Appendix M | **2022 EAHCP Committee and Work Group Meeting Materials**

Appendix M1 | **Implementing Committee Meeting Materials**

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, March 24, 2022 | **10:00 AM** | **Web-Conference**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Approval of Minutes

3.1 **Approval of previous Implementing Committee meeting minutes.**

- Implementing Committee: December 16, 2021

4. Reports

4.1 **Receive report from Tom Taggart, City of San Marcos, on water supply diversification and groundwater pumping for the City of San Marcos.**

5. Individual Consideration

5.1 **Consider staff recommendation to approve amendments to the Edwards Aquifer Authority EAHCP 2022 Funding Application and Work Plan.**

5.2 **Consider staff recommendation to approve the Implementing Committee nominee to the Science Committee.**

5.3 **Consider staff recommendation to approve the 2021 Edwards Aquifer Habitat Conservation Plan Annual Report submittal to the U.S. Fish and Wildlife Service.**

6. Future Meetings

7. Questions from the Public

8. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Implementing Committee

Robert Mace (Texas State University) - Chair
Donovan Burton (SAWS) - Vice-Chair
Tom Taggart (San Marcos) - Secretary
Members: Mark Enders (New Braunfels),Chad Norris (GBRA), and Roland Ruiz (EAA)
Scott Storment - EAHCP Program Manager

Thursday, March 24, 2022 **10:00 AM** **Web-Conference**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chairman Robert Mace called the meeting to order at 12:14 PM.

Present: Robert Mace, Chad Norris, Roland Ruiz, Donovan Burton and Tom Taggart.

2. Public Comment

There were no citizens who requested to address the Implementing Committee.

3. Approval of Minutes

3.1 Approval of previous Implementing Committee meeting minutes.

- Implementing Committee: December 16, 2021

A motion was made by Tom Taggart, seconded by Roland Ruiz, to approve the meeting minutes from December 16, 2021. There were no objections.

4. Reports

Scott Storment provided the Implementing Committee an update on the ITP renewal process and the Edwards Aquifer Authority procurement process. The Request for Proposals and draft contract with ICF Jones & Stocks Inc. considered before the EAA's Aquifer Management Planning Committee on Tuesday, March 22 were distributed to committee members.

4.1 **Receive report from Tom Taggart, City of San Marcos, on water supply diversification and groundwater pumping for the City of San Marcos.**

Tom Taggart provided a report on the City of San Marcos' water supply diversification and groundwater pumping.

5. Individual Consideration

5.1 **Consider staff recommendation to approve amendments to the Edwards Aquifer Authority EAHCP 2022 Funding Application and Work Plan.**

Item 5.1 was removed from the Implementing Committee agenda and will be discussed at the May 19, 2021 meeting.

5.2 **Consider staff recommendation to approve the Implementing Committee nominee to the Science Committee.**

A motion was made by Mark Enders, seconded by Roland Ruiz, to approve to Implementing Committee nominee, Nathan Bendik, to the Science Committee. There were no objections

5.3 **Consider staff recommendation to approve the 2021 Edwards Aquifer Habitat Conservation Plan Annual Report submittal to the U.S. Fish and Wildlife Service.**

A motion was made by Roland Ruiz, seconded by Tom Taggart, to approve the submittal of the EAHCP 2021 Annual Report to the U.S. Fish and Wildlife Service. There were no objections.

6. Future Meetings

7. Questions from the Public

None.

8. Adjourn

There being no business to discuss, the meeting adjourned at 1:15 PM.

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Tom Taggart (May 24, 2022 16:10 CDT)

Tom Taggart
Secretary, Implementing Committee

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Robert Mace (Texas State University) - Chair
Donovan Burton (SAWS) - Vice-Chair
Tom Taggart (San Marcos) - Secretary
Members: Mark Enders (New Braunfels),Chad Norris (GBRA), and Roland Ruiz (EAA)
Scott Storment - EAHCP Program Manager

Thursday, May 19, 2022 **10:00 AM** **City of New Braunfels - City Hall**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Approval of Minutes

3.1 Approval of previous Implementing Committee meeting minutes.

- March 24, 2022

4. Reports

4.1 Receive report from Ryan Kelso, New Braunfels Utilities Chief Operations Officer, and Charles Schoening, Arcadis, on water supply diversification and groundwater pumping for the City of New Braunfels.

4.2 Receive report from Scott Storment, EAHCP Program Manager, on the ITP renewal process and the Listen and Learn Workshops.

5. Individual Consideration

5.1 Consider recommendation to approve the Budget Work Group members for 2022.

5.2 **Consider staff recommendation to approve amendments to the City of New Braunfels EAHCP 2022 Funding Application and Work Plan.**

5.3 **Consider staff recommendation to approve amendments to the Edwards Aquifer Authority EAHCP 2022 Funding Application and Work Plan.**

5.4 **Consider staff recommendation to approve the 2023 City of New Braunfels Work Plan.**

5.5 **Consider staff recommendation to approve the 2023 City of San Marcos/Texas State University Work Plan.**

5.6 **Consider staff recommendation to approve the 2023 Edwards Aquifer Authority Work Plan.**

5.7 **Discuss the Implementing Committee's involvement in the Edward Aquifer Authority's (EAA) budget process and consider possible action regarding the Implementing Committee's participation in future EAA budget discussions.**

6. Future Meetings

7. Questions from the Public

8. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Implementing Committee

Robert Mace (Texas State University) - Chair
Donovan Burton (SAWS) - Vice-Chair
Tom Taggart (San Marcos) - Secretary
Members: Mark Enders (New Braunfels),Chad Norris (GBRA), and Roland Ruiz (EAA)
Scott Storment - EAHCP Program Manager

Thursday, May 19, 2022 **10:00 AM** **City of New Braunfels - City Hall**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chairman Mace called the meeting to order at 11:55 AM.

Present In-Person: Tom Taggart, Mark Enders, and Jana Grey.
Present via Microsoft Teams: Robert Mace, Roland Ruiz, and Donovan Burton.

2. Public Comment

There were no citizens who requested to address the Implementing Committee.

3. Approval of Minutes

3.1

Approval of previous Implementing Committee meeting minutes.

- **March 24, 2022**

A motion was made by Donovan Burton, and seconded by Tom Taggart to approve the meeting minutes from March 24, 2022. There were no objections.

4. Reports

4.1 **Receive report from Ryan Kelso, New Braunfels Utilities Chief Operations Officer, and Charles Schoening, Arcadis, on water supply diversification and groundwater pumping for the City of New Braunfels.**

Ryan Kelso, New Braunfels Utilities, and Charles Schoening, Arcadis, provided a presentation on the City of New Braunfels' water supply diversification and groundwater pumping data.

4.2 **Receive report from Scott Storment, EAHCP Program Manager, on the ITP renewal process and the Listen and Learn Workshops.**

Scott Storment, EAHCP Program Manager, provided an update on the ITP renewal process and the Listen and Learn workshop series. Lucas Bare, ICF consultants, provided a detailed look at the workshop series and what is to be accomplished during the ITP renewal process.

5. Individual Consideration

5.1 **Consider recommendation to approve the Budget Work Group members for 2022.**

A motion was made by Tom Taggart, and seconded by Donovan Burton to approve the Budget Work Group members for 2022. There were no objections.

5.2 **Consider staff recommendation to approve amendments to the City of New Braunfels EAHCP 2022 Funding Application and Work Plan.**

A motion was made by Roland Ruiz, seconded by Tom Taggart, to approve the amendments to the City of New Braunfels EAHCP 2022 Funding Application and Work Plan. There were no objections.

5.3 **Consider staff recommendation to approve amendments to the Edwards Aquifer Authority EAHCP 2022 Funding Application and Work Plan.**

A motion was made by Roland Ruiz, seconded by Mark Enders, to approve the amendments to the Edwards Aquifer Authority EAHCP 2022 Funding Application and Work Plan. There were no objections.

5.4 Consider staff recommendation to approve the 2023 City of New Braunfels Work Plan.

A motion was made by Tom Taggart, seconded by Roland Ruiz, to approve the 2023 City of New Braunfels Work Plan. There were no objections.

Dovovan Burton, SAWS, recommended a review of the costs associated with the Household Hazardous Waste Conservation Measure.

5.5 Consider staff recommendation to approve the 2023 City of San Marcos/Texas State University Work Plan.

A motion was made by Mark Enders, seconded by Roland Ruiz, to approve the 2023 City of San Marcos/Texas State University Work Plan. There were no objections.

5.6 Consider staff recommendation to approve the 2023 Edwards Aquifer Authority Work Plan.

A motion was made by Tom Taggart, seconded by Donovan Burton, to approve the 2023 Edwards Aquifer Authority Work Plan. There were no objections.

5.7 Discuss the Implementing Committee's involvement in the Edward Aquifer Authority's (EAA) budget process and consider possible action regarding the Implementing Committee's participation in future EAA budget discussions.

The Implementing Committee agreed to standardize the approach to receive a formal report from the Edwards Aquifer Authority regarding budget schedules and the EAA budget process.

6. Future Meetings

7. Questions from the Public

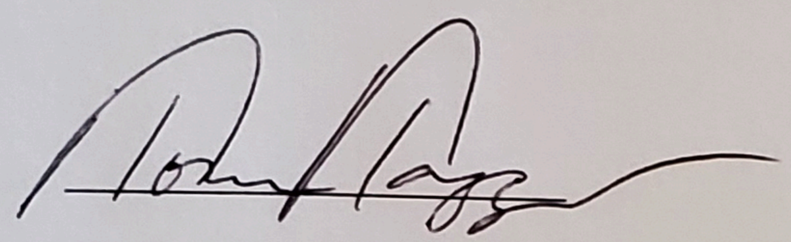
There were no citizens who requested to address the Implementing Committee.

8. Adjourn

There being no further business to discuss, the meeting adjourned at 2:32 PM.

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).



Tom Taggart

Secretary, Implementing Committee

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Robert Mace (Texas State University) - Chair
Donovan Burton (SAWS) - Vice-Chair
Tom Taggart (San Marcos) - Secretary
Members: Mark Enders (New Braunfels),Chad Norris (GBRA), and Roland Ruiz (EAA)
Scott Storment - EAHCP Program Manager

Friday, September 9, 2022 | **10:00 AM** | **EAA Board Room**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Budget Reports
- EAHCP Program Management
- Spring Communities Update
  - City of New Braunfels
  - City of San Marcos

4. Approval of Minutes

4.1 **Approval of previous Implementing Committee meeting minutes.**

- May 19, 2022

5. Reports

5.1 **Receive report from Zia Burns, U.S. Army Corps of Engineers Program Manager, on the San Marcos River Section 206 Aquatic Ecosystem Restoration Project.**

5.2 **Receive report from Jamie Childers, EAHCP Director of Administration, on the Springflow Habitat Protection Work Group Prioritization of Technical Questions.**

5.3 **Receive report from Scott Storment, EAHCP Program Manager, on the Incidental Take Permit Renewal Process.**

5.4 **Receive report from Omar Garcia, Water Resources Manager, regarding Edwards Aquifer 2021 Critical Period Management, permitted groundwater authorization and reported use.**

6. Individual Consideration

6.1 **Consider recommendations from the 2022 EAHCP Budget Work Group as described in the Budget Work Group Report for possible submittal to the Edwards Aquifer Authority Board of Directors.**

7. Future Meetings

8. Questions from the Public

9. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Implementing Committee

Robert Mace (Texas State University) - Chair
Donovan Burton (SAWS) - Vice-Chair
Tom Taggart (San Marcos) - Secretary
Members: Mark Enders (New Braunfels),Chad Norris (GBRA), and Roland Ruiz (EAA)
Scott Storment - EAHCP Program Manager

Friday, September 9, 2022 | **10:00 AM** | **EAA Board Room**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chairman Mace called the meeting to order at 10:00AM

Members present: Tom Taggart, Mark Enders, Jana Grey, Robert Mace, Roland Ruiz, and Donovan Burton.

2. Public Comment

There were no citizens who requested to address the Implementing Committee.

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Budget Reports
- EAHCP Program Management
- Spring Communities Update
  - City of New Braunfels
  - City of San Marcos

Scott Storment provided an overview of the ITP Renewal Process Workshop series. An announcement was made of Jamie Childers', EAHCP Program Director, departure from the EAHCP team. Robert Mace and the Implementing Committee thanked her for contributions to the program.

4. Approval of Minutes

4.1 **Approval of previous Implementing Committee meeting minutes.**

- May 19, 2022

A motion was made by Tom Taggart, and Mark Enders seconded by to approve the meeting minutes from May 19, 2022. There were no objections.

5. Reports

5.1 **Receive report from Zia Burns, U.S. Army Corps of Engineers Program Manager, on the San Marcos River Section 206 Aquatic Ecosystem Restoration Project.**

Zia Burns provided an overview of the Aquatic Ecosystem Restoration Project that is a collaborative effort between the U.S. Army Corps of Engineers and the City of San Marcos.

5.2 **Receive report from Jamie Childers, EAHCP Director of Administration, on the Springflow Habitat Protection Work Group Prioritization of Technical Questions.**

Jamie Childers provided a report on the prioritization of technical questions that were developed from first priority of study and first priority for developing monitoring plans.

5.3 **Receive report from Scott Storment, EAHCP Program Manager, on the Incidental Take Permit Renewal Process.**

Scott Storment provided an overview of the Listen and Learn Workshop series that are the first step in the ITP Renewal Process.

5.4 **Receive report from Omar Garcia, Water Resources Manager, regarding Edwards Aquifer 2021 Critical Period Management, permitted groundwater authorization and reported use.**

Omar Garcia provided an overview of permitted groundwater authorization by permitted use and an overview of springflow protection through critical period management.

6. Individual Consideration

6.1 Consider recommendations from the 2022 EAHCP Budget Work Group as described in the Budget Work Group Report for possible submittal to the Edwards Aquifer Authority Board of Directors.

Tom Taggart provided an overview of the 2022 EAHCP Budget Work Group discussions. Two meetings were held in June and July 2022 to determine what recommendations can be made to the EAHCP Implementing Committee prior to the finalization of the 2023 EAA Budget. A revision was made to the 2022 EAHCP Budget Work Group Report. This revised report is now available on the EAHCP website.

7. Future Meetings

The next Implementing Committee will be held on October 13, 2022.

8. Questions from the Public

Dianne Wassenich invited the committee and attendees to the Gruene Grove to celebrate Robert Gulley and Jim Bauer.

9. Adjourn

There being no further business to discuss, the meeting adjourned at 1:00PM.

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

_____

Tom Taggart

Secretary, EAHCP Implementing Committee

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Robert Mace (Texas State University) - Chair
Donovan Burton (SAWS) - Vice-Chair
Tom Taggart (San Marcos) - Secretary
Members: Mark Enders (New Braunfels),Chad Norris (GBRA), and Roland Ruiz (EAA)
Scott Storment - EAHCP Program Manager

Thursday, October 13, 2022 **10:00 AM** **EAA Board Room**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Approval of Minutes

3.1
- September 9, 2022

4. Individual Consideration

4.1 **Consider staff recommendation to approve the City of New Braunfels EAHCP 2023 Funding Application.**

4.2 **Consider staff recommendation to approve the City of San Marcos/Texas State University 2023 EAHCP Funding Application and amendments to the 2023 Work Plan.**

4.3 **Consider staff recommendation to approve the Edwards Aquifer Authority EAHCP 2023 Funding Application and amendment to the 2023 Work Plan.**

5. Future Meetings

6. Questions from the Public

7. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Implementing Committee

Robert Mace (Texas State University) - Chair
Donovan Burton (SAWS) - Vice-Chair
Tom Taggart (San Marcos) - Secretary
Members: Mark Enders (New Braunfels),Chad Norris (GBRA), and Roland Ruiz (EAA)
Scott Storment - EAHCP Program Manager

Thursday, October 13, 2022 | **10:00 AM** | **EAA Board Room**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

12:00 PM - Present - Robert Mace, Tom Taggart, Mark Enders, Roland Ruiz, Jana Gray, and Donovan Burton.

2. Public Comment

None.

3. Approval of Minutes

3.1

- September 9, 2022

A motion was made by Tom Taggart and seconded by Roland Ruiz, to approve the meeting minutes from the September 9, 2022 Implementing Committee meeting. There were no objections.

4. Individual Consideration

4.1 **Consider staff recommendation to approve the City of New Braunfels EAHCP 2023 Funding Application.**

A motion was made by Tom Taggart and seconded by Donovan Burton, to approve the City of New Braunfels EAHCP 2023 Funding Application. There were no objections.

4.2 **Consider staff recommendation to approve the City of San Marcos/Texas State University 2023 EAHCP Funding Application and amendments to the 2023 Work Plan.**

A motion was made by Mark Enders and seconded by Roland Ruiz, to approve the City of San Marcos/Texas State University EAHCP 2023 Funding Application. There were no objections.

4.3 **Consider staff recommendation to approve the Edwards Aquifer Authority EAHCP 2023 Funding Application and amendment to the 2023 Work Plan.**

A motion was made by Tom Taggart and seconded by Mark Enders, to approve the Edwards Aquifer Authority EAHCP 2023 Funding Application. There were no objections.

Roland Ruiz noted that funds from the EAHCP reserve will be used to help cover the estimated funding costs from implementing VISPO in 2023. Donovan Burton questioned the change in estimated costs for Program Management. Damon Childs responded that the cost reflected in the Program Management line item is due to the permit renewal contract with ICF.

Tom Taggart reminded the committee that costs found in Table 7.1 of the Funding and Management Agreement were initial estimates. Throughout the implementation of the EAHCP, actual costs have deviated from the estimates in Table 7.1. It should be noted that the overall cost to implement the EAHCP is less than what was estimated in Table 7.1.

5. Future Meetings

6. Questions from the Public

None.

7. Adjourn

There being no further business to discuss, the meeting adjourned at 12:27 PM.

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Tom Taggart
Secretary, EAHCP Implementing Committee

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Robert Mace (Texas State University) - Chair
Donovan Burton (SAWS) - Vice-Chair
Tom Taggart (San Marcos) - Secretary
Members: Mark Enders (New Braunfels),Chad Norris (GBRA), and Roland Ruiz (EAA)
Scott Storment - EAHCP Program Manager

Thursday, December 15, 2022 **10:00 AM** **EAA Board Room**

A meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Approval of Minutes

3.1 • October 13, 2022

4. Program Management Update

5. Report

5.1 Receive report from Lucas Bare, ICF Project Manager, on the Incidental Take Permit Listen and Learn Report.

6. Individual Consideration

6.1 **Consider staff recommendation to approve amendments to Edwards Aquifer Authority 2023 Work Plan.**

6.2 **Election of 2023 Implementing Committee officers.**

7. Future Meetings

8. Questions from the Public

9. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Implementing Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.7.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Appendix M2 | **Budget Work Group Meeting Materials**

Edwards Aquifer Habitat Conservation Plan

Report of the 2022 Budget Work Group

To: Edwards Aquifer Habitat Conservation Plan Implementing Committee

From: Edwards Aquifer Habitat Conservation Plan Budget Work Group

Date: August 19, 2022

Overview:

On June 30 and July 29, 2022, meetings of the Edwards Aquifer Habitat Conservation Plan (EAHCP) Budget Work Group were held to receive a report from Edwards Aquifer Authority (EAA) staff pertaining to the EAA's 5-Year Forecast and to make recommendations regarding the EAHCP program budget. The Budget Work Group has been charged by the EAHCP Implementing Committee to "collaborate with and inform the EAA budget process, as it relates to the EAHCP, EAHCP Reserve and EAHCP Aquifer Management Fee and to address fiscal issues."

Members of this Work Group include:

- Tom Taggart, EAHCP Implementing Committee (IC) Member (City of San Marcos – Chair)
- Myron Hess, EAHCP Stakeholder member (Living Waters Project)
- Brock Curry, EAA designee
- Cecilia Velasquez, San Antonio Water System (SAWS) designee
- Adam Yablonski, Member-at-Large, Medina County Farm Bureau

Work Group Discussions:

EAA staff presented information on the following items at the meetings:

- Five-Year Financial Forecast (2023-2027)
- Discussion of economic analysis report from TXP, Inc.

Five-Year Financial Forecast (2023-2027). EAA staff presented a Five-Year Financial Forecast for the EAA, including both the EAA General Operations and Habitat Conservation Program budgets. An illustration was provided on how the EAA receives its revenue, which is almost entirely through the Aquifer Management Fee (AMF). This fee is paid by either Municipal & Industrial (M&I) or Irrigation/Agricultural permit holders. 97% of the revenue from AMF ratepayers are from M&I permit holders.

The 5-Year Forecast included a few noted assumptions on the EAA general operation budget associated staff-related/benefits/and the projected cost factoring in inflation and EAA goals. A detailed illustration was given of how the 7.1 Budget compares to actual expenses (Table 7.1A) thus far and projected through 2027. Excluding costs for

additional triggering events of VISPO or ASR recovery before 2027, the current projections show the EAHCP will be about $51.3 million under budget by the end of that timeframe. No inflationary adjustments to the Table 7.1 amounts, as provided for in the EAHCP and the Funding and Management Agreement, are included in the projection through 2027.
The work group also discussed current drought conditions which indicate a 55% probability of triggering VISPO forbearance for 2023, based on historical data. There was general agreement among Work Group members that the likelihood of avoiding triggering VISPO forbearance in 2023 appears very small. The cost of triggering VISPO forbearance in 2023 would be about $7.5 million, which would be paid from the EAHCP Reserve.

A comparative look at the combined EAA/EAHCP expense projections through 2027 was provided. The EAA operating budget is projected to require increases each year whereas the EAHCP budget is projected to experience annual percentage decreases as it reaches the end of the current Incidental Take Permit (ITP). The Work Group discussed the relevance of evaluating the potential need to maintain a significant Reserve Fund balance at the end of the current ITP and HCP in order to avoid high front-end costs for implementing a new/renewed HCP.

The combined EAA Aquifer Management Fee rate and EAHCP Reserve Fund Forecast were discussed related to past performance and the proposed EAA budget. There is no proposed *overall* increase to the EAA's aquifer management fee rate for 2023, two scenarios/options were presented on how to address any AMF rate changes or Reserve Fund floor considerations going forward:

EAA staff presented two options:

Option 1 - Increase AMF Rate and Maintain $26.4 million EAHCP Reserve Floor

AMF Rate Option 1:

	Forecast Rates				
	2023-F	2024-F	2025-F	2026-F	2027-F
EAA General AMF	$45	$54	$60	$68	$74
HCP Program AMF	$39	$35	$35	$33	$33
Combined AMF	*$84*	*$89*	*$95*	*$101*	*$107*

The total AMF rate would see annual increases beginning in 2024, reaching $107 in 2027. The EAHCP Program AMF rate would increase from $31 to $39 in 2023, whereas the EAA General Operations AMF rate would decrease from $53 to $45. Thereafter, the EAHCP Program AMF rate would decline with significant annual increases in the EAA General Operations AMF rate. The intention of this scenario would be to prevent going below the $26.4 million HCP reserve "floor" in the absence of a VISPO or ASR triggering event. The minimum reserve floor was recommended by the Budget Work Group and Implementing Committee in

2017 and implemented by the EAA Board beginning in 2018 as a protection when implementing reductions in the portion of the AMF rate allocated to the HCP. While an AMF rate increase in 2023 to $88 per acre-foot rate was previously contemplated by EAA staff, staff proposes to keep it at the current $84 per acre-foot rate. This is due to a property sale by the EAA resulting in proceeds that could mitigate the need for a rate increase in 2023.

