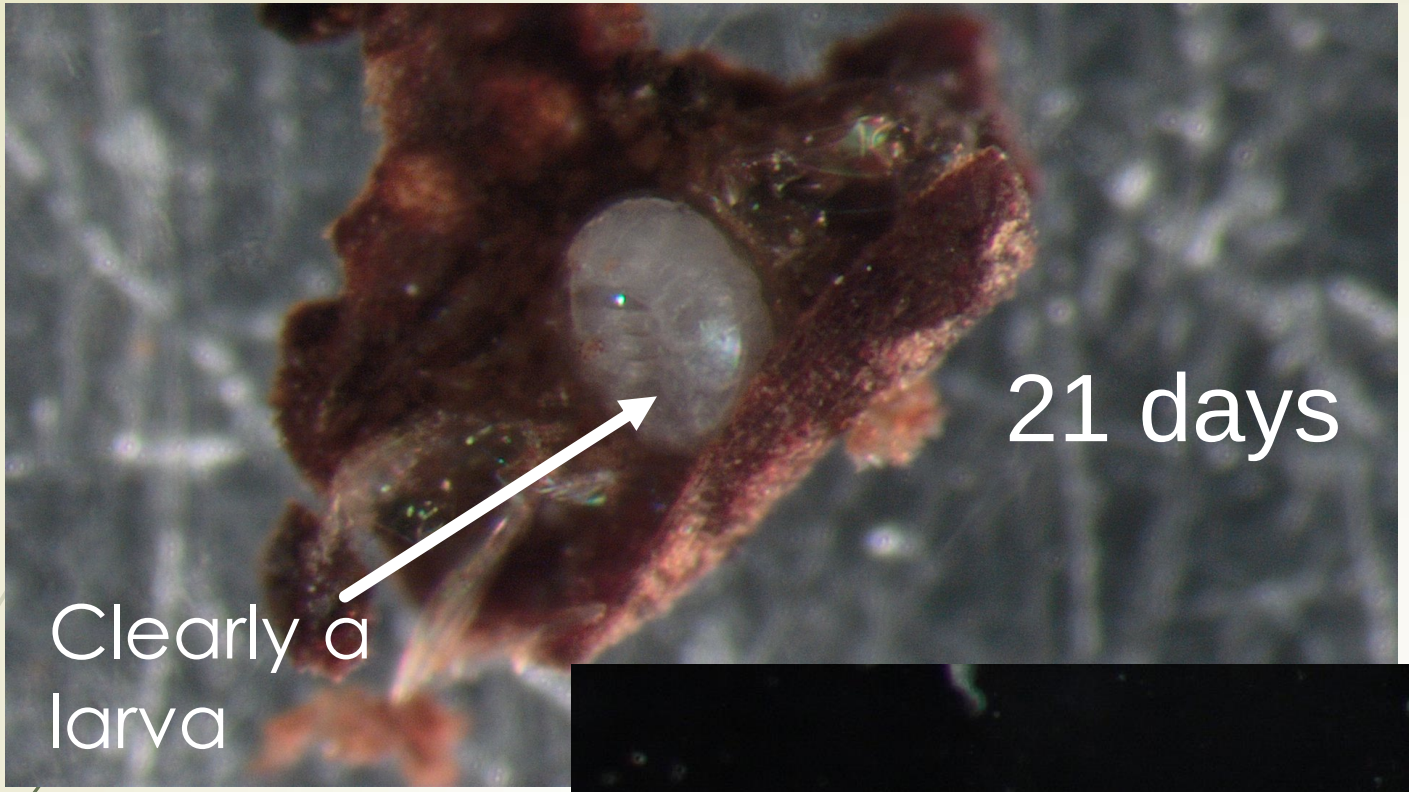
- Developed non-lethal method to determine CSRB gender for breeding pairs.
- Data suggests a 2 male:1 female gender ratio in the wild.
- The cloth used in lures benefitted propagation and husbandry. It is hypothesized this is due to biofilm production on the cotton surface.
- Eggs were predominantly laid on leafy substrates; even more so if cloth were included.
- Egg production declines with time in captivity as did the survival of the adults.
- Eggs hatch in about 25 days
- Larval development appears to develop over 4 months.

Male or Female CSRB?





~3 days


21 days
Clearly a larva


25 days
Newly hatched larva
200 µm