Option 2 – Increase AMF rate and Modify Reserve Management Strategy

AMF Rate Option 2:

	Forecast Rates				
	2023-F	2024-F	2025-F	2026-F	2027-F
EAA General AMF	$54	$57	$59	$63	$68
HCP Program AMF	$30	$29	$29	$28	$28
Combined AMF	$84	$86	$88	$91	$96

The AMF rate would see annual increases after 2023, plateauing at $96 in 2027. The EAHCP Program AMF rate would decrease slightly from $31 to $30 in 2023, whereas the EAA General Operations AMF rate would slightly increase from $53 to $54. After 2023, the overall AMF rate would see smaller, incremental annual increases, reaching $96 in 2027. These increases would be comprised of a relatively flat EAHCP Program AMF rate but smaller annual increases in the EAA General Operations AMF rate. This scenario would cause the EAHCP to decline below the floor, with a projected $15.1 million remaining by 2027. That projected reserve balance does not include any expenses for triggering VISPO forbearance or ASR recovery in the period until 2027. This scenario includes the reliance on alternative funding strategies that were presented to the EAA Board in April 2022 in an economic analysis report by TXP, Inc. This report, which was shared with the EAHCP Budget Work Group in their meeting on June 30, 2022, recommended utilizing a debt instrument or insurance products to fund VISPO or ASR payments should they be triggered. EAA staff stated that they are currently reviewing the viability of such options and will continue to keep the Work Group members fully apprised. EAA further said they will engage all stakeholders, partner entities in the EAHCP, and the USFWS as EAA staff explores potential alternate approaches to fiscal surety of the program.

Findings:

- The current financial projections and cost estimates presented to the Budget Work Group indicate an adequate budget for the EAHCP program for fiscal year 2023.
- There was consensus amongst the group that EAA, after 11 years of no change in the overall AMF amount, does need to adjust permit fees due to increased

EAA general operating expenses and there was strong support for incremental AMF rate increases in a "stair-step" fashion (i.e. smaller and more frequent) to allow the rate payers to absorb those costs better.

- The group firmly advocated against rate designs that result in high "spikes" in rates.

- The work group was formed by the IC after the first "toggle" or decrease in the AMF HCP portion. Concerns on the methodology of funding EAA operations creating a reduction in EAHCP reserves have been conveyed to the EAA by the IC in each year of the Work Group's reports on the financial status of the HCP. A high level of concern was expressed by some members at this Budget Work Group meeting regarding the proposed Option 2 method and the continuing downward trend of the EAHCP Reserve and the possible program implications.

  The design of the reserve in the FMA was intended to provide fiscal surety to the USFW Service, and all involved, that the non-regulatory spring flow protection measures will be supported and implemented in the event of droughts producing triggering conditions. It also protects the funds collected for the EAHCP so they are used **only** for program expenses, and if not used, returned to the permittees that paid them. Some members believe Option 2 does not take that intent into account. While some members believe Option 2 does not take that intent into account, others think that Option 2 will allow the EAA to continue to manage EAHCP fees and associated reserves in a manner consistent with the FMA.

  Discussion included potential advantages seen in Option 2 of containing rates, possible changes in the future ITP to the VISPO to "level" payments vs. tiered based on aquifer conditions, and lower annual increases of rates. It could also avoid collection of higher amounts during droughts that are themselves a hardship on utility customers. This approach would build more capacity in EAA operating reserves, which would also be available to fund the unexpected needs of the EAHCP, if necessary. Disadvantages discussed for Option 2 include possible non-conformance with the program documents and additional debt service expense associated with potential borrowing for VISPO. In extraordinary circumstances, use of reserves may be a reasonable alternative to be considered on a case-by-case basis. There is no consideration of climate change and possible effects on the HCP expense profile related to reserves.

  The group had various positions on the process for evaluating the proposals and the degree to which the stakeholders and partner entities should have input. The group also had differing opinions about whether the $26.4 million reserve "floor" was still appropriate in light of the fact that only five more years remain under the current HCP. Some feel this is purely an EAA budget issue for the EAA Board. Some feel that as the entire HCP was developed with all involved and is an ongoing joint effort of all the partner entities it should be closely coordinated with them. Understanding of the final approach is important to the current and future EAHCP.

- The work group did conclude that much information about the potential alternatives and how they could affect the program is currently lacking. Viability of the Option 2 proposals remains unclear. Due to lack of information to inform a decision and the divergent positions, a consensus was not reached by the Work Group members to support changes to the Reserve levels or a specific option. However, consensus was reached to continue to seek info on alternative funding mechanisms and reserve effects to better identify and understand the implications. The group has requested to be kept fully abreast on the exploration of alternatives to the current AMF reserve approach.
- The Budget Work Group will continue to convene as early in the budget process as reasonable each year.

Recommendations:

The Work Group recommends the Implementing Committee adopt and present the following recommendations to the EAA Board of Directors:[1]

1. **The Implementing Committee supports robust EAA outreach to and involvement of the public, stakeholders from the EAHCP committees, and EAA permittees as funding options are considered.**
2. **EAHCP Reserve Fund declines have been noted by the Work Group as a cause for concern in all past reporting years and the Option 2 proposal further elevates that concern, accordingly the Implementing Committee urges the EAA to develop and share information about potential Option 2 funding approaches, and implications, as early and openly as possible.**
3. **In addition, the Work Group recommends the Implementing Committee should further evaluate the EAA proposed funding approach, particularly as new information is developed regarding Option 2 and impacts on the Reserve Fund design and floor and include further input as appropriate to the EAA Board.**

[1] (REVISED: 9/9/22) An initial recommendation to support rate increases to the AMF rate for EAA and EAHCP operations funding as well as the preference for frequent & smaller periodic rate adjustments vs. high single year increases was not considered and approved by the EAHCP Implementing Committee during their September 9, 2022 meeting.

APPENDIX A
SLIDE PRESENTATIONS

EAHCP Budget Work Group

July 29, 2022

Charge of the EAHCP Budget Work Group

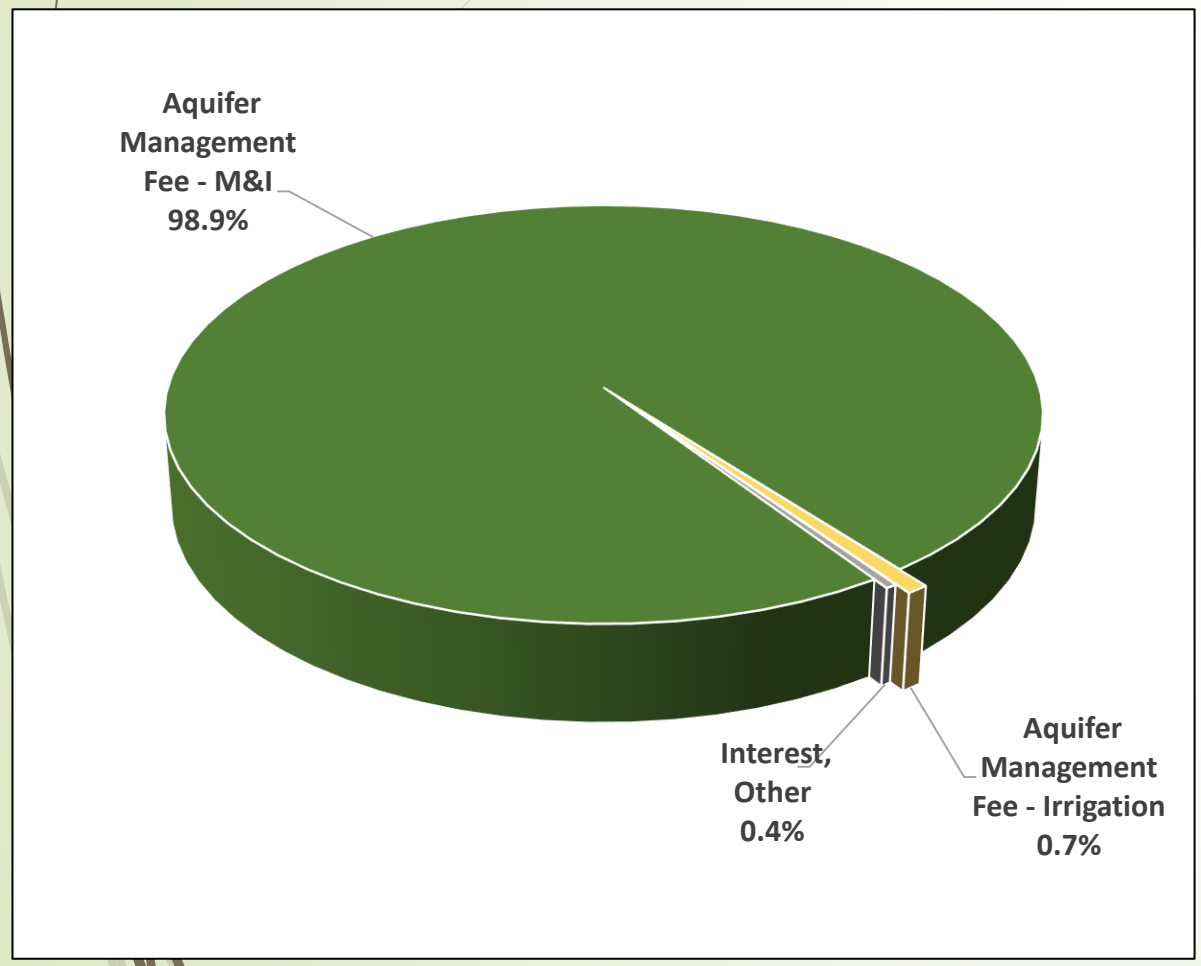
- Collaborate with and inform the EAA Budget Process, as it relates to the EAHCP, EAHCP reserve and EAHCP aquifer management fee.

- Address fiscal issues as they arise and are referred by the Implementing Committee.

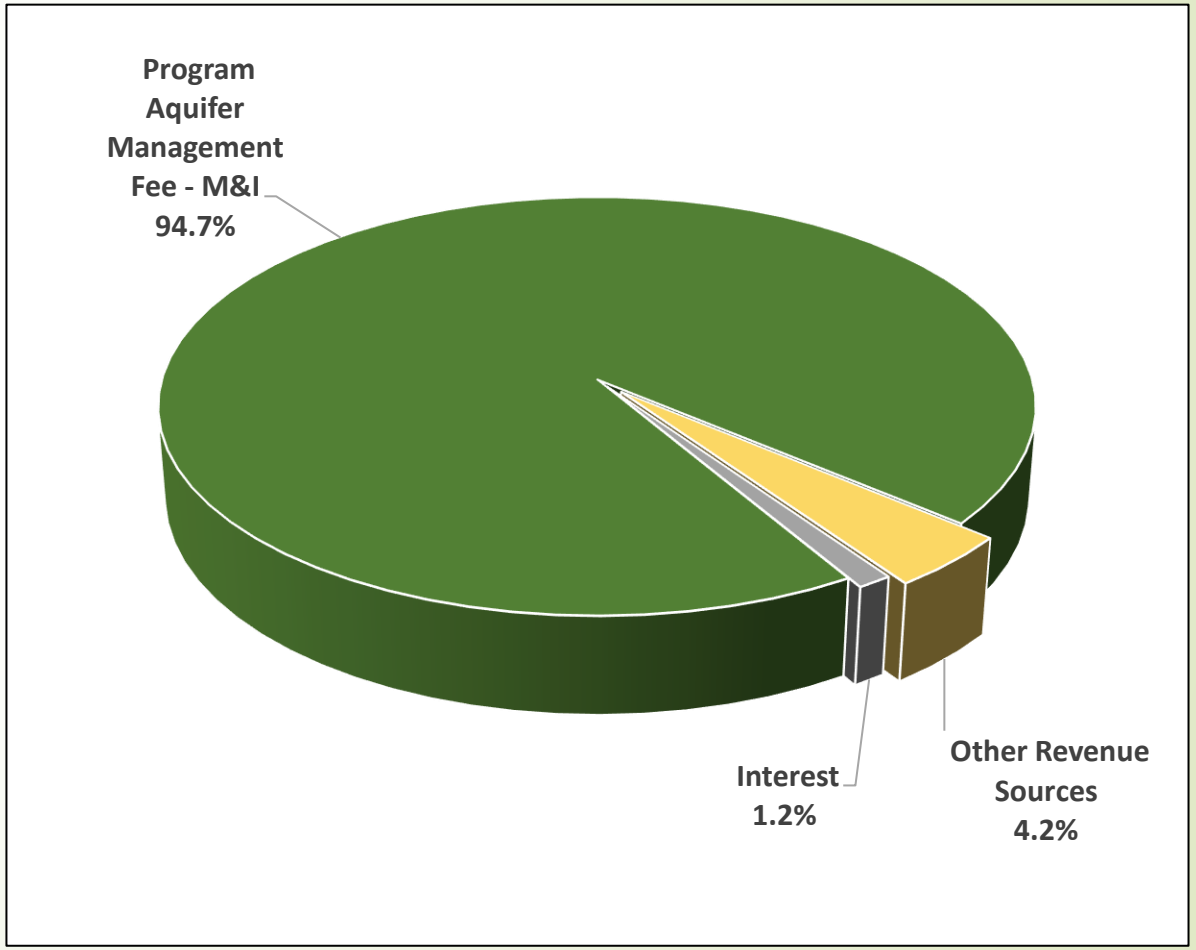
EAA Forecast: 2023-2027

Where does our REVENUE come from?

EAA General Operations



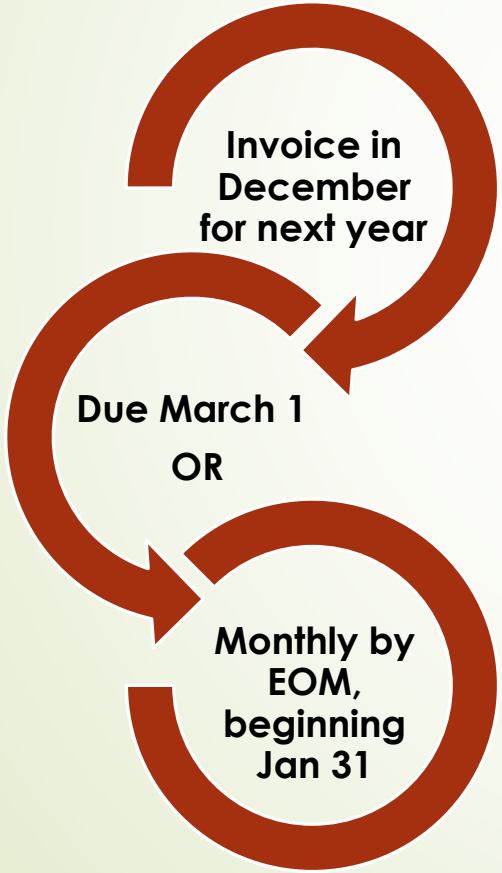
Habitat Conservation Program



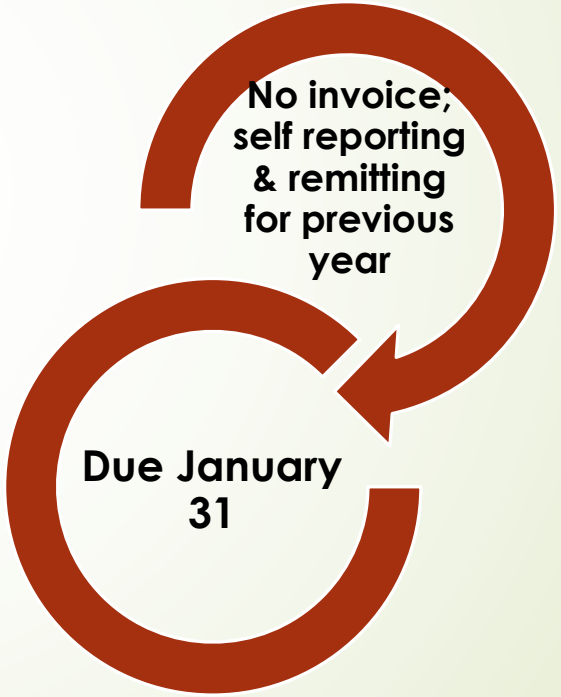
Percentages may not total to 100% due to rounding.

When and how do we get paid?

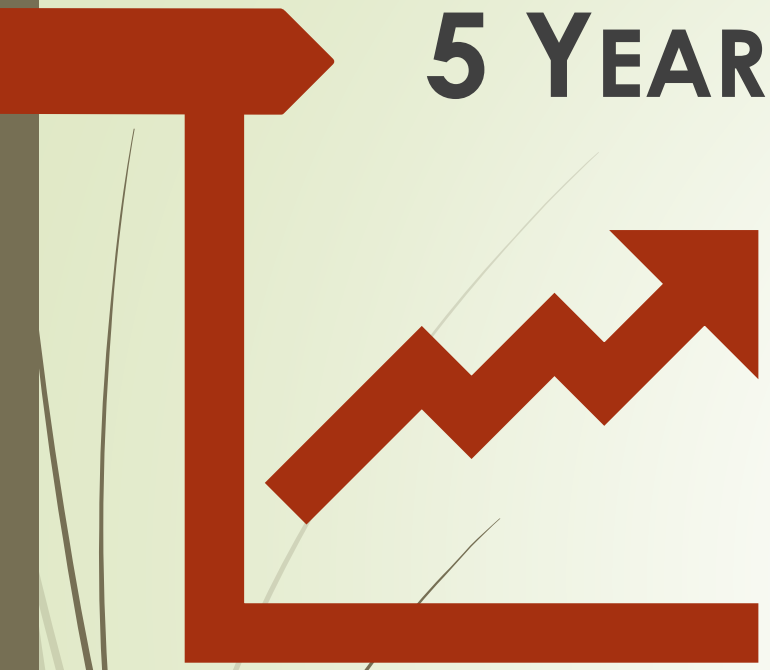
Municipal & Industrial (M&I) Permit Holders



Irrigation/Agricultural Permit Holders



5 Year Forecast

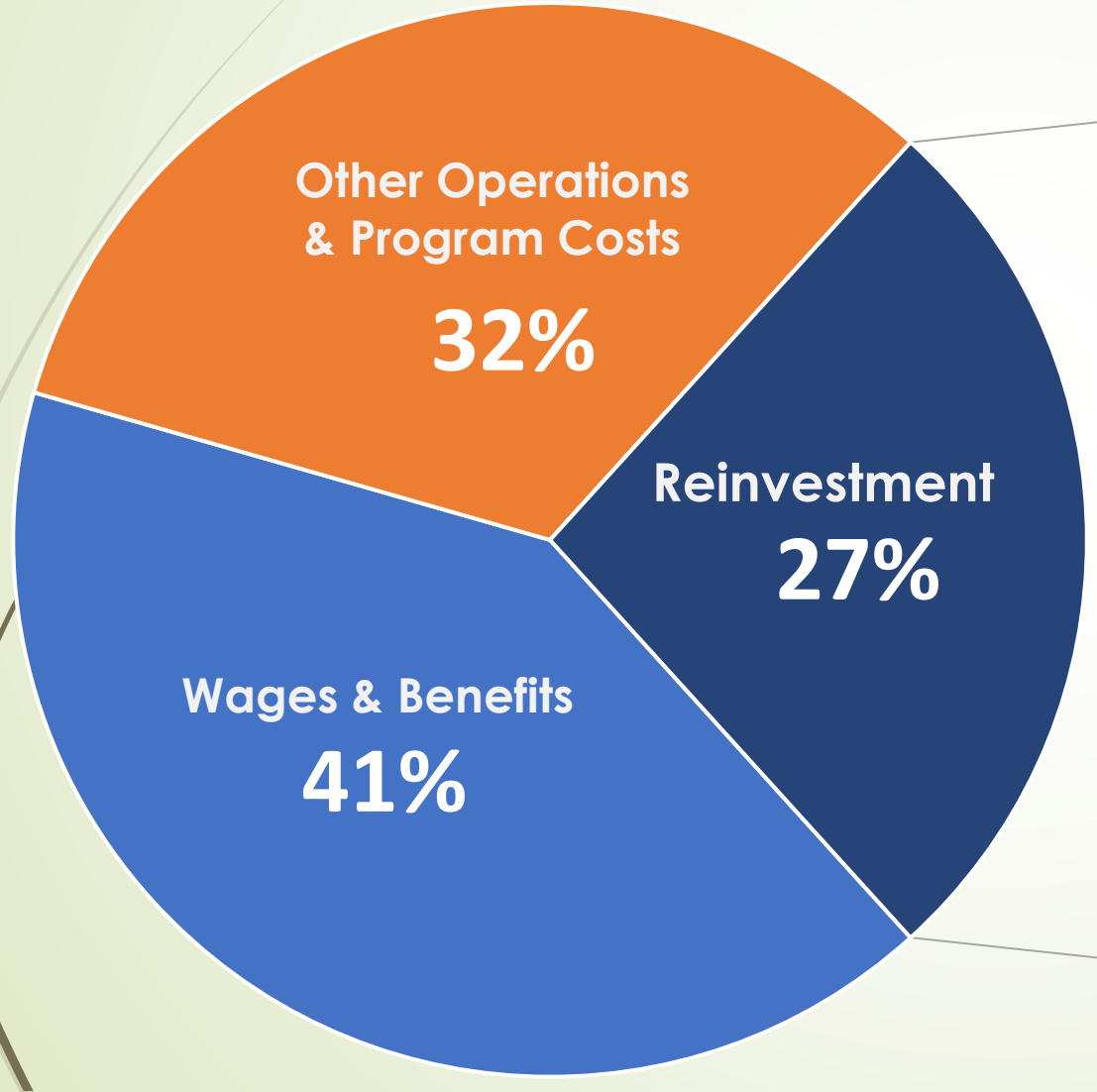


- Assumptions
  - People/Benefits
  - Programs
  - Constituent/Community Reinvestment
- Rate Considerations & Reserves
  - Build/Manage Capacity
  - Maintain Predictability/Stability

5 Year Forecast
People/Benefits

- New Positions Proposed
  - 2023: 3 Full Time positions
- Average Combined Annual Cost of Living/Merit Increase: 6%/year
- Insurance:
  - 2023: 18% increase
  - 2024 – 2027: 15% increase/year
- Retirement (TCDRS): 11.09%

5 Year Forecast
Constituent/Community Reinvestment



EAHCP Expense Projections

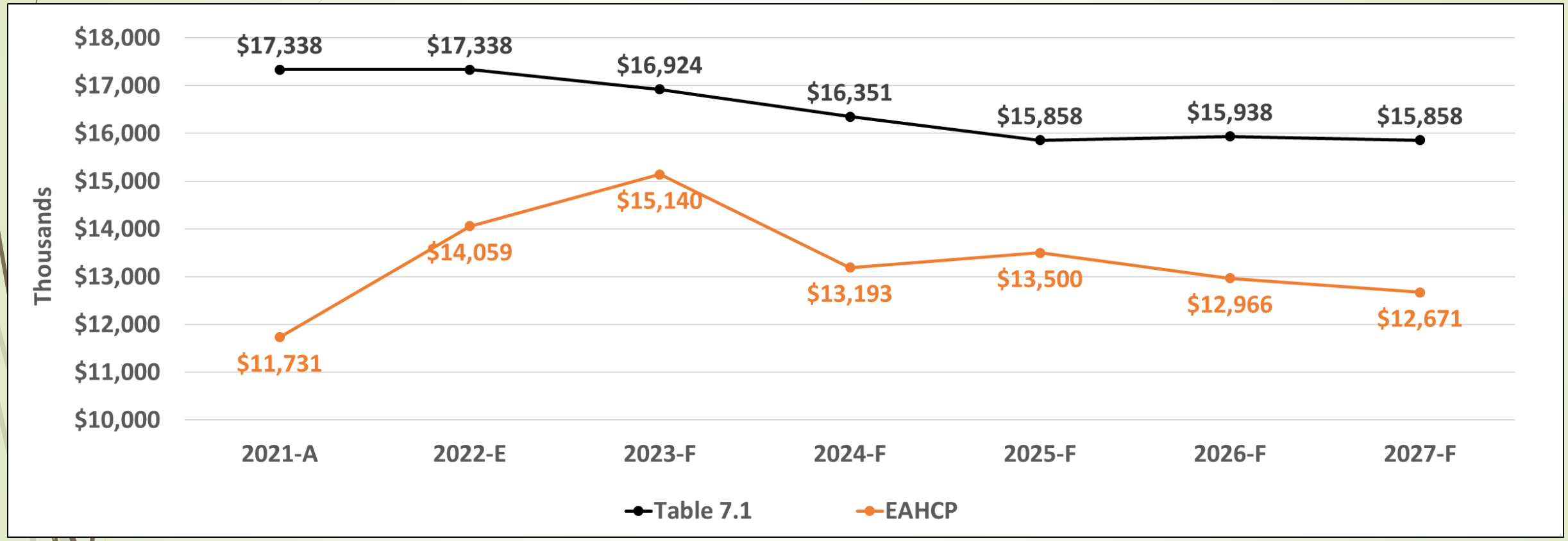


Table 7.1 and Table 7.1A Comparison

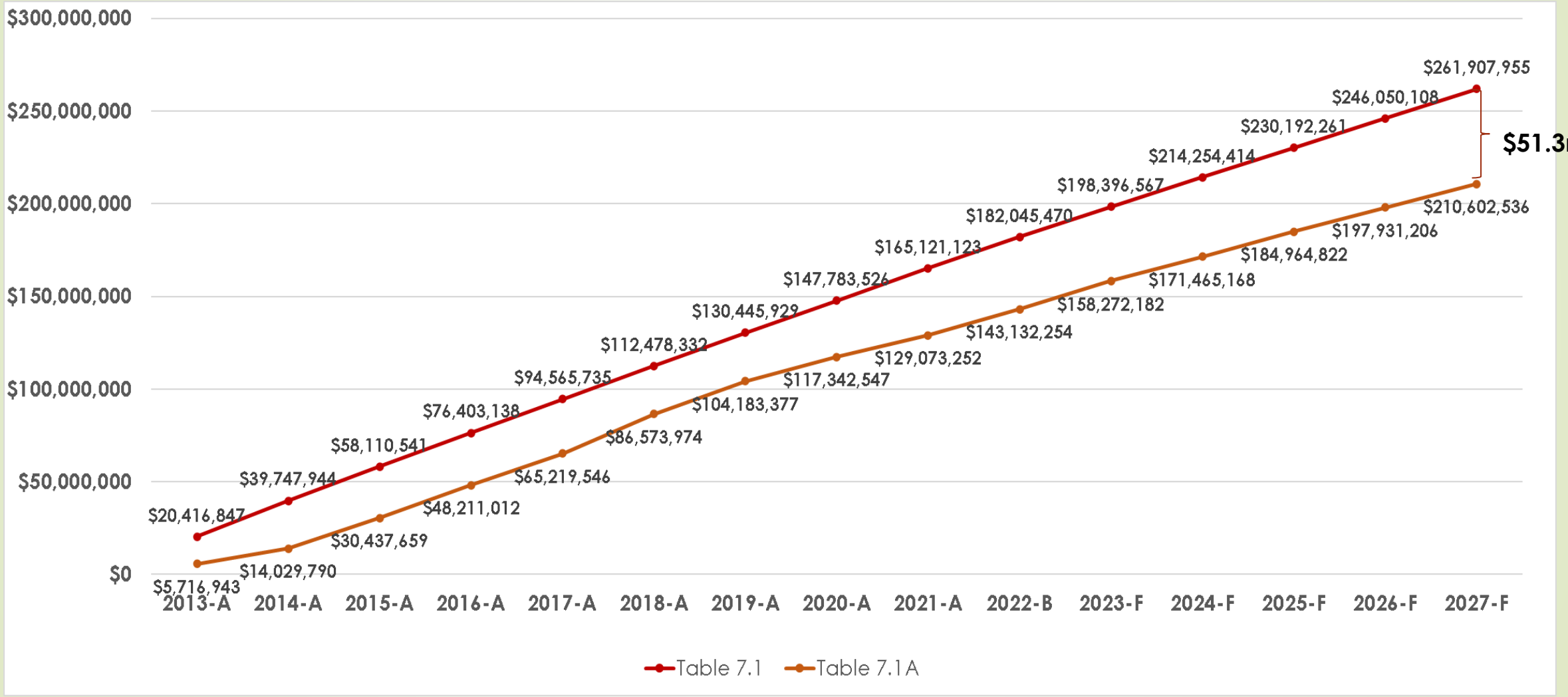
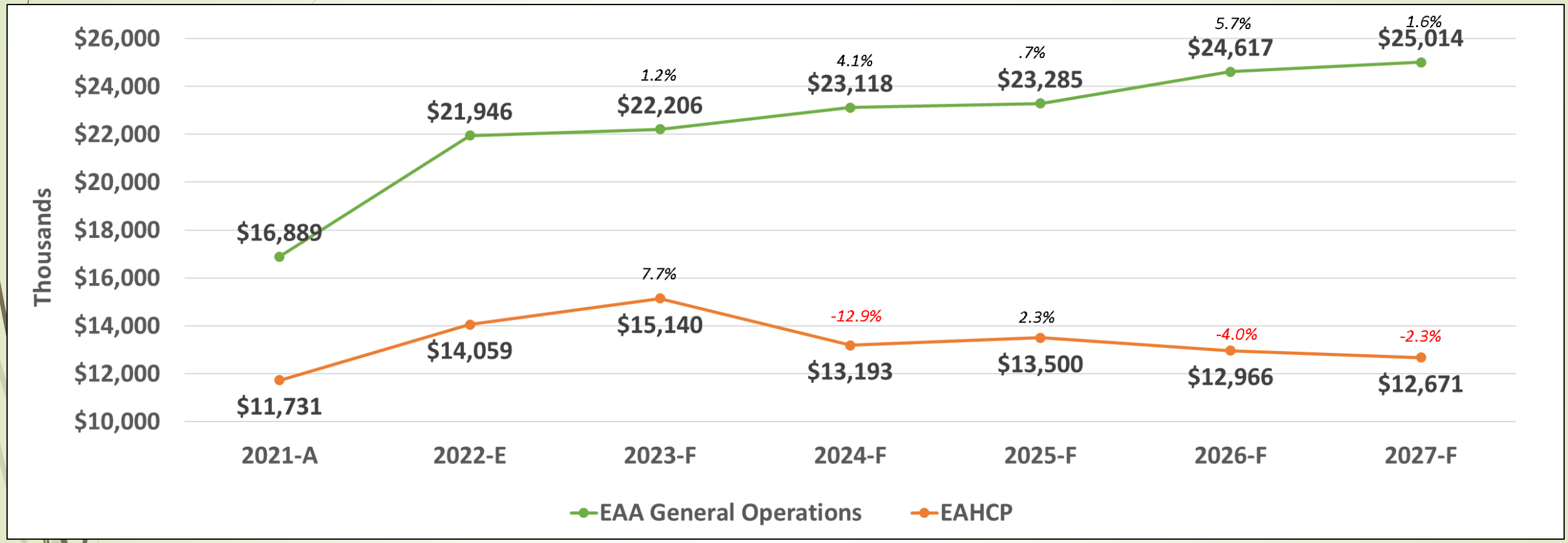


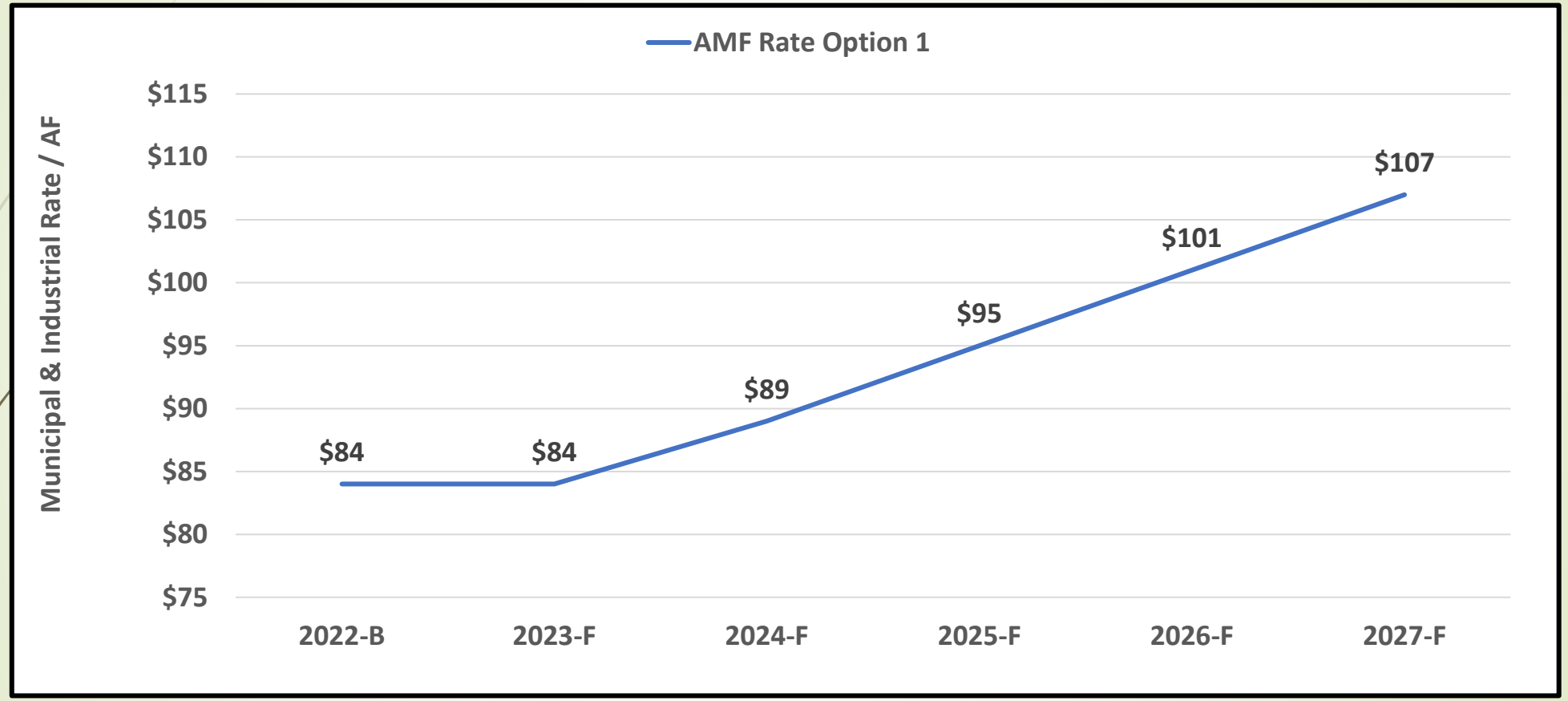
Table 7.1A Updated for 2023-2027 Forecast

Combined EAA/EAHCP Expense Projections



Note: Percentages indicate year-to-year percentage change in budget/forecast.

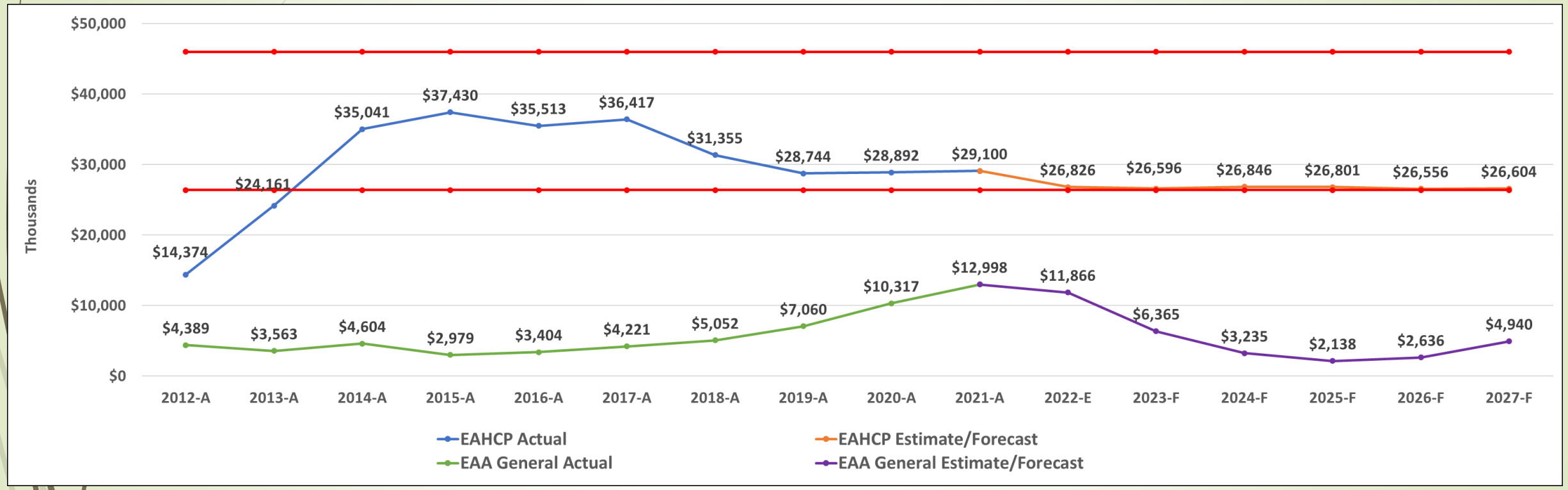
Reserve Forecast
Maintain HCP Reserve Floor at $26.4M



Forecasted Reserves (in Millions)

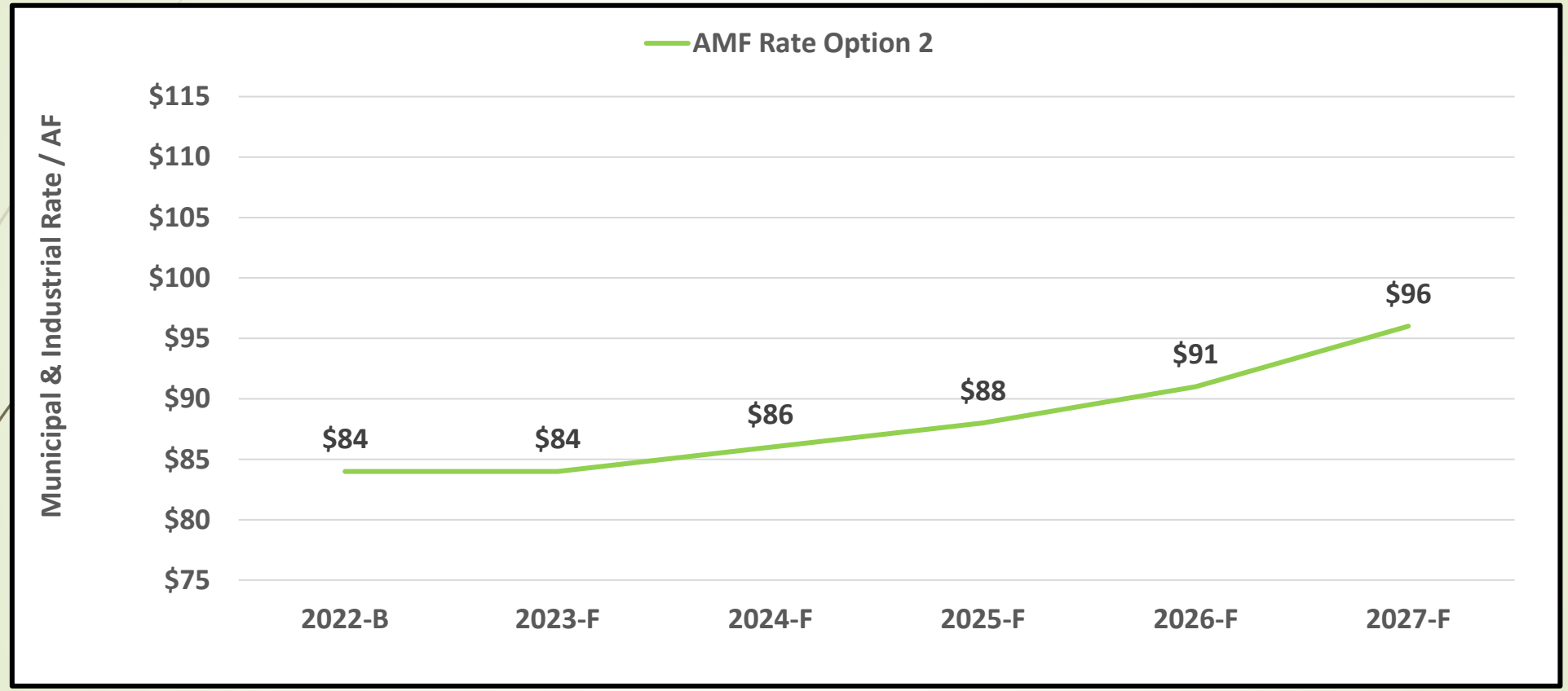
General Operations	$11.9	$6.4	$3.2	$2.1	$2.6	$4.9
HCP	$26.8	$26.6	$26.8	$26.8	$26.6	$26.6

Reserve Projections
Maintain HCP Reserve Floor at $26.4M



	2012-A	2013-A	2014-A	2015-A	2016-A	2017-A	2018-A	2019-A	2020-A	2021-A	2022-E	*Forecast Rates* 2023-F	2024-F	2025-F	2026-F	2027-F
EAA General AMF	$47	$47	$37	$37	$40	$44	$42	$46	$50	$50	$53	*$45*	*$54*	*$60*	*$68*	*$74*
HCP Program AMF	$37	$37	$47	$47	$44	$40	$42	$38	$34	$34	$31	*$39*	*$35*	*$35*	*$33*	*$33*
Combined AMF	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	$84	*$84*	*$89*	*$95*	*$101*	*$107*

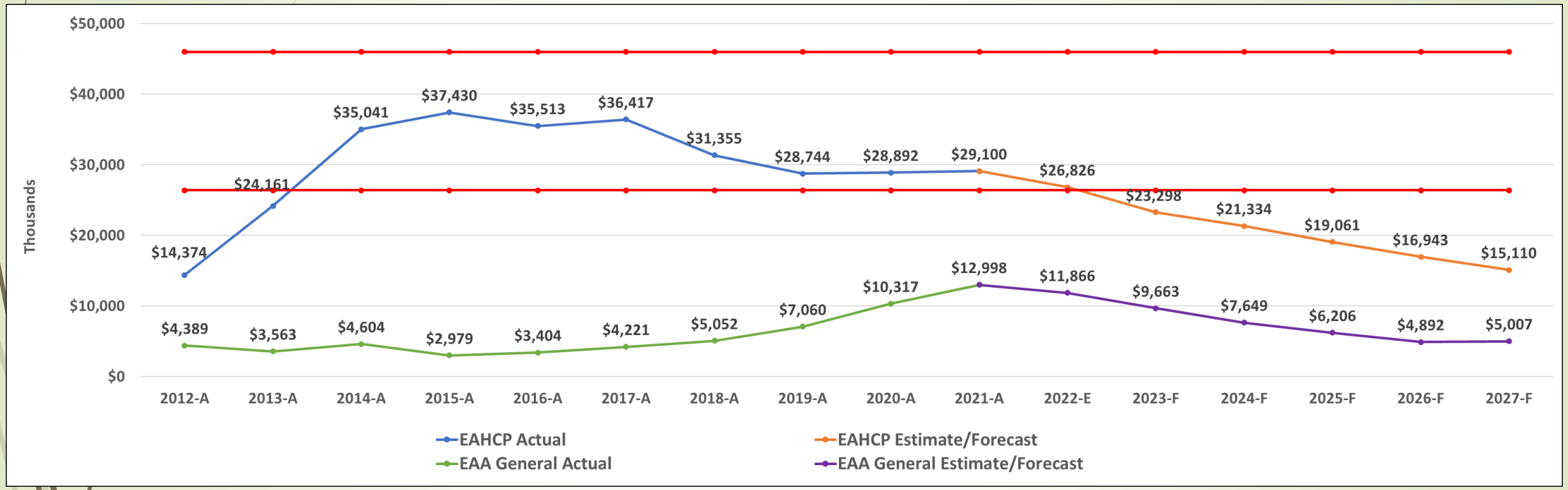
Reserve Forecast
Alternative Funding Strategy



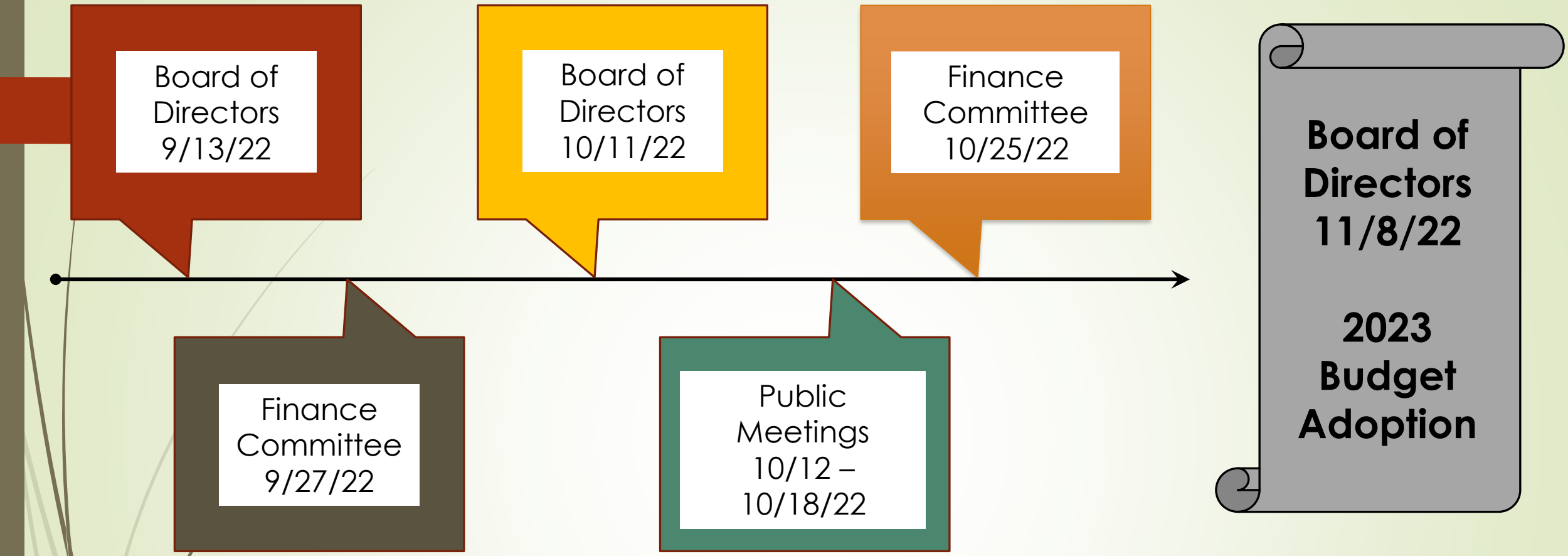
Forecasted Reserves (in Millions)

General Operations	$11.9	$9.7	$7.6	$6.2	$4.9	$5.0
HCP	$26.8	$23.3	$21.3	$19.1	$16.9	$15.1

Reserve Projections
Alternative Funding Strategy



	2012-A	2013-A	2014-A	2015-A	2016-A	2017-A	2018-A	2019-A	2020-A	2021-A	2022-E	*Forecast Rates* 2023-F	2024-F	2025-F	2026-F	2027-F
EAA General AMF	$47	$47	$37	$37	$40	$44	$42	$46	$50	$50	$53	*$54*	*$57*	*$59*	*$63*	*$68*
HCP Program AMF	$37	$37	$47	$47	$44	$40	$42	$38	$34	$34	$31	*$30*	*$29*	*$29*	*$28*	*$28*
Combined AMF	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	$84	*$84*	*$86*	*$88*	*$91*	*$96*



2023 Proposed Budget Schedule

Questions?

APPENDIX B
MEETING AGENDA

2022 EAHCP Budget Work Group

Meeting Agenda
Thursday, June 30, 2022
10:00 a.m.- 12:00 p.m.

1. **Confirm attendance**
2. **Public comment**
3. **Receive presentation and consider possible action associated with the EAHCP Table 7.1A Analysis and Forecast**
4. **Discussion of economic analysis report from TXP, Inc.**
5. **Public comment**
6. **Future meetings**

2022 EAHCP Budget Work Group

Meeting Agenda
Friday, July 29, 2022
10:00 a.m. - 12:00 p.m.

1. **Confirm attendance**

2. **Meeting logistics**

3. **Public comment**

4. **Receive presentation and consider possible action associated with the EAA's Five-Year Financial Forecast (2023-2027)**

   Purpose: To provide an overview of the EAHCP Budget Forecast through 2027

   Action: Consideration to make recommendations to the Implementing Committee

5. **Public comment**

6. **Future meetings**

APPENDIX C
MEETING MINUTES

2022 EAHCP Budget Work Group

Meeting Minutes
Thursday, June 30, 2022

Members of this Work Group include Tom Taggart (Chair - City of San Marcos), Brock Curry (Edwards Aquifer Authority), Adam Yablonski (Medina County Farm Bureau), Myron Hess (Texas Living Waters Project), and Cecilia Vasquez (SAWS).

1. **Confirm attendance.**
   Tom Taggart called the meeting to order at 10:01 a.m. Tom called roll for the Work Group. All Work Group members were present.

2. **Public comment.**
   There were no comments from the public.

****NOTE: Tom Taggart requested for agenda items# 3 and 4 to be switched in order of discussion****

3. **Discussion of economic analysis report from TXP, Inc.**

   Brock Curry summarized the major findings of the economic analysis report that TXP, Inc. provided to the EAA Board at their meeting on 5-10-22. Stated the major findings of the report, notably that To increase revenues that are not keeping up with expenses, TXP proposed a gradual increase in AMF rates and how that effects municipal and industrial payment holders. Advocated that a gradual increase in rates be absorbed over time to avoid cost spikes. The report provided two new concepts to consider:
   - Insurance product (similar to crop insurance) – resembles the concept of how federal crop insurance works with farmers nationally in which subsides are received from the federal government. There currently is no known off-the-shelf product that exists right now but the EAA may contemplate having conversations with insurance carriers about the prospect of creating something that fits our needs.
   - Implement a debt instrument (such as a line of credit) – would be used to issue debit to absorb costs, which you can manage over time as opposed to being subjected to a big spike in interest rates. This would essentially augment operating revenues.

   Both concepts help spread costs over time and would free up current reserves to offset projected short falls. TXP recommended a portfolio approach to manage future increasing costs.

Brock stated that the EAA's 2023-2027 financial forecast will be presented to EAA Board on 7-12-22 and the Board has already directed staff to review the report and to explore the TXP recommendations. If the debt instrument approach proves to be viable, the EAA may consider a gradual reduction in reserves in conjunction with gradual AMF rate increases.

Tom sought clarification on how these proposed concepts fit within the guidelines of the Funding/Management Agreement (FMA) and how they may affect how we govern the HCP since the EAHCP reserves are restricted to the HCP and cannot be used to offset EAA reserves. Brock clarified that it is not proposed to eliminate the reserve entirely. EAA GM Roland Ruiz added that he suggested years back to toggle the AMF rate to offset rising operational costs and that he is open to additional tools for safety net reasons. Reminded us that we are considering all options to apply towards the budget with the current HCP but also as a template in the next HCP. Myron commented the original intent of the fee increases was to flatten those expenses and is interested in seeing how this will be contemplated after the HCP is renewed in 2028. Roland asserted the EAA has done a good job of absorbing inflation over the last 10 years in our rates.

Adam asked if the current Cash Reserve model that we follow will be useful going ahead. Brock referenced back to Roland's comments of the use of additional tools in our toolbox to aid in both the current HCP as well as the next HCP. Dianne Wassenich (San Marcos River Foundation) added that we will need to make certain that we have to consider all financial considerations that U.S. Fish and Wildlife Service will ask of the EAHCP.

Myron remarked that he felt that TXP analysis might be a bit of an over-sell and was curious to know how this will influence the Board's future decisions. Expressed worry that it may give a too rosy outlook on our financial predictors. Tom opined that we need to consider inflationary factors for conservation measure expenses in the Springs Communities, not just with the EAA operational items. Brock said that he felt that the Budget Work Group should be primarily focused on the funding of EAHCP programs and not on how the fund reserve is ultimately managed. Proposed that it should convene on an ad-hoc basis. Tom pointed out that the original goal of the Work Group has been met but still sees the need for its continuation and still serves as a necessary function, for the notion of maintaining and monitoring a reserve floor is still needed. Cecilia added that she too sees the value in the continued oversight of the Work Group, whether on an ad-hoc basis or not. Adam agreed with this sentiment as well.

Brock concluded that the next step is for the 5-year forecast to be presented to the Board in July but explained that is unlikely to discuss debt concerns in any detail. However, the EAA Finance/Administrative Committee will meet to

discuss the forecast and explore initial findings and recommendations based on the TXP report.

4. **Receive presentation and consider possible action associated with the EAHCP Table 7.1A Analysis and Forecast**

   Shelly Hendrix, EAA Director/Controller Financial Services, presented an overview of EAHCP Table 7.1 and Table 7.1A. The information presented are the same projections provided in the previous Budget Work Group meeting on 9-29-22, with revisions that include the 2021 Actuals and any 2022 budget amendments. Overall, Table 7.1 is budgeted at $261,907,955 for EAHCP activities from 2013-2027. Ms. Hendrix also presented Table 7.1A, which illustrates the actual amounts spent per conservation measure per year through 2021 and forecasts expenses through the end of the Incidental Take Permit (2028). A comparative look at the projections between Table 7.1 and Table 7.1A indicates expenditures at $54.4 million below Table 7.1 values, assuming no additional triggering of VISPO or ASR.

   Brock Curry asked if any inflationary costs are considered when forecasting. Shelly replied that it indeed considered for the EAA budget and those costs are assumed when receiving budget amounts from the City of New Braunfels and City of San Marcos/TX State. Tom added that the 7.1 Budget did not factor in inflationary costs when created and Shelly contended that 7.1 is a 'guiding budget' but there are no consequences to exceeding the annual amounts prescribed in the 7.1 table. Tom stated the annual Work Plans do indeed include inflation considerations. Shelly remarked that inflationary costs are not considered on a formulaic basis but rather on an annual forecasting basis.

   Tom inquired about the current $90 AMF rate projection for 2023 but Brock cautioned that the Board has yet to discuss this year's 5-year forecast and this is subject to change. Tom and Cecilia requested clarity on EAA's budget process timeline each year. Brock explained the current 5-year forecast is presented to the Board each July and then the proposed budget will be provided to the Board each September, which will result in further discussions in the EAA Finance/Administrative Committee each September and October. This culminates in the final budget being submitted to the Board for approval each November. Tom requested if we could have a meeting soon after the initial 5-year forecast is released in July.

5. **Public comment**
   There were no comments from the public.

6. **Future meetings**
   Will schedule another Work Group meeting in late July 2022.

7. **Adjourn** – 11:50 a.m.

2022 EAHCP Budget Work Group

Meeting Minutes
Friday, July 29, 2022

Members of this Work Group include Tom Taggart (Chair - City of San Marcos), Brock Curry (Edwards Aquifer Authority), Adam Yablonski (Medina County Farm Bureau), Myron Hess (Texas Living Waters Project), and Cecilia Vasquez (SAWS).

1. **Confirm attendance.**
   Tom Taggart called the meeting to order at 10:01 a.m. Tom called roll for the Work Group. All Work Group members were present.

2. **Public comment.**
   There were no comments from the public.

3. **Receive presentation and consider possible action associated with the EAA's Five-Year Financial Forecast (2023-2027)**

   Shelly Hendrix presented the EAA's Five-year financial forecast that was presented to the EAA Board on 7-12-22. Provided an overview of how the EAA gets paid through AMF and noted that the 5 year forecast is predicated on assumptions and rate considerations & reserves. Most notably, there will be 3 new full time positions in 2023 as well as an 8.3% insurance rate. Also gave explanation of how constituent/community reinvestment is provided by the EAA. Tom Taggart asked how this relates to the EAHCP and Brock responded with the example of how VISPO dollars are essentially a reinvestment into the community. A comparative look at the projections between Table 7.1 and Table 7.1A indicates expenditures at $51.3 million below Table 7.1 values. Shelly informed that any forecast updates were based on estimates to the end of the ITP and 2023 EAHCP budget. The EAHCP and combined EAA/EAHCP expense projections through 2027 were provided, in which Myron Hess inquired about the cost increase in 2023 in EAHCP expense. Shelly replied that this was largely due to the consultant costs of the ITP Renewal contract and a capital project in the City of New Braunfels. Myron further inquired why there is declining trend in costs after 2023 and Shelly replied that it is due to a general decline in programmatic expenses as we approach the end of the permit.

   Two AMF rate and budget reserve forecast options were presented to the Workgroup for consideration. Option# 1 is Maintain the HCP Floor Reserve Floor at $26.4 Million, which takes the approach of adjusting the AMF rates annually to fund EAA and EAHCP operations keep the EAHCP reserve amount above the current, established "floor" of $26.4 million. In this approach, the combined

overall AMF rate would remain the same at $84 per acre-foot (a/f) in 2023, with the EAA General AMF rate dropping to $45 but the HCP Program AMF rate raising to $39. Beyond 2023, the overall AMF rate would see annual increases, peaking at $107 in 2027 an increase of $33 over 5 years. This would stem from dramatic increases in the EAA General AMF rate each year while the HCP Program AMF rate would experience a gradual decline. Option# 2 is to consider an Alternative Funding Strategy, which takes the approach of using smaller, incremental increases in the overall AMF rate but allowing the HCP budget reserve to go below its observed floor, decreasing as low as $15.1 million in 2027 if no VISPO or ASR expense occurs due to drought. Like Option# 1, this approach would keep the combined overall AMF rate the same at $84 per acre-foot (a/f) in 2023, with the EAA General AMF rate raising to $54 but the HCP Program AMF rate declining to $30. Beyond 2023, the overall AMF rate would see small, gradual annual increases, reaching $96 in 2027 or an increase of $12 over 5 years. This would be entirely predicated on small increases to the EAA General AMF rate each year whereas the HCP Program rate would remain relatively at the same rate through 2027. This option would employ an additional funding measure such as a possible line of credit or insurance policy to serve as a funding instrument to address VISPO or ASR expense should triggers occur.. This approach was presented to the EAA Board in May 2022 in an economic analysis report by TXP, Inc. It is unclear at this point what line of credit rates or possible insurance products are available to the EAA. Tom remarked that Option# 2 does not reflect any VISPO triggers despite a growing likelihood that a possible trigger event. Scott Storment cautioned that the VISPO probability analysis is not done until September each year. Tom asserted that he would like to ensure the stakeholders and Implementing Committee the proper time to provide input.. Brock added that the reserves are well-equipped to deal with the potential triggers in the coming years.
Discussion of the likelihood of triggering and the effect on reserves was held. Tom stated that this ???

Tom raised the topic of possible recommendations to the Implementing Committee and offered framing the discussion around two overarching issues: AMF rate increases and budget reserve levels. He contended that the EAA should maintain the $26.4 million floor and increase rates as necessary and advocates for smaller, gradual increases. Moreover, he expressed that the practice of borrowing money (via credit) to cover operating expenses is not sound or sustainable. Brock replied that there would be no issuance of debt in the event of the single VISPO trigger but possibly with multiple triggers. Myron Hess expressed discomfort in continuing to kick the issue down the road each year. Adam Yablonski stated the Work Group cannot advise the EAA on their finances but that it is valuable for the Work Group to give the perspective of rate-payers.

A consensus was reached by the Work Group that the preferable route to any AMF rate increases would be to do so in a small, stairstep increases.

Regarding the topic of budget reserves levels, Tom commented that the reserves were originally designed to pay for springflow protection measures during drought (ex: VISPO and ASR). Contended that rates reflected consensus among the initial partners. He also added that in relation to the reserves, the alternative funding strategy approach of Option# 2 gives the City of San Marcos concern and does not support this approach. Does not feel it is consistent with the clear intent of the Funding and Management Agreement (FMA). He asserted that the $46 million cap was never a goal but rather a calculated amount to cover the initial years of a repeat of the drought of record (DOR).. Any remaining reserves after 2027 the FMA are directed to be returned back to the Permittees at the end of the Incidental Take Permit. Adam felt that we do not have enough information yet to decide which strategy is better. He also suggested a ramp-down strategy for the reserve floor over the upcoming years with consideration of any suggested amount for the ITP rollover balance.

A consensus was reached to continue to seek information from EAA staff on the exploratory search into alternative funding mechanisms and reserve effects. No consensus on the reserve floor was reached on any suggested changes to the reserve levels, due to the lack of clear specifics on the differences related to reserve handling and whether an increase should start in 2023.

4. **Public comment**
   Dianne Wassenich of the San Marcos River Foundation reminded the group that when the EAHCP started, there was a huge apprehension on drought implications and not having a reserve in place. Advocated for the stair-step rate increase approach, for it helps with acceptance and understanding. Concurred that it has been an avoided issue and cannot continue to be postponed.

5. **Future meetings**
   No date was set for any additional Work Group meetings in 2022.

6. **Adjourn** – 11:57 a.m.

Appendix M3 | **Springflow Habitat Protection Work Group Meeting Materials**

Springflow Habitat Protection Work Group Charge

Overview

The Edwards Aquifer Habitat Conservation Plan (EAHCP), through its committees, approved Nonroutine Adaptive Management for the Voluntary Irrigation Suspension Program (VISPO) in May 2019. The Adaptive Management Stakeholder Committee (Stakeholder Committee) recommended the Implementing Committee approve the Nonroutine Adaptive Management Proposal for VISPO, create a Work Group to address springflow-related issues raised in the discussion document circulated to the Stakeholder Committee members by Myron Hess on May 22 (for issues not related to federal exempt pumping), and that the Implementing Committee support the evaluation process and any recommended studies that come out of the Work Group. These directives are captured in the Stakeholder Report accompanying the Nonroutine Adaptive Management proposal. Therefore, a Work Group is being formed to address springflow-related issues raised in the May 22 discussion document.

Background

The May 22, 2019 discussion document distributed by Myron Hess to the Stakeholder Committee provided a description of the overall EAHCP springflow objectives and discussion of flows in both the Comal and San Marcos springs. The discussion document concluded with the following recommendations as presented to the Implementing Committee January 30, 2020.

(1) The Implementing Committee should ensure a technical evaluation is undertaken of water quality impacts of predicted extended periods of flow below 80 cfs in both spring systems, either using the Hardy water quality model but calibrated and validated using data from recent low-flow periods or using an alternate approach;

(2) The Implementing Committee should ensure a technical evaluation is undertaken of potential impacts of predicted extended periods of flow below 80 cfs on Comal Springs riffle beetle populations;

(3) The Implementing Committee should ensure that a technical evaluation is undertaken of potential impacts of predicted extended periods of flow below 80 cfs on San Marcos salamander populations, particularly for populations in the area below Spring Lake dam, and on Texas wild-rice and other vegetation serving as habitat for fountain darters downstream of Spring Lake dam, including consideration of impacts from recreation;

(4) The Implementing Committee should ensure that a rigorous review process, involving input from qualified experts in addition to the Science Committee, is undertaken, as soon as reasonably possible, to inform study design for each of the above-listed technical evaluations and to assess the extent to which adaptive management study commitments included in the EAHCP that are related to flow impacts have been met, will be met, or should be adjusted;

(5) The Implementing Committee should ensure, to the maximum extent possible, that the above-listed technical evaluations are completed by December 31, 2022; and

(6) The Implementing Committee should commit to undertaking an evaluation, to be completed by no later than December 31, 2023 if possible, of whether adaptive management action is needed to address adverse impacts predicted by one or more of the above-listed technical evaluations and commit to provide reasonable opportunity for Science Committee and Stakeholder Committee input into the decision process.

Previous Decisions

On May 23, 2019 the EAHCP Implementing Committee approved the recommendations of the Stakeholder Committee, including the creation of a Work Group to address springflow-related issues raised in the discussion document circulated to the Stakeholder Committee members by Myron Hess on May 22. The Springflow Habitat Protection Work Group will be comprised of Stakeholder Committee members representing permittees, industrial and agricultural users, and environmental organizations.

Charge

The Work Group's charge will be developed through a two-part process. Part 1, defined here, asks the Work Group to clarify and refine the broad questions highlighted in the May 22 discussion document to focus the inquiry and help identify the technical expertise and analysis needed to inform the deliberations of the Work Group during Part 2 of the charge, regarding recommended studies and evaluations. That refinement of the questions is intended to be captured in Part 2 of the charge. Building on the additional information developed pursuant to Part 1, the Work Group's implementation of Part 2 of the charge should result in recommendations to the Implementing Committee outlining specific technical studies or evaluations to address points (1), (2), and (3), and, if additional, relevant shortcomings of adaptive management study commitments are identified, point (4) of the May 22 discussion document. The Implementing Committee understands the over-arching intent of the discussion document and of the Work Group process is to ensure progress continues in understanding the effects of extended periods of low flow on Covered Species

and in identifying realistic approaches to address any significant adverse effects identified. Computer modeling and species-specific research conducted pursuant to the EAHCP have been working to address aspects of these questions. It is understood that the approaches developed through this Work Group may lead to adaptive management under the current federally issued Incidental Take Permit (TE-63663A-1) or may be addressed as part of the application process for rollover to a future permit.

Administration

The Work Group will meet on an as-needed basis. The Work Group will bring Part 1 recommendations to the Implementing Committee directed at defining Part 2 of the charge for approval before beginning implementation of Part 2 of the charge. The Implementing Committee will guide the implementation of specific studies or evaluations identified pursuant to Part 2 of the charge, with the Work Group considering those results in recommending potential management responses.

Members

The Work Group will consist of the following members:

- Myron Hess—Chair (Texas Living Waters Project)
- Patrick Shriver (San Antonio Water System)
- Adam Yablonski (Agriculture Permit Holder)
- Doris Cooksey (City Public Service [CPS])
- Cindy Loeffler (Texas Parks and Wildlife)
- Ryan Kelso (New Braunfels Utility)
- Melani Howard (City of San Marcos)
- Kimberly Meitzen (Texas State University)
- Charles Ahrens (Edwards Aquifer Authority)
- Jacquelyn Duke (Science Committee representative)
- Charles Kreitler (Science Committee representative)
- Tom Arsuffi (Science Committee representative)

Part 1 Process

During Part 1, the Work Group will work to clarify and refine the broad issues identified in the May 22, 2019 discussion document regarding the potential adverse impacts of extended periods of low flow as currently predicted with a recurrence of historical hydrology and possible responses. Part 1 is expected to result in a series of more-specific questions, as well scientific inquiries to identify knowledge gaps and recommended tools for filling those gaps, to be considered during Part 2, under the following general topics: (1) water quality impacts in both springs, (2) impacts on the Comal Springs riffle beetle

populations, (3) impacts on San Marcos salamander populations, (4) impacts on Texas wild-rice and other vegetation serving as habitat for fountain darters, and (5) any relevant, specific adaptive management study commitments identified as meriting adjustment or further attention.

During Part 1, scientists and others who played a key role in development of the flow-regime recommendations incorporated into the EAHCP will be requested to provide input, either through in-person or remote presentations, all of which will be recorded. These presentations are anticipated to cover subjects such as the development of springflow objectives, the models used to develop the EAHCP (i.e. the Hardy model, habitat suitability modeling, and STELLA), species-specific research completed and on-going as part of the EAHCP, EAHCP EcoModeling, and the results of the National Academy of Sciences (NAS) review. In addition to adding EAHCP Adaptive Management Science Committee members to the Work Group as indicated above, Science Committee members will be invited to be present for the presentations.

Following the presentations, the Work Group will have an open discussion to inform the process of refining the set of questions and issues to be pursued, subject to approval by the Implementing Committee, as Part 2 of this charge.

Proposed Part 2 Process[1]

The Part 2 process is intended to result in two discrete sets of scopes of work (SOW), with set (a) designed to identify data gaps and evaluate/review available tools and set (b) designed to guide studies and analyses to address data gaps, including by developing and/or employing tools identified pursuant to set (a). Both sets are intended to provide information to address the refined questions and issues identified in Part 1. The anticipated steps for both parts of the process are set out in **Table 1**.

[1] This proposed process was developed from comments at the January 30, 2020 Implementing Committee meeting. The Part 2 process may change depending on the outcome of the Part 1 process.

Table 1. Springflow Habitat Protection Work Group Tasks and Products

Part	Task	Product	Timeframe
Part 1	Presentations by key scientists and participants (EAHCP staff will handle logistics.)	Identification of issues that were anticipated to be addressed regarding extended periods of low flow	March 20 – June 30
	Work Group (WG) refines questions and issues to be addressed in Part 2	Proposed Part 2 of the Charge elaborating on species questions and issues to be addressed	Ongoing through Aug. 19; presented to IC on Aug. 20.
Part 2	Develop SOW(s) for technical experts to identify data gaps and evaluate/review available tools (based on WG input, EAHCP staff will develop draft SOW(s) for review by WG*)	SOW(s) to be presented to the IC for approval	August 21 – Oct 7 IC = Oct 8
	RFP(s) and contracting (undertaken by EAHCP staff)	Award contracts to identify data gaps and evaluate/review available tools	Oct. 9 – Jan. 15, 2021
	Contractors present interim results	Presentations to Work Group members	As needed
	Contractors present recommendations to Work Group and Science Committee	Work Group defines/prioritizes next steps*	Late 2021
	Develop SOW(s) for studies and/or tool development (based on WG input, EAHCP staff will develop draft SOW(s) for review by WG*)	SOW(s) to be presented to IC for approval	Early 2022
	RFP(s) and contracting (undertaken by EAHCP staff)	Award contracts for studies and/or tool development	Mid-year 2022
	Contractors present to Work Group and Science Comm. Results shared with Stakeholders and IC	TBD	TBD

* Opportunity provided for input from EAHCP Adaptive Management Science Committee members.

The technical experts who are contracted for the Set (a) SOW(s) will be asked to present to Work Group members periodically, as appropriate, during their evaluation of data gaps and available tools. The Work Group members, with EAHCP staff, will use the results of the contracted work to finalize, with input from Science Committee members, recommendations for the Set (b) SOW(s) for studies to fill data gaps, which may include development and deployment of tools identified pursuant to the Set (a) SOW(s).

The Work Group will seek input from Science Committee members on the various SOW(s). Summaries of input received will accompany the SOW(s) presented to the Implementing Committee for approval. The Implementing Committee will then guide the implementation of specific studies or evaluations developed pursuant to Part 2 of this charge.

Appendix M4 | **Adaptive Management Stakeholder Committee Meeting Materials**

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Stakeholder Committee

Thursday, March 24, 2022 | **10:00 AM** | **Web-Conference**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Budget Reports
- EAHCP Program Management
- Spring Communities Update

4. Approval of Minutes

4.1 **Approval of previous Stakeholder Committee meeting minutes.**

- Stakeholder Committee: October 14, 2021
- Stakeholder Committee: December 16, 2021

5. Reports

5.1 **Receive report from Ed Oborny, BIO-WEST, on the Net Disturbance and Incidental Take in the San Marcos and Comal Spring systems.**

5.2 **Receive report from Myron Hess, 2021 EAHCP Stakeholder Committee Chair, on potential amendments to the EAHCP Stakeholder Committee Operational Rules.**

6. Individual Consideration

6.1 **Election of 2022 Stakeholder Committee officers.**

6.2 **Receive report from Dr. Chad Furl, EAHCP Chief Science Officer, regarding the Science Committee member vacancy and consider recommendation to create a Work Group and adopt a Work Group Charge to review nominations for the Stakeholder Committee appointee to the Science Committee.**

7. Future Meetings

8. Questions from the Public

9. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Stakeholder Committee

Thursday, March 24, 2022 | **10:00 AM** | **Web-Conference**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chairman Hess called the meeting to order at 10:03 AM.

Present: Javier Hernandez, Buck Benson, Doris Cooksey, James Dodson, Mark Enders, Adam Yablonski, Kerim Jacaman, Myron Hess, Cindy Hooper, Melani Howard, David Villarreal, Colette Barron-Bradsby, Glenn Lord, Brian Mast, Kimberly Meitzen, Gary Middleton, Carol Patterson, Ray Joy Pfannstiel Humberto Ramos, Patrick Shriver, Nathan Pence and Rachel Sanborn.

2. Public Comment

There were no citizens who requested to address the Stakeholder Committee.

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Budget Reports
- EAHCP Program Management
- Spring Communities Update

Scott Storment announced the retirement of Darren Thompson from the San Antonio Water System and updated the committee on a letter sent to the U.S. Fish and Wildlife Service in response to the their 5-year review of Texas wild-rice. Olivia Ybarra provided an update on the EAHCP Steward Newsletter and the 10-Years of Habitat Conservation article series. Mark Enders and Melani Howard provided a spring community update on New Braunfels and San Marcos, respectively.

4. Approval of Minutes

4.1 **Approval of previous Stakeholder Committee meeting minutes.**

- Stakeholder Committee: October 14, 2021
- Stakeholder Committee: December 16, 2021

A motion was made by Colette Baron-Bradsby, seconded by Kimberly Meitzen, to approve the meeting minutes from October 14, 2021. There were no objections.

A motion was made by Glen Lord, seconded by Rachel Sanborn, to approve the meeting minutes from December 16, 2021. There were no objections.

5. Reports

5.1 **Receive report from Ed Oborny, BIO-WEST, on the Net Disturbance and Incidental Take in the San Marcos and Comal Spring systems.**

Ed Oborny, BIO-WEST Inc. presented results from the monitoring program used to calculate the net disturbance and incidental take that occurred in the San Marcos and Comal Spring systems in 2021.

5.2 **Receive report from Myron Hess, 2021 EAHCP Stakeholder Committee Chair, on potential amendments to the EAHCP Stakeholder Committee Operational Rules.**

Myron Hess, EAHCP Stakeholder Committee Chairman, presented suggested revisions to the Program Operational Rules for the EAHCP Program Adaptive Management Stakeholder Committee. Members of the committee proposed to continue the conversation throughout several Stakeholder Committee meetings to address issues such as officer term limits.

6. Individual Consideration

6.1 **Election of 2022 Stakeholder Committee officers.**

The Stakeholder Committee nominated the following individuals: Chair – Myron Hess, Vice-Chair – Dr. Kimberly Meitzen, and Secretary – Patrick Shriver.

A motion was made by Glen Lord, seconded by Buck Benson, to approve the Stakeholder Committee Officers for 2022. There were no objections.

6.2 **Receive report from Dr. Chad Furl, EAHCP Chief Science Officer, regarding the Science Committee member vacancy and consider recommendation to create a Work Group and adopt a Work Group Charge to review nominations for the Stakeholder Committee appointee to the Science Committee.**

A motion was made by Humberto Ramos, seconded by Glen Lord to approve the Science Committee Vacancy Work Group Charge. There were no objections.

7. Future Meetings

8. Questions from the Public

None.

9. Adjourn

There being no further business to discuss, the meeting adjourned at 12:01 PM.

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Patrick Shriver (Nov 9, 2022 14:23 CST)

Patrick Shriver
Secretary, Stakeholder Committee

Stakeholder Commitee_MeetingMinutes_03.24.2022

Final Audit Report 2022-11-09

Created:	2022-11-09
By:	Damon Childs (dchilds@edwardsaquifer.org)
Status:	Signed
Transaction ID:	CBJCHBCAABAAHgezc0oA6Y5JXseZJtVkSEOQODzIpw_t

"Stakeholder Commitee_MeetingMinutes_03.24.2022" History

Document created by Damon Childs (dchilds@edwardsaquifer.org)
2022-11-09 - 4:54:01 PM GMT- IP address: 70.92.53.18

Document emailed to Patrick Shriver (patrick.shriver@saws.org) for signature
2022-11-09 - 4:55:06 PM GMT

Email viewed by Patrick Shriver (patrick.shriver@saws.org)
2022-11-09 - 8:23:02 PM GMT- IP address: 198.181.6.163

Document e-signed by Patrick Shriver (patrick.shriver@saws.org)
Signature Date: 2022-11-09 - 8:23:38 PM GMT - Time Source: server- IP address: 198.181.6.163

Agreement completed.
2022-11-09 - 8:23:38 PM GMT

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Stakeholder Committee

Thursday, May 19, 2022 | **10:00 AM** | **City of New Braunfels - City Hall**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. EAHCP Program Management Announcements

3.1

- Hydrologic Update
- EAHCP Budget Reports
- EAHCP Program Management
- Spring Communities Update
  - City of New Braunfels
  - City of San Marcos

4. Approval of Minutes

4.1 **Approval of previous Stakeholder Committee meeting minutes.**

- March 24, 2022

5. Reports

5.1 **Receive report from Myron Hess, EAHCP Stakeholder Committee Chair, on the Stakeholder Operational Rule Revisions.**

5.2 **Receive report from Myron Hess, EAHCP Stakeholder Committee Chair, on the Science Committee Vacancy Work Group.**

6. Individual Consideration

6.1 **Consider recommendation to approve the Stakeholder Committee action items from 2020 through March 2022.**

7. Future Meetings

8. Questions from the Public

9. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Stakeholder Committee

Thursday, May 19, 2022 | **10:00 AM** | **City of New Braunfels - City Hall**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chairman Hess called the meeting to order at 10:00AM.

Present In-Person: Chuck Ahrens, Bruce Alexander, Buck Benson, Ryan Kelso, Julie Lewey, Doris Cooksey, James Dodson, Mark Enders, Kerim Jacaman, Myron Hess, Cindy Hooper, Melani Howard, David Villarreal, Colette Bradsby Barron, Brian Mast, Kimberely Meitzen, Carol Patterson, Ray Joy Pfannstiel, Humberto Ramos, Brandon Payne, Rachel Sanborn, and Jana Grey.

Present Via Microsoft Teams: Glenn Lord.

2. Public Comment

There were no citizens who requested to address the Stakeholder Committee.

3. EAHCP Program Management Announcements

3.1

- Hydrologic Update
- EAHCP Budget Reports
- EAHCP Program Management
- Spring Communities Update
  - City of New Braunfels
  - City of San Marcos

Chad Furl provided the hydrologic update. Scott Storment provided an update on the EAA Education Outreach Center and the latest Steward Newsletter. Myron Hess presented a recognition of Colette Baron Bradsby's retirement from TPWD. Mark Enders and Melani Howard provided spring community updates from the City of New Braunfels and City of San Marcos, respectively.

4. Approval of Minutes

4.1 Approval of previous Stakeholder Committee meeting minutes.

- March 24, 2022

A motion was made by Bruce Alexander, seconded by Humberto Ramos, to approve the meeting minutes from March 24, 2022. There were no objections.

5. Reports

5.1 Receive report from Myron Hess, EAHCP Stakeholder Committee Chair, on the Stakeholder Operational Rule Revisions.

Myron Hess, EAHCP Stakeholder Committee Chairman, provided a formal report on the potential revisions to the Program Operational Rules for EAHCP Program Adaptive Management Stakeholder Committee.

5.2 Receive report from Myron Hess, EAHCP Stakeholder Committee Chair, on the Science Committee Vacancy Work Group.

Myron Hess, EAHCP Stakeholder Committee Chairman, reminded the committee that nominations to fill the Science Committee vacancies are needed and will be reviewed by the Science Committee Vacancy Work Group.

6. Individual Consideration

6.1 Consider recommendation to approve the Stakeholder Committee action items from 2020 through March 2022.

The motion to approve the Stakeholder Committee action items from 2020 through March 2022 is postponed for the October 13, 2022 Stakeholder Committee Meeting.

7. Future Meetings

8. Questions from the Public

9. Adjourn

There being no further business to discuss, the meeting adjourned at 11:10 AM.

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Patrick Shriver (Nov 9, 2022 14:22 CST)

Patrick Shriver
Secretary, EAHCP Stakeholder Committee

Stakeholder Committee_Part1_MeetingMinutes_05.19.2022

Final Audit Report 2022-11-09

Created:	2022-11-09
By:	Damon Childs (dchilds@edwardsaquifer.org)
Status:	Signed
Transaction ID:	CBJCHBCAABAApkXvgi5WEz8aeSta8dhJclsOdSI5PYj0

"Stakeholder Committee_Part1_MeetingMinutes_05.19.2022" History

Document created by Damon Childs (dchilds@edwardsaquifer.org)
2022-11-09 - 4:55:51 PM GMT- IP address: 70.92.53.18

Document emailed to Patrick Shriver (patrick.shriver@saws.org) for signature
2022-11-09 - 4:56:24 PM GMT

Email viewed by Patrick Shriver (patrick.shriver@saws.org)
2022-11-09 - 8:22:18 PM GMT- IP address: 198.181.6.163

Document e-signed by Patrick Shriver (patrick.shriver@saws.org)
Signature Date: 2022-11-09 - 8:22:45 PM GMT - Time Source: server- IP address: 198.181.6.163

Agreement completed.
2022-11-09 - 8:22:45 PM GMT

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Stakeholder Committee

Thursday, May 19, 2022 | **11:00 AM** | **City of New Braunfels - City Hall**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Individual Consideration

3.1 **Consider recommendation to approve the revisions to the EAHCP Program Operational Rules for the EAHCP Program Adaptive Management Stakeholder Committee Members and Participants.**

4. Future Meetings

5. Questions from the Public

6. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Stakeholder Committee

Thursday, May 19, 2022 | **11:00 AM** | **City of New Braunfels - City Hall**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chairman Hess called the meeting to order at 11:20 AM.

Present In-Person: Chuck Ahrens, Bruce Alexander, Buck Benson, Ryan Kelso, Doris Cooksey, James Dodson, Mark Enders, Kerim Jacaman, Myron Hess, Cindy Hooper, Melani Howard, David Villarreal, Colette Bradsby Barron, Brian Mast, Kimberly Meitzen, Carol Patterson, Ray Joy Pfannstiel, Humberto Ramos, Brandon Payne, Rachel Sanborn, Jana Grey, and Julie Lewey.

2. Public Comment

There were no citizens who requested to address the Stakeholder Committee.

3. Individual Consideration

3.1 Consider recommendation to approve the revisions to the EAHCP Program Operational Rules for the EAHCP Program Adaptive Management Stakeholder Committee Members and Participants.

A motion was made by Bruce Alexander, seconded by Humberto Ramos, to approve the revisions made to the EAHCP Program Operational Rules for the EAHCP Program Adaptive Management Stakeholder Committee Members and Participants. There were no objections.

4. Future Meetings

5. Questions from the Public

The San Marcos River Foundation awarded Tom Taggart, City of San Marcos, the Friends of the River award.

6. Adjourn

There being no further business to discuss, the meeting adjourned at 11:35 AM.

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Patrick Shriver (Nov 9, 2022 14:22 CST)

Patrick Shriver

Secretary, Stakeholder Committee

Stakeholder Committee_Part2_MeetingMinutes_05.19.2022

Final Audit Report 2022-11-09

Created:	2022-11-09
By:	Damon Childs (dchilds@edwardsaquifer.org)
Status:	Signed
Transaction ID:	CBJCHBCAABAALms2D5lx8aZnUKPBTSrrQcVKujPHvxEH

"Stakeholder Committee_Part2_MeetingMinutes_05.19.2022" History

Document created by Damon Childs (dchilds@edwardsaquifer.org)
2022-11-09 - 4:56:58 PM GMT- IP address: 70.92.53.18

Document emailed to Patrick Shriver (patrick.shriver@saws.org) for signature
2022-11-09 - 4:57:26 PM GMT

Email viewed by Patrick Shriver (patrick.shriver@saws.org)
2022-11-09 - 8:21:25 PM GMT- IP address: 198.181.6.163

Document e-signed by Patrick Shriver (patrick.shriver@saws.org)
Signature Date: 2022-11-09 - 8:22:10 PM GMT - Time Source: server- IP address: 198.181.6.163

Agreement completed.
2022-11-09 - 8:22:10 PM GMT

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Stakeholder Committee

Thursday, October 13, 2022 | **10:00 AM** | **EAA Board Room**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Budget Reports
- EAHCP Program Management
- Spring Communities Update
  - City of New Braunfels
  - City of San Marcos

4. Approval of Minutes

4.1

- May 19, 2022 - Part 1
- May 19, 2022 - Part 2

5. Reports

5.1 **Receive report from Scott Storment, EAHCP Program Manager, on the Incidental Take Permit Renewal Process.**

5.2 **Receive report from Scott Storment, EAHCP Program Manager, on the Biological Goals Work Group.**

5.3 **Receive report from Chad Furl, EAHCP Chief Science Officer, on the proposed schedule and planned activities regarding springflow projections for the Incidental Take Permit Renewal effort.**

6. Individual Considerations

6.1 **Consider recommendations from the Science Committee Vacancy Work Group to nominate two individuals to the Science Committee.**

6.2 **Consider recommendation to ratify the Stakeholder Committee action items from 2020 through March 2022.**

7. Future Meetings

8. Questions from the Public

9. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Stakeholder Committee

Thursday, October 13, 2022 | **10:00 AM** | **EAA Board Room**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chuck Ahrens, Ryan Kelso, Doris Cooksey, Shaun Donovan, Mark Enders, Adam Yablonski, Kerim Jacaman, Myron Hess, Cindy Hooper, Melani Howard, David Villarreal, Kevin Mayes, Glenn Lord, Brian Mast, Kimberly Meitzen, Carol Patterson, Ray Joy Pfannstiel, Humberto Ramos, Patrick Shriver, Jana Gray, and Rachel Sanborn.

2. Public Comment

Dianne Wassenich invited the committee and the public to attend a social gathering for all those involved in EAHCP efforts and provided her contact information.

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Budget Reports
- EAHCP Program Management
- Spring Communities Update
    - City of New Braunfels
    - City of San Marcos

Scott Storment reported that Jana Gray will now be representing Guadalupe-Blanco River Authority (GBRA) in the Stakeholder and Implementing Committees. Nathan Pence will be the alternate representative for GBRA on those committees. The Education Outreach Center now houses aquariums with EAHCP endangered species to showcase. The EAHCP received notice of a $1 million grant from the USFWS Cooperative Endangered Species Conservation Fund. The committees thanked Melani Howard for her years of service and dedication to the EAHCP. Olivia Ybarra provided a reminder of the NHCPC Conference and provided an update on the Steward Newsletter.

4. Approval of Minutes

4.1

- May 19, 2022 - Part 1
- May 19, 2022 - Part 2

Part 1: A motion was made by Rachel Sanborn and seconded by Brian Mast, to approve the meeting minutes from Part 1 of the May 19, 2022 Stakeholder Committee meeting. There were no objections.

Part 2: A motion was made by Brian Mast and seconded by Glenn Lord, to approve the meeting minutes from Part 2 of the May 19, 2022 Stakeholder Committee meeting. There were no objections.

5. Reports

5.1 Receive report from Scott Storment, EAHCP Program Manager, on the Incidental Take Permit Renewal Process.

Scott Storment presented an overview of the ITP renewal process and the formation of associated work groups.

5.2 Receive report from Scott Storment, EAHCP Program Manager, on the Biological Goals Work Group.

Scott Storment presented an overview of the Biological Goals Work Group. A charge for this work group will be presented at the December 15th meeting for the Stakeholder Committee to consider for approval.

5.3 Receive report from Chad Furl, EAHCP Chief Science Officer, on the proposed schedule and planned activities regarding springflow projections for the Incidental Take Permit Renewal effort.

Chad Furl provided a presentation on climate change and the permit renewal process.

6. Individual Considerations

6.1 Consider recommendations from the Science Committee Vacancy Work Group to nominate two individuals to the Science Committee.

A motion was made by Melani Howard, and seconded by Rachel Sanborn, to approve the nominations of Megan Bean and Jason Martina to the EAHCP Science Committee. There were no objections.

6.2 Consider recommendation to ratify the Stakeholder Committee action items from 2020 through March 2022.

A motion was made by Carol Patterson, and seconded by Mark Enders, to approve the ratification of the Stakeholder Committee action items from 2022 through March 2022. There were no objections.

7. Future Meetings

8. Questions from the Public

None.

9. Adjourn

There being no further business to discuss, the meeting adjourned at 11:42 AM.

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Patrick Shriver
Secretary, EAHCP Stakeholder Committee

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Stakeholder Committee

Thursday, December 15, 2022 | **10:00 AM** | **EAA Board Room**

A meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Program Management
- Spring Communities
  - City of New Braunfels
  - City of San Marcos

4. Approval of Minutes

4.1

- October 13, 2022

5. Individual Consideration

5.1 **Consider staff recommendation to approve the establishment of the Biological Goals Subcommittee and charge.**

5.2 **Election of 2023 Stakeholder Committee officers.**

6. Future Meetings

7. Questions from the Public

8. Adjourn

Olivia Ybarra
Habitat Conservation Plan Coordinator

This meeting of the Stakeholder Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.8.4 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

EDWARDS AQUIFER
HABITAT CONSERVATION PLAN PROGRAM
("EAHCP PROGRAM")

PROGRAM OPERATIONAL RULES

FOR

EAHCP PROGRAM ADAPTIVE MANAGEMENT STAKEHOLDER COMMITTEE MEMBERS AND PARTICIPANTS

SECTION 1. PROMULGATION AND PURPOSE.

1.1. Promulgation. These Rules are promulgated by the EAHCP Program Adaptive Management Stakeholder Committee ("Stakeholder Committee") created in compliance with the requirements of the Funding and Management Agreement ("FMA") and in furtherance of the spirit of Senate Bill 3 ("S.B. 3").

1.2. Purpose. The purpose of these Rules is to provide rules and procedures (a) to ensure that the Stakeholder Committee is an open process that provides advance public notice of meetings and proposed actions, opportunity for stakeholder participation, open communication, and Consensus-based decision-making; and (b) to enable the EAHCP Program to meet the purposes, goals, requirements, and, to the maximum extent feasible, deadlines imposed by the FMA.

SECTION 2. APPLICATION AND CONSTRUCTION.

2.1. Application. These Rules, and any amendment of these Rules made under Section 10, shall be effective and apply to the actions of the Stakeholder Committee from and after the respective date of approval of the Rules or the amendment.

2.2. Construction. These Rules shall be construed to comply with the FMA. In the event of any inconsistency in any portion of these Rules and the FMA, the inconsistent portion shall be disregarded or, to the extent feasible, deemed modified to conform to the FMA.

2.3. Good Faith Exceptions. These Rules recognize the critical importance to the EAHCP Program of requirements for procedural transparency, including, but not limited to, requirements for prior public notice and opportunity for participation in proposed EAHCP Program activities. However, Participants also acknowledge that for the EAHCP Program to efficiently and timely meet its goals, it is not feasible for every discussion pertaining to the EAHCP Program to be conducted in strict compliance with the procedural requirements in these Rules for prior notice and public participation. Accordingly, these Rules are not intended to prohibit discussions of EAHCP Program-related topics among Stakeholder Committee members or among the Program Manager, Chair, other Stakeholder Committee members, and other persons, provided such discussions are conducted in good faith and in furtherance of the goals of the EAHCP Program.

Persons participating in such discussions shall use their own best judgment in determining when reasonable notice to other Members and Participants, either in advance or after-the-fact, of such discussions is appropriate in order to further the interests of the EAHCP Program.

2.4. Percentages. Whenever these Rules provide for a specified percentage of persons to constitute a quorum, to consider or approve some action, or to perform any other duty or responsibility, and the result is not a whole number, the result shall be rounded up to the next whole number.

SECTION 3. DEFINITIONS.

Certain terms used in these Rules shall have the meanings assigned in this section unless the context clearly indicates another meaning. Any terms used as captions of sections or subsections are for convenience only and have no special meaning unless assigned a meaning in this section.

"Abstention" means that a Member or Alternate Member affirmatively indicates, in good faith, his or her intention not to vote on a matter.

"Alternate Member" means a person designated as provided in Subsection 5.2 to serve as an alternate to a Member of the Stakeholder Committee. Lower case "alternate member" means a person who serves as an alternate to a member of an Issue Team, Subcommittee, or Work Group.

"Chair" means the member of the Stakeholder Committee, Subcommittee, Work Group, or Issue Team who is elected or appointed to chair the meetings of the group. Unless another group is indicated, "Chair" refers to the Stakeholder Committee Chair, who has the duties provided in Subsection 6.2.

"Consensus" means approval of a decision by all Members, or members, of the Stakeholder Committee, Subcommittee, Issue Team, or Work Group as determined by an explicit request for approval to the group at a time when the requisite quorum is present and in response to which no Member, or member, indicates opposition to the decision.

"Consensus-based decisions" mean decisions reached by Consensus or by the process provided in Subsections 7.8 and 7.9 of these Rules.

"EAA" means the Edwards Aquifer Authority.

"EAHCP" *or* ***"HCP"*** means the habitat conservation plan prepared pursuant to S.B. 3 and Section 10(a)(2)(A) of the federal Endangered Species Act: Edwards Aquifer Authority, et al., Edwards Aquifer Recovery Implementation Program Habitat Conservation Plan (Nov. 2012), as amended.

"EAHCP Program" means the activities undertaken in furtherance of the EAHCP, including the FMA.

"Entire Stakeholder Committee" or ***"entire membership of the Stakeholder Committee"*** or ***"by vote of the entire membership,"*** or a similar phrase using "entire" in a reference to a requirement for quorum or Consensus or voting means the requirement is based on the total number of persons serving as Members of the Stakeholder Committee,

including any Alternate Member temporarily replacing a Member, but not including a Member whose position has been Vacated.

"Expedited Tier 1 Decision" means a Tier 1 decision that, because of exigent circumstances, must be acted upon and resolved prior to the end of the Stakeholder Committee meeting at which the decision is initially presented for resolution. The types of Tier 1 Decisions subject to identification as Expedited Tier 1 Decisions are limited by Subpart 7.8.8.

"Facilitator" means a person responsible for facilitating discussion and Consensus-building among Stakeholder Committee Members at EAHCP meetings or among Subcommittee members at Subcommittee meetings. A Facilitator may be the Program Manager, a person appointed by the Program Manager, or an independent facilitator. A person may not be appointed as the Facilitator without the concurrence of the Stakeholder Committee.

"FMA" means the Funding and Management Agreement submitted to the U.S. Fish and Wildlife Service with the EAHCP and effective on January 1, 2012, as amended.

"Implementing Committee" means the committee created pursuant to Section 7.7 of the FMA.

"Issue Team" means a group of persons, which may include Members and Participants, appointed by the Stakeholder Committee to assist the Stakeholder Committee in reaching Consensus on certain Tier 1 Decisions, as provided in Subsection 7.8.

"Member" means a person who serves as a member of the EAHCP Stakeholder Committee established under the FMA and any Alternate Member with respect to any meeting or procedure for which the Alternate actually acts as the alternate to an unavailable Member. When used in these Rules in a reference to a quorum or a vote of the Stakeholder Committee or a vote of the entire membership of the Stakeholder Committee, the term "Member" does not include any Member whose position has been Vacated. Lower case "member" means a person who serves as a member of an Issue Team, Subcommittee, or Work Group.

"Non-Tier 1 Decision" means a decision of or action taken by the Stakeholder Committee, other than a vote relating to the selection of Stakeholder Committee officers, which is not enumerated in these Rules as a Tier 1 Decision.

"Participant" means a person, other than a Stakeholder Committee Member, who signs up to receive emails regarding activities related to the EAHCP and is involved in activities of the Stakeholder Committee.

"Program Manager" means the person selected by the EAA, as provided in the FMA, to manage the EAHCP Program.

*"**Quorum**"* means the minimum number of Members of the Stakeholder Committee or members of any Subcommittee, Issue Team, or Work Group described in these Rules required to either consider or take action on a matter within that group's authority.

"Rules" means these Program Operational Rules for the EAHCP Program Adaptive Management Stakeholder Committee Members and Participants, as they may be amended from time to time.

"S.B. 3" means Article 12 of Senate Bill 3, 80th Regular Session, 2007, of the Texas Legislature and Article 2 of House Bill 3, 80th Regular Session, 2007, of the Texas Legislature. The Articles amend the Edwards Aquifer Authority Act ("Act"), Chapter 626, Acts of the 73rd Legislature, Regular Session, 1993. Section 1.26A of the Act provides for the development of a recovery implementation program. Senate Bill 3 and House Bill 3 contain identical relevant provisions.

"Secretary" means the member of the Stakeholder Committee, Subcommittee, Work Group, or Issue Team who is elected to serve as secretary of the group. Unless another group is indicated, "Secretary" refers to the Stakeholder Committee Secretary, who has the duties provided in Subsection 6.4.

"Section" means a section of these Rules, unless the term is part of a reference to a section of the FMA.

"Special Circumstances," for purposes of Subsection 7.15, and subparts thereof, means unusual circumstances that make it unreasonably difficult, unreasonably risky, or unreasonably burdensome to hold an in-person meeting. The COVID-19 outbreak is an example of Special Circumstances.

"Sponsor" means a state agency, political subdivision of the state, governmental entity, public utility, a Stakeholder association or group, or other entity authorized in the FMA to be represented through the designation of a representative to serve as a Member of the Stakeholder Committee. The term Sponsor includes an entity authorized to designate a representative of a specified Stakeholder class as a Member of the Stakeholder Committee.

"Stakeholder" means an individual or group that has an interest in the protection of the species listed in the EAHCP as covered species or the management of the San Antonio Segment of the Edwards (Balcones Fault Zone) Aquifer, or both.

"*Stakeholder Committee*" means the committee established pursuant to Subsection 7.8.1 of the FMA to take certain actions and provide input into operations and decisions under the EAHCP Program.

"Subcommittee" means any Subcommittee established by the Stakeholder Committee, unless the context indicates the term is used to mean all Subcommittees.

"Subsection" means a subsection of these Rules, unless the term is used as part of a reference to a subsection of the FMA.

"Subpart" means a separately numbered portion of a Subsection.

"Tier 1 Decision" means one of the Stakeholder Committee decisions enumerated immediately below:

(a) Recommendations to the Implementing Committee, the Program Manager, or one or more members of the Implementing Committee on a proposed Routine AMP Decision, proposed Nonroutine AMP Decision or proposed Strategic AMP Decision, as those terms are used in the FMA;

(b) Membership, responsibilities, and procedures of subcommittees;

(c) Adjusting the decision process of the Stakeholder Committee for an individual decision without amending the Rules when such an adjustment is authorized under the terms of Subsection 7.13;

(d) Adoption or amendment of Program Operational Rules;

(e) Appointments to the Science Committee;

(f) Recommendations to the Program Manager or the Implementing Committee on the design of studies related to the Biological Goals or the Biological Objectives;

(g) Recommendation of an organization to establish the Science Review Panel in the event that the National Academies of the National Academy of Science is not retained for that function pursuant to Section 7.10 of the FMA; and

(h) Any significant action determined by the Stakeholder Committee to require Tier 1 decision-making.

"USFWS" means the United States Fish and Wildlife Service.

"**Vacancy**" or "**Vacated**" means a position on the Stakeholder Committee for a particular entity or class listed in Subsection 7.8.1 of the FMA that, because of the applicability of one of the conditions listed in Subsection 5.5, is not then active on the Stakeholder Committee.

"Vice Chair" means the member of the Stakeholder Committee, Subcommittee, Work Group, or Issue Team who is elected to serve as Vice Chair of the group. Unless another group is indicated, "Vice Chair" refers to the Stakeholder Committee Vice Chair, who has the duties provided in Subsection 6.3.

"Virtual Means" is defined as communication undertaken using internet-based conferencing services, phone-based call services with or without video components, and combinations of both.

"*Virtual Meeting*" means a meeting in which some or all Members, or members, participate via Virtual Means rather than in person.

"Work Group" means a specific ad hoc work group of Members, which may also include Participants, established under Subsection 8.11.

SECTION 4. PARTICIPATION IN THE EAHCP.

4.1. Participants.

4.1.1. Any individual Stakeholder, including a representative of a class or group, who participates in activities of the Stakeholder Committee and provides information for receiving communications from EAHCP staff is considered to be a Participant in the EACHP Program.

4.1.2. Each Participant is subject to the procedural requirements of these Rules.

SECTION 5. ORGANIZATION OF THE STAKEHOLDER COMMITTEE.

The Stakeholder Committee is organized as provided in this Section 5.

5.1. Composition of the Stakeholder Committee. The Members of the Stakeholder Committee shall be those persons designated to represent the Sponsors listed in, or identified pursuant to, Subsection 7.8.1 of the FMA. Nothing in this provision shall be construed to prevent an organization from withdrawing from representation on the Stakeholder Committee.

5.2. Alternate Members. The Program Manager will request each Sponsor and Member to ensure an Alternate Member is designated in writing to act for the Member in the event of the Member's temporary unavailability. In the absence of a written communication to the Program Manager from the relevant Sponsor indicating otherwise, an Alternate Member identified by a Member in a written communication to the Program Manager is presumed to be a validly designated alternate for the Member. In the case of inconsistency in designations, the Sponsor's designation will control. An Alternate Member may act at any given time, in a meeting or otherwise, on behalf of only one Sponsor or only one Member and may not act on any matter at the same time as the Member the Alternate Member is designated to temporarily replace; provided that an Alternate Member may participate in EAHCP Program discussions in which such Member also participates.

5.3. Replacement of a Member. If a Member resigns or becomes unavailable to participate in meetings for a period reasonably expected to include three or more consecutive meetings, the Program Manager will request the Sponsor indicated in Subsection 7.8.1 of the FMA for the specific position at issue to designate in writing a person to replace the Member. After the effective date of the resignation or removal of a Member, the designated Alternate Member may continue to serve as the Alternate Member for up to three consecutive meetings unless, prior to that time, the position on the Stakeholder Committee becomes Vacated pursuant to Subsection 5.5 or the Sponsor designates the Alternate Member as the new Member, designates a different new Member and Alternate Member, or notifies the Program Manager that the Alternate Member is not authorized to continue in that capacity. If the Sponsor designates someone other than the Alternate Member as the new Member, the Sponsor may designate the Alternate Member to continue to serve in that capacity.

5.4. Lack of Participation of Members and Alternates and Forfeiture. A Member absent from three consecutive meetings, without attendance of a designated Alternate Member, automatically forfeits status as a representative of an entity or class on the Stakeholder Committee, and the Program Manager will request the Sponsor to designate in writing a person to replace the Member. Forfeiture under this Subsection becomes effective for both the Member and the Alternate Member upon written notification of forfeiture to the Sponsor by the Program

Manager. To help Members avoid membership forfeiture, the Secretary shall work with the Program Manager to provide prompt notice to the Member, the Alternate Member, and the Chair, after two such consecutive absences. If the person who served as the Alternate Member is named by the Sponsor to replace the Member whose position was forfeited, the Program Manager will request written designation of a new Alternate Member.

5.5. Vacated Position on Stakeholder Committee. A position of an entity or class on the Stakeholder Committee shall be Vacated or deemed Vacated when one of the following occurs:

5.5.1. a Member or Sponsor notifies the Program Manager in writing that the Sponsor has withdrawn from participation on the Stakeholder Committee; or

5.5.2. a Sponsor has not designated a person to replace a Member who resigns, forfeits status as a representative pursuant to Subsection 5.4 for non-attendance, or is removed by the Sponsor within 90 days after the removal or 90 days after the Sponsor is notified in writing by the Program Manager of the resignation or forfeiture (if the Sponsor charged with designating a person is the EAA or the Stakeholder Committee, the period for action to avoid a Vacancy extends until the end of the second meeting of the EAA Board or the Stakeholder Committee, whichever is relevant, following notification of the resignation, notification of forfeiture, or the decision to remove the Member); or

5.5.3. a Sponsor notifies the Program Manager in writing that the Sponsor is unable or unwilling to designate a Member.

5.5.4 For purposes of Subpart 5.5.2, notification of resignation or forfeiture to a Sponsor is effective on the date the written notification from the Program Manager is sent to the Sponsor or, if a resignation has a delayed effective date, on the later of the date the notification from the Program Manager is sent or the date that the resignation is effective.

5.6. Notice of Vacated Position or Curing of Vacancy. The Program Manager will provide notice to the Stakeholder Committee when a position is Vacated or a Vacancy is cured consistent with the FMA and these Rules. Consistent with the FMA, a Vacancy may be cured by action of the Sponsor.

SECTION 6. STAKEHOLDER COMMITTEE GOVERNANCE.

6.1. Election of Officers. The Stakeholder Committee will elect from among its Members a Chair, Vice Chair, a Secretary, and other officers as may be desired. Election of any officer requires an affirmative vote of 75 percent of the entire Stakeholder Committee. Absent extenuating circumstances, the regular election of officers shall occur during the last meeting of a calendar year. An officer may participate in discussions of Tier 1 Decisions and Non-Tier 1 Decisions and may vote on any such decisions. Although not an enforceable requirement, the Stakeholder Committee should strive to achieve a change in Members holding officer positions on a regular basis to provide the opportunity for officers to represent diverse stakeholder interests if such a change can be achieved consistent with ensuring efficient implementation of the responsibilities and duties of the Committee.

6.2. Duties of the Chair. The Chair will have the following duties:

6.2.1. coordinate with the Program Manager and Members of the Stakeholder Committee the scheduling of Stakeholder Committee meetings;

6.2.2. coordinate with the Program Manager and Members of the Stakeholder Committee the development of an agenda for each Stakeholder Committee meeting;

6.2.3 preside over Stakeholder Committee meetings in a manner that encourages Consensus-based decision-making, full participation, full and open discussion to allow expression of all points of view, and consideration of alternative proposals for resolving controversial issues;

6.2.4. work with the Program Manager to arrange for the facilitation of discussions of Tier-1 Decisions;

6.2.5. facilitate discussion of agenda items either personally or by requesting the Program Manager or a Facilitator to facilitate such discussion;

6.2.6. provide leadership of the Stakeholder Committee;

6.2.7. perform in a representative capacity for the Stakeholder Committee as requested by the Stakeholder Committee; and

6.2.8. meet, in coordination with and after notice to the Program Manager, with elected and appointed officials and other persons on matters related to the EAHCP Program, and if the Chair and Program Manager determine it is in the interest of the EAHCP Program to do so, include other Participants in such meetings;

6.2.9. communicate to Participants information relevant to Stakeholder Committee decisions; and

6.2.10. other duties as requested by the Stakeholder Committee.

6.3. Duties of the Vice Chair. In addition to the duties listed in Subsections 7.3 and 7.15, the Vice Chair will exercise the duties of the Chair in the event of the unavailability of the Chair.

6.4. Duties of the Secretary. The Secretary will oversee the taking of the roll at Stakeholder Committee meetings, preparation of minutes of Stakeholder Committee meetings, and will coordinate with the Program Manager on the management of records of the Stakeholder Committee. The Secretary will exercise the duties of the Chair in the event of the unavailability of both the Chair and the Vice Chair and the duties of the Vice Chair listed in Subsections 7.3 and 7.15 if the Vice Chair is not available to perform those duties or is exercising the duties of the Chair.

6.5. Duties of other Officers and Designation of Alternate Presiding Officer. The election of and duties of other Stakeholder Committee officers will be determined by the Stakeholder Committee from time to time. In the event that the Chair, Vice Chair, and Secretary are all unavailable to preside at a meeting, the Stakeholder Committee may, by Consensus, name one of its Members as an alternate presiding officer to fulfill the duties of the Chair during that meeting.

6.6. Terms of Office for Officers. Except as otherwise provided in this Subsection or Subsection 6.8, each officer shall serve a term not longer than one calendar year, commencing on

the first day of the calendar year following the date of election if the election is held at the last meeting during a calendar year or commencing immediately upon election if the election is held at a different time or is held to fill an open position pursuant to Subsection 6.8 and ending on the last day of the calendar year in which the term commences. Unless he or she has resigned, is unable to continue to serve, or has been removed from office, an officer's term shall continue until a replacement is named. A Member may be elected to an office for any number of additional one-year terms.

6.7. Removal of Officer. An officer subject to a vote of confidence requested as provided in Subpart 7.3.4 must receive, at the first meeting for which there is a quorum following the submission of a request for vote of confidence in compliance with Subpart 7.3.4, an affirmative vote of confidence from at least 75 percent of the entire Stakeholder Committee to continue in office or is otherwise immediately removed.

6.8. Election of Replacement Officer. The Stakeholder Committee will elect by affirmative vote of 75 percent of the entire Stakeholder Committee a Member as replacement officer to complete any unexpired portion of a term of any officer who resigns, is unable to complete a term, or is removed from office.

SECTION 7. CONDUCT OF MEETINGS.

7.1 Open Meetings. All meetings of the Stakeholder Committee and any Subcommittee, Issue Team, or Work Group will be held in, or near, the Edwards Aquifer region at meeting locations to be determined or through Virtual Means as provided in Subsection 7.15. The meetings will be open to the public and, except as provided in Subsection 7.15, held in facilities that can accommodate members of the public who may wish to attend. All or part of a Stakeholder Committee meeting may be closed, so that only Members and, if appropriate, key EAHCP Program staff may attend and participate in a discussion, if such closing is required by law or if, upon the request of two or more Members or the Program Manager, at least 75 percent of the entire membership of the Stakeholder Committee determines there is good cause to close that portion of the meeting.

7.2. Notices. Notices of meetings of the Stakeholder Committee, and any Subcommittee and Work Group, and the agendas for such meetings, will be posted on the EAA website at least six calendar days prior to the meeting. The meeting notice and agenda will also be distributed by email to the email list maintained by the EAHCP Program staff, which will include email addresses for Stakeholder Committee Members, Alternate Members, and Participants who have provided email addresses, at least six calendar days prior to the meeting. Notices of any Issue Team meeting set pursuant to Subsection 7.8 that is not held as part of a Stakeholder Committee meeting will be posted on the EAA website and distributed by email to the email list maintained by the EAHCP Program staff at least 72 hours prior to any meeting. Notices of any closed meetings will be posted in accordance with the requirements of this Subsection.

7.3. Agenda. The Chair, Vice-Chair, and Program Manager, after consideration of discussion among and input from Stakeholders, will develop an agenda for each scheduled Stakeholder Committee meeting as provided in this Subsection.

> **7.3.1.** The agenda will identify each matter or item, including each Tier 1 Decision, Expedited Tier 1 Decision, and Non-Tier 1 Decision, which the Stakeholder Committee may discuss or consider for action, and will identify any matter or item that it is

anticipated the Stakeholder Committee will consider in a closed meeting pursuant to Subsection 7.1.

7.3.2. The Chair, Vice-Chair, and Program Manager may, at their joint discretion, place an item on the agenda for discussion at the next meeting pursuant to a written request from any Member or Participant received by the Program Manager by mail or email at least eight days prior to the meeting.

7.3.3. The Chair, Vice-Chair, and Program Manager shall place any item on the agenda for discussion at the next Stakeholder Committee meeting if a written request is made by at least three Members and received by the Program Manager by mail or email at least eight days prior to the meeting or if so requested by a majority of the entire Stakeholder Committee at a prior meeting.

7.3.4. If written request for a vote of confidence with respect to one or more officers is made by at least 20 percent of the Members and received by the Program Manager by mail or email at least eight days prior to a Stakeholder Committee meeting, the Chair and Program Manager shall place on the agenda for action at that meeting:

(a) a vote of confidence, to be held as provided in Subsection 6.7, and

(b) the possible election of a replacement officer, to be held as provided in Subsection 6.8 in the event such replacement is needed.

7.4. Quorum. A Stakeholder Committee decision shall be made only at a meeting noticed pursuant to Subsection 7.2 above. Seventy-five percent of the entire Stakeholder Committee membership will constitute a quorum for a meeting of the Stakeholder Committee. Members will make best efforts to attend all Stakeholder Committee meetings, either in person, via Virtual Means, or through a designated Alternate Member, and will act in good faith in participating in the activities of the EAHCP Program. In the absence of a quorum, the Stakeholder Committee may move forward with discussion items but may not make decisions or take any official action.

7.5. Meeting Rules of Order. To the extent not inconsistent with these Rules, the Stakeholder Committee will follow Roberts Rules of Order, in a current edition approved by the Stakeholder Committee from time to time, for the conduct of its meetings. The rules of order may be temporarily suspended at any time by an affirmative vote of a majority of the Stakeholder Committee upon determining that suspension will facilitate discussion, deliberation, and Consensus by Participants. Failure to follow these Rules is not intended to constitute grounds for a challenge of an action or decision. The Chair may request the Program Manager to provide guidance on the interpretation of any rule of order, any of these Rules, any provision of the FMA, or applicable law with respect to the conduct of any meeting.

7.6. Consideration of Items. The Chair will request approval, by Consensus or, in the absence of Consensus, by affirmative vote of the majority of the entire Stakeholder Committee membership, of the order of the agenda as the first item of business at each Stakeholder Committee meeting, and will introduce items for consideration at each such meeting in the order of the agenda unless the Stakeholder Committee, by Consensus or, in the absence of Consensus, by majority vote of the entire membership, approves a different order or approves postponing consideration of an item to a subsequent meeting. If, at a meeting, a Member or Participant inquires about an item not on the agenda, any responsive discussion about such an item must be

limited to a proposal to place the subject on a future agenda, a statement of factual information, or a recitation of existing policy.

7.7. Consensus-based Decisions. In compliance with the spirit of S.B. 3 and the FMA, the goal of the Steering Committee is that all decisions will be made by Consensus. The process for Consensus-based decision making on all Stakeholder Committee decisions will be as provided in this Subsection 7.7 and Subsections 7.8 and 7.9.

7.7.1. Appointment of Facilitator. A Facilitator may be appointed to facilitate the discussion of and attempt to reach Consensus on any proposed Stakeholder Committee decision, and, upon the request of any Member, shall be appointed to facilitate the discussion of and attempt to reach Consensus on any proposed Tier 1 Decision. In order to be appointed as Facilitator for a particular decision, a person must be approved by an affirmative vote of at least 75 percent of the entire Stakeholder Committee, upon recommendation of the Program Manager or any Member. If a Facilitator is not appointed, the discussion of and attempt to reach Consensus on the decision may be led by the Chair.

7.7.2. Discussion Generally. In any discussion of Tier 1 and Non-Tier 1 Decisions, the Chair or Facilitator will encourage Members to reach Consensus on the proposed decision. All points of view will be given full and fair review and consideration. The Chair or Facilitator will invite Participants and Members to comment and voice opinions and, if appropriate, to direct questions and requests for clarification to other Participants and Members in the attempt to reach Consensus on the proposed decision. The Chair or Facilitator will encourage commenters to speak to the topic at hand and avoid irrelevant comments, may limit individual comments to a reasonable length of time, and will exercise reasonable judgment in calling an end to discussion and assessing Consensus approval of the proposed decision after the topic has received full review.

7.7.3. Discussion and Consensus on Tier 1 Decisions. The Facilitator for any Tier 1 Decision will facilitate the discussion as provided in Subpart 7.7.2 and this Subpart. Unless Consensus is reached in less than an hour, the time for discussion of each proposed Tier 1 Decision will ordinarily be between one and two hours. The Facilitator will extend the discussion period, if needed, to allow full comment on the range of Stakeholder views and for the Stakeholder Committee to attempt to reach Consensus on the proposed decision. The Facilitator may call a temporary recess to allow Participants and Members to caucus in Stakeholder groups or may continue the discussion to the next Stakeholder Committee meeting. At the conclusion of discussion of a proposed Tier 1 Decision, the Facilitator will determine if the Stakeholder Committee has reached Consensus by inquiring if there is objection. If the Stakeholder Committee indicates, by the absence of objection after fair notice and opportunity, it has reached Consensus on the proposed Tier 1 Decision, that Consensus will be recorded as the action of the Stakeholder Committee on the decision. If the Stakeholder Committee indicates it has not reached Consensus on the proposed Tier 1 Decision, the Facilitator will proceed as provided in Subsection 7.8. If a Facilitator is not appointed, the Chair may take the actions otherwise assigned to the Facilitator pursuant to this Subpart.

7.8. Tier 1 Decision-Making in Absence of Initial Consensus. If, after following the procedures of Subpart 7.7.3, the Stakeholder Committee has not reached Consensus on any Tier 1 Decision, an Issue Team will be appointed to further deliberate and develop the Tier 1 Decision. Each Issue Team will be comprised of between three and nine persons, which may include

Participants in addition to Members. The members of each Issue Team will be nominated by the Facilitator, or by the Chair if there is no Facilitator, and approved by at least 75 percent vote of the entire Stakeholder Committee and must be representative of the full range of views on the proposed Tier 1 Decision. The Issue Team will be assigned a title to indicate the assigned Tier 1 Decision, and will proceed as provided in this Subsection. Except in the case of an Expedited Tier 1 Decision, the Facilitator, or in the absence thereof the Chair, may also nominate, and the Stakeholder Committee may approve, by 75 percent vote of the entire membership, one or more alternates to take the place of any Issue Team member who is unable to serve.

7.8.1. Initial Issue Team Action. The Issue Team may, and in the case of an Expedited Tier 1 Decision shall, convene initially during a recess of the Stakeholder Committee meeting at which Team members are appointed. No notice beyond an oral announcement in the Stakeholder Committee meeting shall be required for such an initial meeting. Unless the Stakeholder Committee has appointed a Team Chair, the Issue Team will elect, by affirmative vote of 75 percent of its membership, a Team Chair from among its Members and attempt to reach a Consensus on the decision or to restate the proposed Tier 1 Decision for reconsideration by the Stakeholder Committee at that meeting.

(a) In the case of consideration of an Expedited Tier 1 Decision, regardless of the outcome of the Issue Team meeting, the Team Chair shall orally report to the Stakeholder Committee on the outcome of the meeting and any Consensus reached. If Consensus is not reached, any member of the Issue Team shall be entitled to present a succinct summary of his or her position and perspective on the deliberations of the Issue Team.

(b) In the case of any Tier 1 Decision that is not an Expedited Tier 1 Decision, if unable to meet or to reach such Consensus during a recess of the Stakeholder Committee meeting, the Issue Team shall convene one or more separate meetings.

7.8.2. Separate Meetings. Except in the case of consideration of an Expedited Tier 1 Decision, the Issue Team shall convene separate meetings, as often as necessary, to fully discuss the Tier 1 Decision and to attempt in good faith to reach Consensus on the decision originally proposed or on a restated version. Each such Issue Team meeting will be noticed as provided in Subsection 7.2. The quorum for each meeting is 75 percent of the Team members.

7.8.3. **Issue Team Report.** Except in the case of consideration of an Expedited Tier 1 Decision, following the final separate meeting, the Team Chair will submit to the Facilitator, or in the absence thereof the Chair, a written report stating one of the following:

(a) the Team Consensus on the proposed decision;

(b) the Team Consensus on a restatement of the proposed decision; or

(c) a summary of the full range of views discussed and the reasons the Team could not reach Consensus on the proposed decision or on a restatement of the proposed decision.

Any members of the Issue Team who disagree with the report may so declare at the final meeting of the Team and may attach one or more minority reports to the Team Chair's report. The Team Chair's report, including any minority report, will be submitted as soon as practicable, and in any event not more than 20 days after the Issue Team is first appointed, unless by affirmative vote of 75 percent of the entire membership of the Stakeholder Committee a different deadline has been established. The report, and consideration of any action on the report, will be placed on the agenda of the next Stakeholder Committee meeting.

7.8.4. Stakeholder Committee Consideration of Consensus by Issue Team. If the Team Chair reports that the Issue Team has reached Consensus on the decision as originally proposed or on a restated version of the decision, the Stakeholder Committee will, after discussing the Issue Team report, determine if the Stakeholder Committee can reach Consensus on the initial or restated decision. If Consensus is not reached in a reasonable period of time, the approval process in Subpart 7.8.6 shall be followed.

7.8.5. Stakeholder Committee Consideration of No Consensus by Issue Team. If the Issue Team reports that it is unable to reach Consensus on a proposed decision or restated decision to propose to the Stakeholder Committee for consideration, the Stakeholder Committee, by majority vote of the entire membership, may

(a) allow further discussion in an attempt to reach Consensus;

(b) call for the vote provided for in Subpart 7.8.6;

(c) resubmit the proposed decision or a variation of that decision to the Issue Team for further consideration; or

(d) except for Expedited Tier 1 Decisions, submit the proposed decision or a variation of that decision to a new Issue Team.

7.8.6. Tier 1 Decision Vote. A Tier 1 Decision that has been submitted to the Issue Team process, but after completion of that process still has not been approved by Consensus of the Stakeholder Committee, shall be considered approved if it receives the affirmative vote of 75 percent of the Members of the entire Stakeholder Committee. Because the primary role of the Stakeholder Committee is to provide recommendations to the Implementing Committee, this vote total is necessary to avoid providing the Implementing Committee members, all of whom are represented on the Stakeholder Committee, a combined number of votes sufficient to unilaterally block a Stakeholder Committee recommendation. The vote total also reflects the requirements of the FMA and the desire to reflect a strong endorsement across different interest groups while also minimizing the likelihood of a stalemate in making a Stakeholder Committee recommendation. It is the intent of the Stakeholder Committee to revisit the affirmative vote percentage requirement periodically in order to maintain an affirmative vote total that serves these goals as, and if, interest groups withdraw from membership on the Stakeholder Committee.

7.8.7. Reconsideration of Tier 1 Decision. If a Tier 1 Decision that has been submitted to the Issue Team process is voted upon pursuant to Subpart 7.8.6 and is not approved, the Stakeholder Committee, by majority vote of the entire membership, may assign a revised version to the Issue Team using the procedures provided in Subparts

7.8.1 through this Subpart 7.8.7 either at the same meeting or, if not considering an Expedited Tier 1 Decision, at a subsequent meeting.

7.8.8. Eligibility for Expedited Tier 1 Decision Status. Only a matter jointly identified by the Program Manager and Chair as an Expedited Tier 1 Decision and indicated as such on the Stakeholder Committee meeting agenda shall be subject to the procedural constraints applicable to Expedited Tier 1 Decisions. A recommendation on a Nonroutine AMP Decision or a Strategic AMP Decision, as those terms are defined in the FMA, is not eligible for identification as an Expedited Tier 1 Decision.

7.9. Non-Tier 1 Decision. A Non-Tier 1 Decision will be considered and discussed consistent with the provisions of Subparts 7.7.1 and 7.7.2. At the conclusion of discussion of a Non-Tier 1 Decision, the Chair will determine if the Stakeholder Committee has reached Consensus by requesting a showing of objection. If Consensus has not been reached, a Non-Tier 1 Decision will be decided by majority vote of the entire Stakeholder Committee if it does not involve a recommendation to the Program Manager or the Implementing Committee. In the absence of Consensus, a recommendation to the Program Manager or the Implementing Committee may be approved only by an affirmative vote of at least 75 percent of the Stakeholder Committee.

7.10. Manner of Voting. For any decision or action that requires a vote, the Stakeholder Committee will vote by show of hands of the Members or, for Virtual Meetings, a comparable method that indicates the vote of each Member. The number of ayes and nays for each vote at a meeting will be noted in the minutes for the meeting. Upon request by any Member, a roll call of votes shall be taken and the results of the roll call shall be noted in the minutes for the meeting.

7.11. Effect of Abstention. The abstention of any Member does not affect the number of Members required for determining if a quorum is present and the person or persons abstaining shall be counted as being present for that purpose. The abstention of any Member does not affect the ability to determine if Consensus has been achieved because the Member abstaining is not considered to have stated an objection to the matter being considered. The abstention of any Member does not affect the number of votes needed to determine if an action is approved in the absence of Consensus, and the number of affirmative votes needed for approval shall be determined based on the entire membership of the voting body, including any abstaining Member.

7.12. Determination of Quorum. In determining the presence of a quorum at a meeting, any Alternate Member temporarily replacing a Member shall be included in all calculations, but any position that is then Vacated shall not be included in calculating the number required for achieving a quorum or for approving an action. Similarly, any position that is temporarily unfilled because both the Member and Alternate Member have resigned or been removed by the Sponsor, the Member has resigned or been removed by the Sponsor and there is no designated Alternate Member, or membership has been forfeited as provided in Subsection 5.4, but for which the conditions for Vacating the position have not been met, shall not be included in calculating the number required for achieving a quorum or for approving an action. Unless these Rules provide otherwise, a person must be physically present to be counted in determining the presence of a quorum.

7.13. Special Procedures for Individual Decisions. The Stakeholder Committee may, as an Expedited Tier 1 Decision, establish by resolution specific procedures, consistent with the requirements of the FMA, governing the Tier 1 Decision process for an individual decision.

Those procedures may depart from the requirements of these Rules to the extent such departures are essential to address unavoidable time constraints that would otherwise prevent the Stakeholder Committee from making a decision by the applicable deadline.

7.14. Meeting Minutes. Written minutes of each Stakeholder Committee shall be posted on the EAA website. As soon as practicable after each meeting, EAHCP Program staff will work with the Secretary to prepare a written draft of the meeting minutes. EAHCP Program staff shall post, not later than two weeks after a Stakeholder Committee meeting, the draft minutes, which shall be prominently identified as being in draft form, on the EAA website along with the agenda and other materials for the meeting. The draft minutes will be presented for approval by the Stakeholder Committee at its next meeting and, within two weeks of approval, a final version of the minutes will be posted in place of the draft minutes.

7.15 Virtual Meetings. As determined necessary to address Special Circumstances, the Stakeholder Committee, and any Subcommittee, Issue Team, or Work Group, may hold meetings entirely or partially via Virtual Means. Any such determination of necessity requires unanimous concurrence of the Program Manager and the Chair, as well as the Vice Chair if there is a Vice Chair, of the Committee, Subcommittee, Issue Team, or Work Group. Notwithstanding other provisions of these Rules, such meetings may be held with all Members, or members, participating through Virtual Means or through some combination of in-person and Virtual Means that meets the requirements of Subpart 7.15.4.

7.15.1. Ratification of Prior Actions. Actions taken in meetings held entirely via Virtual Means in response to the COVID 19 virus prior to the effective date of Subsection 7.15 may be fully ratified by the Stakeholder Committee, acting through the Tier 1 decision process at a meeting held after the effective date of this provision. Such ratification shall have the effect of curing any procedural deficiencies associated with relying on Virtual Means for holding such meetings and taking such actions.

7.15.2. Partial Virtual Meetings. In addition to holding Virtual Meetings upon a determination of the necessity to address Special Circumstances, the Stakeholder Committee and any Subcommittee or Work Group may hold meetings with some Members, or members, participating via Virtual Means. For Virtual Meetings of the Stakeholder Committee held without a determination of necessity to address Special Circumstances, a majority of the Members of the Stakeholder Committee must attend in person unless there are no action items other than approval of minutes of previous meetings or unless, for each action item other than approval of minutes, all Members participating in the meeting agree to waive the requirement for a majority of the full Committee to participate in person. In the absence of such agreement for an individual action item, the meeting may continue but no action shall be taken on the item.

7.15.3. Virtual Meeting or Action for Subcommittees, Work Groups, or Issue Teams in Absence of Special Circumstances. In the absence of objection from any member, a Subcommittee or Work Group may hold meetings with all members participating via Virtual Means without a determination of the necessity to address Special Circumstances. In addition, in the absence of objection from any member, a Subcommittee, Issue Team, or Work Group may poll its members via email, without convening a meeting, to formalize agreement on the final language of a report, the substance of which was agreed-upon in a previous meeting, or to approve meeting minutes.

7.15.4. Participation Requirements for Virtual Meetings. To the extent reasonable under the circumstances, Members, or members, participating in a Virtual Meeting must be provided the opportunity to hear and see the other Members, or members, participating in the meeting and the public must be accorded reasonable opportunities for participation in a manner that allows the participants from the public to hear the Members, or members, and to be heard during public comment opportunities.

(a) Neither limitations on connectivity for individual Members, members, or participants from the public nor unintentional limitations or disruptions in connectivity that result in some Members, members, or participants communicating solely by phone or in some Members, members, or participants losing connection for portions of a meeting are, alone, sufficient to represent an impairment of the reasonable opportunity for participation. However, if such limitations or disruptions are known to occur, participating Members, or members, must be accorded a reasonable opportunity to provide input and indicate a position before a final decision is made on any action item.

(b) Quorum requirements must be met at the time of action on any individual action item and only Members, or members, able to be heard and to hear other Members, or members, at that time may be counted towards meeting those requirements.

(c) If technical difficulties arise during a Virtual Meeting, the meeting may be recessed temporarily, for a specified period of up to two hours, while those difficulties are addressed.

SECTION 8. SUBCOMMITTEES AND WORK GROUPS.

8.1 Appointment of Subcommittees and Work Groups. The Stakeholder Committee may appoint Subcommittees and Work Groups as provided in this Section 8. The appointment of members of and determination of a charge to any Subcommittee is a Tier 1 Decision. The appointment of members of and determination of a charge to a Work Group may be proposed by the Chair or Program Manager and made upon the approval of a majority of the Members of the entire Stakeholder Committee. In approving appointments, the Stakeholder Committee shall strive to ensure that the membership of a Subcommittee or a Work Group, to the extent relevant to the charge to the group, represents the diversity of interests of Members and Participants. The members of any Subcommittee may include Stakeholder Committee Members and Participants. The members of Subcommittees may be nominated by the Chair and Program Manager and shall be appointed by the Stakeholder Committee pursuant to the requirements of Subsections 7.7 and 7.8. Any such Subcommittee will operate as provided in these Rules, unless the Stakeholder Committee approves, as a Tier 1 Decision, other specific operational procedures for the Subcommittee, which will supersede any inconsistent provision in these Rules.

8.2. Quorum for Subcommittee Meetings. Seventy-five percent of the members of the Subcommittee shall constitute a quorum for any meeting of a Subcommittee at which the Subcommittee will make a decision on a recommendation to the Stakeholder Committee in response to a specific charge from the Stakeholder Committee. For any other meeting of a Subcommittee, 51 percent of the members shall constitute a quorum.

8.3. Reports of Subcommittees. Each Subcommittee shall operate on a Consensus basis to the maximum extent possible. In the event that Consensus of the members cannot be obtained on all or any part of any report, evaluation, or recommendation to the Stakeholder Committee, the Subcommittee shall prepare its report, evaluation, or recommendation and identify those parts, if less than all, on which Consensus has been reached, identify those parts on which Consensus has not been reached, explain why Consensus was not reached, and indicate the votes of individual members of the Subcommittee. In any recommendation to the Stakeholder Committee, a recommendation of a Subcommittee will have the Consensus-based approval of the

Subcommittee when at least 75 percent of the entire membership of the Subcommittee has voted in favor of the recommendation.

8.4. Terms of Members of Subcommittees. The term of each member of a Subcommittee shall commence on the date of appointment or reappointment and end on the earlier of the date that the Subcommittee ceases to exist or the last day of the calendar year next following the year of the appointment or reappointment. However, any member of a Subcommittee whose term has ended prior to the termination of the Subcommittee shall remain as a member until replaced or reappointed. A person may be reappointed to serve any number of terms on a Subcommittee, and may serve on more than one Subcommittee simultaneously. A person may be appointed by the Stakeholder Committee to serve the unexpired portion of the term of a Subcommittee member who resigns, is removed, or is unavailable to serve.

8.5. Conduct of Subcommittee Meetings; Officers. Except as specifically provided otherwise in these rules or in the written charge to a Subcommittee, all activities and meetings of any Subcommittee shall be governed by applicable definitions in Section 3; by Subsections 2.3, 5.4, 7.1, 7.2, 7.5, 7.10, 7.11, 7.12, and 7.15; and by the provisions of this Section 8. To the extent applicable, any reference in the provisions cited in the preceding sentence to the conduct and activities of the Stakeholder Committee shall be construed also as a reference to the conduct and activities of a Subcommittee and any reference to Member, or Alternate Member shall be construed also as a reference to member or alternate member, respectively. The Stakeholder Committee will give each Subcommittee a written charge and timetable for reporting to the Stakeholder Committee. If the Stakeholder Committee has not appointed a Subcommittee Chair, the Subcommittee will elect a Subcommittee Chair, by affirmative vote of at least 75 percent of the entire membership, from among its members. The Subcommittee Chair will coordinate with the Program Manager to call meetings of the Subcommittee, preside over meetings, and prepare and submit reports to the Stakeholder Committee. Any Subcommittee may, at its discretion, elect from among its members, by affirmative vote of at least 75 percent of the entire membership, a Vice Chair or a Secretary, or both, and assign appropriate responsibilities to such Subcommittee officers. The term of office of each Subcommittee officer, and the replacement of any officer, will be the same as for appointment to the Subcommittee. A Subcommittee may request the Program Manager to designate a Facilitator to assist in its deliberations and attempts to reach Consensus.

8.6. Subcommittee Discussions. The Subcommittee Chair or Facilitator will encourage Subcommittee members to reach Consensus on their recommendations and responses to their charge. The Chair or Facilitator will encourage members and Participants to speak to the topic at hand and avoid irrelevant comments, may limit individual comments to a reasonable length of time, and will exercise reasonable judgment in limiting discussion on a topic to the members of the Subcommittee.

8.7. Work Groups. The Stakeholder Committee may from time-to-time, as a Non-Tier 1 Decision, establish ad hoc Work Groups to consider specific administrative matters, other than Tier 1 Decisions, and request any such Work Group to report its findings and recommendations to the Members and Participants within a specified period of time. Unless the Stakeholder Committee establishes different procedures in the appointment of and charge to any Work Group, the activities, including membership, officers, notice, quorum, and reports of a Work Group will be subject to the provisions in these Rules applicable to a Subcommittee.

8.8. Alternate Members. Each member of a Subcommittee shall submit to the Subcommittee Chair and Program Manager a written designation of an alternate member to act

for the member in the event of the member's temporary unavailability. An alternate member may act at any given time, in a meeting or otherwise, on behalf of only one Sponsor or only one member and may not act on any matter at the same time as the member the alternate member is designated to temporarily replace; provided that an alternate member may participate in Subcommittee discussions in which such member also participates.

SECTION 9. STAKEHOLDER COMMITTEE SUPPORT AND RECORDS

9.1. Stakeholder Committee Support. Consistent with the EAHCP Program budget, the Program Manager will be responsible for arranging staff support for Stakeholder Committee activities.

9.2. Records of Stakeholder Committee Activities. The Program Manager will be responsible for compiling and maintaining the records of Stakeholder Committee activities as part of the EAHCP Program administrative record.

9.3. Stakeholder Committee Budget. To the extent that funds for Stakeholder Committee activities are available from previous funding for the EARIP Steering Committee or become available from another funding source not specifically provided for in the FMA, the Program Manager shall oversee those funds in cooperation with the Stakeholder Committee, pursuant to a budget adopted as a Tier 1 Decision**.** Nothing in this provision grants the Stakeholder Committee control over funds collected pursuant to the FMA.

SECTION 10. AMENDMENT.

10.1. Rule Amendment. These Rules may be amended, supplemented, or superseded by action of the Stakeholder Committee as a Tier 1 Decision. Consideration of the amendment or other change shall be noticed on the posted agenda of a regular Stakeholder Committee meeting, and a written statement of the proposed change and the reason for the change shall be provided to Members and Participants for discussion. Approval of the Rule change by the Stakeholder Committee may be on the agenda of a subsequent meeting, or, if a proposed Rule change is made available for review at the same time as the agenda and is expressly listed as being considered for adoption on the agenda of the meeting for which it is first presented for discussion and if no Member objects to taking action at that meeting, the Stakeholder Committee can take action on the Rule change during the same meeting at which the proposed text is first discussed. The text of the approved rules shall be included with the minutes of the meeting at which adoption of any rule change occurred and shall be posted on the EAA website.

10.2. Effective date of change. Unless a later effective date is noted at the time of adoption, any change to these Rules will be effective upon the date of its approval by the Stakeholder Committee.

Appendix M5 | **Science Committee Vacancy Work Group Meeting Materials**

Edwards Aquifer Habitat Conservation Plan

Report of the Science Committee Vacancy Work Group

July 1, 2022

Overview

The Edwards Aquifer Habitat Conservation Plan (EAHCP) Program Adaptive Management Stakeholder Committee (SH) approved creation of the Science Committee Vacancy Work Group at their March 24, 2022, Committee meeting. The work group was created to respond to two vacancies in the Adaptive Management Science Committee (SC). The SC is comprised of members who have technical expertise in the Edwards Aquifer, the Comal or San Marcos springs systems, or the Covered Species (EAHCP Funding and Management Agreement § 7.9). The EAHCP Implementing Committee (IC) and SH select an equal number of members of the SC and select one additional member jointly.

Three members of the SC stepped down in 2021 and 2022 prompting selection of one IC appointed SC member and two SH appointed SC members. Members of the SC that stepped down were Glenn Longley, Jackie Poole, and Doyle Mosier. Glenn Longley is a retired professor from Texas State University with over 50 years of experience who helped to identify many of the program's Covered Species. Jackie Poole is a botanist specializing in Texas wild-rice who retired from the Texas Parks and Wildlife Department (TPWD). Doyle Mosier is a fish biologist retired from the Lower Colorado River Authority and TPWD. Doyle Mosier was appointed by the IC and was replaced with Nathan Bendik at the March 24, 2022, IC meeting. Nathan Bendik is a salamander expert at the City of Austin. Other current members of the SC have expertise in riparian ecology, macroinvertebrates of the spring systems, biological diversity and sustainability, hydrogeology, environmental statistics, and stream ecology.

The SH Chair, Myron Hess, sought recommendations from members beginning in February 2022. Presentations were also made at the April 27, 2022, SC and May 19, 2022, SH meetings where requests were made for member recommendations. A final call for recommendations was made prior to the meeting of the work group, July 1, 2022.

Charge of the Science Committee Vacancy Work Group

The Work Group is charged with reviewing nominations to fill the vacancy, or vacancies, for Stakeholder-Committee-appointed positions on the Science Committee identified during the term of the Work Group and with presenting a recommendation to the Stakeholder Committee for filling each such vacancy. See **Appendix A** Charge of the Science Committee Vacancy Work Group.

Members of the Science Committee Vacancy Work Group

Members of the work group met July 1, 2022, to discuss two nominations submitted for consideration to fill the two SC vacancies. The work group met virtually on Microsoft Teams and operated by consensus. The meeting agenda (**Appendix B**), presentation (**Appendix C**), and meeting minutes (**Appendix D**) are included as referenced. Members of the work group are:

- Colette Barron Bradsby, TPWD and Work Group Chair
- Kimberly Meitzen, Texas State University
- Nathan Pence, Guadeloupe-Blanco River Authority
- Patrick Shriver, San Antonio Water Systems
- James Dodson, City of Victoria

The nominations and a summary of the work group's discussion follows.

Nominations to the Science Committee Vacancy Work Group

The work group received two nominations—Megan Bean, MS and Jason Martina, PhD. Megan Bean is a Senior Scientist and Native Fish Conservation Coordinator with TPWD. See her resume in **Appendix E**. Jason Martina is an Assistant Professor in the Department of Biology at Texas State University. He specializes in aquatic plant biology. See his resume in **Appendix E**.

Discussion of the Science Committee Vacancy Work Group

The work group Chair, Colette Barron Bradsby led the discussion of nominees. Overall members acknowledged the difficulty in finding members to serve on a voluntary basis and were appreciative of the candidates' interest in serving on the Science Committee. Members described what impressed them about the qualifications of both nominees.

Megan Bean's publications, field work, participation on advisory groups, and species experience with fisheries challenged by drought were noted in members' comments about her experience. Jason Martina's academic experience in aquatic vegetation, aquatic invasives, and climate change, as well as his experience on student committees and national research were highlighted. Colette also noted that both nominees work for organizations that support the EAHCP (TPWD and Texas State University) which will support their continued participation.

Recommendations of the Science Committee Vacancy Work Group

The work group recommended, by consensus, both nominations to the Stakeholder Committee—Megan Bean, MS and Jason Martina, PhD.

Appendix A

Science Committee Vacancy Work Group Charge

2022 Science Committee Vacancy Work Group Charge

Background: The Stakeholder Committee and the Implementing Committee each are charged, pursuant to Subsection 7.9.1 of the FMA, with appointing an equal number of members to the Science Committee, with one appointment made jointly. Currently, there is a vacancy, resulting from a resignation, for one of the positions appointed by the Stakeholder Committee. Based on absences, the possibility also exists that another vacancy may develop in the near future.

Work Group Membership:

- **Chair:** Collette Barron-Bradsby
- Kimberly Meitzen
- Nathan Pence
- Patrick Shriver
- James Dodson

Charge: The Work Group is charged with reviewing nominations to fill the vacancy, or vacancies, for Stakeholder-Committee-appointed positions on the Science Committee identified during the term of the Work Group and with presenting a recommendation to the Stakeholder Committee for filling each such vacancy.

Term: The term of membership on the Work Group is initially set to extend until the end of any Stakeholder Committee meeting held on October 13, 2022, but, if the Stakeholder Committee has not taken action to appoint persons to fill all then-vacant Stakeholder-Committee-appointed positions on the Science Committee by the end of that meeting, the term will automatically continue until the end of any Stakeholder Committee meeting held on December 15, 2022.

Procedures: Pursuant to Subsections 8.1 and 8.7 of the Stakeholder Committee Program Operational Rules, the Work Group is authorized to conduct its business and hold meetings, with appropriate notice and opportunity for public input, entirely through virtual communication channels, including, but not limited to, Zoom or Microsoft Teams. For purposes of approving the final text of a Work Group report and/or approving meeting minutes, the Work Group also is authorized to rely solely on email communications or individual conversations, including by phone call, in lieu of a meeting.

Adopted by the EAHCP Stakeholder Committee on March 24, 2022

Appendix B

Science Committee Vacancy Work Group Agenda

Edwards Aquifer Habitat Conservation Plan
Science Committee Vacancy Work Group
Agenda

July 1, 2022
Meeting Starts at 1:00PM

1) Call to Order.

2) Review of the Work Group Charge.

3) Discuss nominations to the Science Committee.

4) Science Committee Vacancy Work Group approval of final nominations to the Science Committee.

5) Discuss Work Group written report and presentation to the Stakeholder Committee.

6) Public comment.

7) Consider future meetings: Stakeholder Committee Meeting – October 13, 2022.

8) Questions.

9) Adjourn.

Appendix C

Science Committee Vacancy Work Group Presentation

Edwards Aquifer Habitat Conservation Plan
Stakeholder Committee
Science Team Vacancy Work Group

Work Group Meeting
July 1, 2022

Charge

- The Work Group is charged with reviewing nominations to fill the vacancy, or vacancies, for Stakeholder-Committee-appointed positions on the Science Committee identified during the term of the Work Group and with presenting a recommendation to the Stakeholder Committee for filling each such vacancy.

Term

- The term of membership on the Work Group is initially set to extend until the end of any Stakeholder Committee meeting held on October 13, 2022, but, if the Stakeholder Committee has not taken action to appoint persons to fill all then-vacant Stakeholder-Committee-appointed positions on the Science Committee by the end of that meeting, the term will automatically continue until the end of any Stakeholder Committee meeting held on December 15, 2022.

Procedures

- Pursuant to Subsections 8.1 and 8.7 of the Stakeholder Committee Program Operational Rules, the Work Group is authorized to conduct its business and hold meetings, with appropriate notice and opportunity for public input, entirely through virtual communication channels, including, but not limited to, Zoom or Microsoft Teams. For purposes of approving the final text of a Work Group report and/or approving meeting minutes, the Work Group also is authorized to rely solely on email communications or individual conversations, including by phone call, in lieu of a meeting.

Funding and Management Agreement

- 7.9.1. Membership on the Science Committee.

The Implementing Committee and the Stakeholder Committee will each select an equal number of members of the Science Committee and will coordinate with one another in making selections in order *to ensure balance and proper coverage of areas of expertise*. The Implementing Committee and the Stakeholder Committee will jointly select one additional member of the Science Committee. In the case of a vacancy on the Science Committee, the committee, or committees, that made the initial appointment for that position will appoint a replacement member.

Funding and Management Agreement

- 7.9.2. Role of the Science Committee.

a. consult with, advise and make recommendations to the Program Manager, the Implementing Committee and the Stakeholder Committee on any AMP Decision upon request;

b. *provide independent and unbiased advice based on their best scientific judgment so that all AMP Decisions will be made consistent with the best scientific and commercial data available*; and

c. participate in the meetings of the Science Review Panel and provide to the Panel such information as requested by that Panel or the Implementing Committee

Funding and Management Agreement

- 7.9.1.a Invitations to Serve

Any person to which the Implementing Committee or the Stakeholder Committee extends an invitation to be a member of the Science Committee will be requested to respond in writing to the Program Manager within 30 days of the date of the invitation advising of the acceptance of the invitation and to provide the invitee's contact information. If an invitee does not timely respond with acceptance, that invitation will be considered declined and another qualified person will be invited to become a member of the Science Committee in the same manner as for the invitation that was declined.

Factors for Selection

- Expertise of existing Science Committee members
- Upcoming Science Committee tasks
- Ability to provide independent unbiased advice

Appendix D

Science Committee Vacancy Work Group Meeting Minutes

Edwards Aquifer Habitat Conservation Plan
Science Committee Vacancy Work Group

Meeting Minutes

July 1, 2022

1) **Call to Order.**
Chair, Colette Barron Bradsby called the meeting to order at 1:05 p.m. All members were present except Nathan Pence. Nathan provided comments to Colette via email. James Dodson joined the meeting at 1:15 p.m. Work group members include Colette Barron Bradsby, Nathan Pence, James Dodson, Kimberly Meitzen, and Patrick Shriver.

2) **Review of the Work Group Charge.**
Colette summarized the work group charge to review nominations to fill two vacancies and to present those recommendations to the Stakeholder Committee. The term of the work group is through December 2022 if for some reason the work group is not able to report back to the Stakeholder Committee at its next meeting in October. She described the procedures of the work group to use whatever means suitable to allow public comment at meetings. The work group is otherwise open in the way they want to communicate and conduct their business. The characteristics they are looking for in members was quoted from the Funding Management Agreement's Role of the Science Committee; they are seeking members to "provide independent and unbiased advice based on their best scientific judgement." Members will not be on the Science Committee until they have been formally invited and have accepted that invitation.

3) **Discuss nominations to the Science Committee.**
Colette then presented the factors for work group members to consider in their selection of nominees. The main factors for selection are to examine them in the context of the expertise of the existing Science Committee members, consider upcoming Science Committee tasks, and their ability to provide independent unbiased advice. She added that the work group members need to face a practical reality that there have been a couple rounds of nomination periods that resulted in two nominations. She acknowledged it is difficult to attract people to positions like those proposed; it is voluntary and on top of their other professional responsibilities.

She then asked if anyone had any questions or comments. There were none.

4) Science Committee Vacancy Work Group approval of final nominations to the Science Committee.

Colette opened the floor for discussion of the nominations in alphabetical order—Megan Bean, MS and Jason Martina, PhD. She noted that members had Megan Bean's CV with her experience, publications, and work experience. (Work group members were also provided with Jason Martina's CV before the meeting.)

Patrick Shriver started the discussion expressing that he liked that she (Megan) had published in her field and indicated that she had found her niche with TPWD. He suggested that Colette may have more to add since they both work at TPWD. Colette said she had only worked briefly with Megan. She did like that Megan has participated in quite a few advisory groups. Those experiences lend well to her participation in the EAHCP Science Committee where members have robust discussions and have to work through decision making. Patrick added that Megan has experience in physical sciences locally.

James Dodson joined the meeting and Colette and Patrick summarized what the group had covered. James then said that he was impressed with the breadth of Megan's field experience. He liked having someone with strong field biology experience.

Colette then reminded folks that the Science Committee had in the past had members from TPWD. She described the institutional value in having a Science Committee member working for TPWD.

Kimberly Meitzen concurred with what had been discussed. She noted Megan's expertise with fishes challenged by drought. In closing the discussion of Megan, Colette echoed what others had said.

Patrick asked to be reminded of the members coming off the committee. Chad Furl reminded members that Jackie Poole and Doyle Mosier had stepped down. He summarized; three members of the Science Committee had stepped down—Glenn Longley, Jackie Poole, and Doyle Mosier. Glenn Longley is a retired professor from Texas State University with over 50 years of experience who helped to identify many of the program's Covered Species. Jackie Poole is a botanist specializing in Texas wild-rice who retired from TPWD. Doyle Mosier is a fish biologist retired from the Lower Colorado River Authority and TPWD. Doyle Mosier was appointed by the Implementing Committee and was replaced with Nathan Bendik at the March 2022, Implementing Committee meeting. Nathan Bendik is a salamander expert at the City of Austin. Current members of the Science Committee have expertise in riparian ecology, macroinvertebrates of the spring systems, biological diversity and sustainability, hydrogeology, environmental statistics, and stream ecology. The remaining areas of expertise Chad was interested in filling were in fisheries and plants.

Colette then turned the discussion to Jason Martina. Kimberly started the discussion with fully supporting his nomination. She indicated that he would bring a lot of expertise because of his experience in aquatic vegetation and aquatic invasives. He also uses a full variety of tools and techniques bringing a lot of advice on adaptive management. She said that she had not worked with him directly but had heard great things about him from colleagues including someone that is actively working with him on grants. He has also served on several committees and is very thoughtful in his reviews of others work and the feedback he provides. Though he hasn't

published work on the Covered Species, she believes his experience will translate well to EAHCP programs.

James expressed his preference for a field biologist but indicated that Jason has the qualifications to fill the position.

Patrick indicated that he really liked his academic experience to support the current phase of the program in that he could support future modeling work. He also mentioned Jason's work on a national level.

Finally, Colette reiterated that his experience with climate change would offer a helpful perspective. She was impressed with his qualifications and had no problems recommending him.

She asked if anyone objected to recommending Jason Martina. There was no response.

She closed the discussion with Nathan's emailed response. He had no objection to either candidate. He thought there was only one vacancy and he liked Dr. Martina's experience in submerged aquatic vegetation.

Colette is comfortable saying from the meeting that the work group had a recommendation to support both candidates.

Kimberly wanted to mention that she reached out to others who could potentially be candidates for future vacancies. She spoke with Jay Banner who has expertise in climate science, climate change and large-scale watershed modeling. He was interested but not able to commit based on his current obligations. There was another suggestion for Ryan McManamey at Baylor. He does a lot of environmental flows work. She wanted to provide this information on these two individuals. She acknowledged that both Jason and Megan had already showed their willingness to serve in their responsiveness to the nomination process.

Colette also noted that it speaks well to their nominations that they both work for organizations that support the EAHCP.

Patrick asked Chad if the nominees meet the needs of the EAHCP moving forward. Chad indicated that they do. The only big gap the group had before going into this process was experience with salamanders. That gap has been filled by Nathan Bendik. Now Chad was hoping to fill the roles of the members that had left—fisheries and plant biology.

5) **Discuss Work Group written report and presentation to the Stakeholder Committee.**
Colette said she was pleased that the group was able to come to consensus and can recommend both nominations to the Stakeholder Committee. She will be working on the report with Program staff. She will send out the report for folks to review at the end of next week. She also let folks know that she is retiring at the end of July and will not be able to make the presentation to the Stakeholder Committee at their October 13 meeting. Kimberly volunteered to make the presentation to the Stakeholder Committee in October; Patrick and James agreed.

6) **Public comment.**
Colette offered an opportunity for public comment. Myron Hess thanked the work group members. He said he appreciated the discussion and said he feels good about the candidates they have.

Patrick thanked Colette for her service.

7) **Adjourn.**
The meeting was adjourned at 1:38 p.m.

Appendix E

Resumes

Megan G. Bean

512-214-3449
megan.bean@tpwd.texas.gov
5103 Junction Highway
Mountain Home, Texas 78058

EDUCATION

2006 - 2008 **MASTER OF SCIENCE**

Biology at Texas State University - San Marcos

2002 - 2006 **BACHELOR OF SCIENCE**

Biology, Minor in Chemistry at Texas State University - San Marcos

EXPERIENCE

MARCH 2022 - PRESENT

Senior Scientist and Native Fish Conservation Coordinator
Texas Parks and Wildlife Department

- Coordinates Native Fish Conservation efforts at TPWD including participation with Species Status Assessments and engagement with USFWS and other partners
- Coordinates the Inland Fisheries State Wildlife Grant Program which addresses research needs for state species of greatest conservation need
- Coordinates Inland Fisheries component of the Texas Conservation Action Plan and updates to state listed and species of greatest conservation need lists

JAN 2012 - FEBRUARY 2022

Watershed and Conservation Ecologist and Native Fish Conservation Coordinator for the Chihuahuan Desert
Texas Parks and Wildlife Department

- Leads regional and international work teams and collaborative partnerships to implement projects, conduct research and monitoring, and engage in science communication to benefit the aquatic and riparian resources
- Develops and implements watershed conservation projects to provide healthy habitats which benefit the natural resources of the state. Work has been statewide but focus has been on the Chihuahuan Desert and Edwards Plateau ecoregions
- Provides technical guidance to landowners, land managers, and other stakeholders in the identification, design, review, planning, and implementation of habitat restoration and land management projects and strategies
- Manages and ensures projects meet budget, regulatory, permitting, and compliance requirements
- Provides outreach and education to landowners, the public, stakeholders, and other conservation professionals
  - Co-manages the Facebook and Instagram pages for the Texas Rivers and Streams accounts
  - Organizes workshops and technical trainings for landowners, the public, and conservation professionals. Co-hosted professional and landowner workshops after the Oasis Pipeline Fire in Junction, Texas

    - Collaborates with TPWD staff, conservation partners, and landowners to establish monitoring protocols and evaluate project effectiveness
    - Manages grants and contracts including State Wildlife Grants, Section 6 Grants, National Fish and Wildlife Foundation Grants, TPWD Aquatic Invasive Species Riparian Restoration contracts, Desert Fish Habitat Partnership contracts, Multistate Conservation Grants, TPWD Landowner Incentive Program contracts, and VPA-HIP River Access and Conservation Areas Contracts
    - Gives presentations and demonstrations to local landowners, conservation groups, and school groups about natural resource conservation and management
    - Assists with the review of Paddling Trail locations and signage
    - Develops materials like the Guide to the Sunfish of Texas
    - Assists other TPWD with the development and design of outreach and educational material like
        - River Access and Conservation Areas brochures and handouts
        - Guadalupe Bass Conservation Plan: A ten-year plan for restoring and preserving the state fish of Texas 2017-2026
- Analyzes, interprets, and writes presentations, reports, articles, and publications with project collaborators
- Supervised Interns and supervises TPWD volunteers
- Represents the Inland Fisheries Division and the Habitat Conservation Branch on Division, state, regional, national, and international groups
    - Served as a member of the Inland Fisheries Awards Committee
    - Serves on the River Access and Conservation Areas Team
    - Participates in the Desert Fishes Council
        - DFC is a binational, scientific organization supporting the conservation of desert ecosystems
        - President from November 2019 to present
        - Member-At-Large from November 2016 to November 2018
        - Served as the Conservation grant coordinator and serves on the conservation grants selection committee
        - Serves as Editor for the Desert Fishes Council journal
        - Organized and hosted the 51st Annual Meeting in Alpine, Texas and organized the Chihuahuan Desert Symposium
    - Serves on the Desert Fish Habitat Partnership
        - TPWD Steering Committee Representative from 2015 to present
        - Rio Grande Representative on the Executive Committee from 2011 to present
        - Served as Partnership Coordinator with the Federal co-chair
        - Serves on the Grant Selection, Science, and Report Writing committees
    - Represents TPWD on the Rio Grande Chub and Sucker Conservation Team
    - Represents TPWD on the Pecos Pupfish Conservation Team
    - Serves on the Landowner Incentive Program selection and review committee
    - Serves on the TPWD Aquatic Invasive Species Riparian Restoration Committee
    - Represented TPWD in the Desert Landscape Conservation Cooperative and on several sub-committees
    - Represented TPWD at the Rio Grande/Rio Bravo Binational Forum (2017) with Sarah Robertson
    - Represented TPWD on the Big Bend Bi-National Conservation Cooperative group

AUG 2008 - JAN 2012

Research Associate and Texas Parks and Wildlife Department Fellow

Texas State University - San Marcos

- Participated in the Edwards Aquifer Recovery Implementation Program (EARIP) performing statistical analysis of species data
- Coordinated and co-led a team of undergraduate students to map the San Marcos River
- Coordinated fish research in the Rio Grande
- Developed a database of known information for Rio Grande fishes
- Worked in TPWD Genetics Laboratory on the populations genetics study of Guadalupe Bass
- Assisted Dr. Whiteside with the Texas Freshwater Fish Identification Course held at Texas State University - San Marcos

AUG 2006 - MAY 2008

Instructional Assistant
Texas State University - San Marcos

- Taught labs for Ichthyology (BIO 4415/5425) and Intermediate Zoology (BIO 2411)
- Lab coordinator for Ichthyology and Zoology
- Coordinated lab schedules and Instructional Assistants
- Maintained lab inventories and assisted with lab budgets
- Organized research trips for Ichthyology lab

MAY 2006 - AUG 2008

Graduate Research Assistant
Texas State University - San Marcos

Thesis Title: Occurrence and impact of the Asian Fish Tapeworm in the Rio Grande (Rio Bravo del Norte)

- Studied impacts of an invasive parasite on native fish fauna
- Oversaw an undergraduate student worker
- Prepared permit application for Texas and New Mexico
- Organized seasonal sampling trips to the upper Rio Grande and Pecos Rivers in New Mexico and lower Rio Grande in Texas to assess fish habitat associations
- Assisted on other research projects and gained experience with electrofishing (backpack, canoe, barge, boat), sampling gear (fish and aquatic invertebrates), collection fish and invertebrate abundance and habitat data, and radio telemetry

JAN 2006 - MAY 2006

Undergraduate Research Assistant
Texas State University - San Marcos

- Independent study project documenting Asian Fish Tapeworm in the Rio Grande
- Published research in the Journal of Aquatic Animal Health

AUG 2004 - MAY 2006

Athletic Academic Center Tutor
Texas State University - San Marcos

- Tutored students in Biology, Chemistry, English, Math, History, Political Science, and Philosophy

PROFESSIONAL AFFILIATIONS

- Desert Fishes Council
- American Fisheries Society
- Texas Chapter American Fisheries Society
- Texas Riparian Association
- American Society of Ichthyologists and Herpetologists

PUBLICATIONS

Bean, M., S. Robertson, A. Hoffmann, T. Birdsong, and P. Bean. In prep. Public Engagement in River and Riparian Conservation Through Social Media.

Sjoberg, J., B. Senger, M. Bean, K. Guadalupe, A. Robinson, and M. Maza. In prep. Standard methods for sampling desert springs. Standard Methods for Sampling North American Freshwater Fishes New edition. American Fisheries Society.

Bean, M. and A. Kalmbach. In prep. Watershed conservation and landowner engagement in Texas. Desert Fishes Council Special Publication.

Garrett, G., M. Bean, R. Edwards, and D. Hendrickson. 2021. Mining hidden waters: groundwater depletion and loss of aquatic diversity in the Chihuahuan Desert of Texas. In D. Propst, J. Williams, K. Bestgen, and C. Hoagstrom, editors. Standing Between Life and Extinction. University of Chicago Press.

Parker, S., J. Perkin, M. Bean, D. Lutz-Carrillo, and M. Acre. 2021. Temporal distribution modelling reveals upstream habitat drying and downstream non-native introgression are squeezing out an imperiled headwater catfish. Biodiversity Research 2020:1-19.

Osborne, M., D. Portnoy, A. Fields, M. Bean, C. Hoagstrom, and K. Conway. 2021. Under the radar: genetic assessment of Rio Grande Shiner (Notropis jemezanus) and Speckled Chub (Macrhybopsis aestivalis), two Rio Grande basin endemic cyprinids that have experienced recent range contractions. Conservation Genetics 22:187-204.

Acre, M., J. Perkin, and M. Bean. 2020. Multiple survey methods reveal greater abundance of endangered pupfish in restored habitats. Aquatic Conservation: Marine and Freshwater Ecosystems 2020:1-12.
Birdsong, T., G. Garrett, M. Bean, S. Curtis, K. Mayes, and S. Robertson. 2020. Conservation status of Texas freshwater fishes: informing state-based species protection. Journal of the Southeastern Association of Fish and Wildlife Agencies 8:40-52.

Birdsong, T., S. Magnelia, J. Botros, M. Bean, A. Hoffman, M. Parker, and S. Robertson. 2020. Texas river access and conservation areas: a case study in use of riparian leases to enhance angler access and facilitate river stewardship. Journal of the Southeastern Association of Fish and Wildlife Agencies 7:114-122.

Dauwalter, D., S. Vail-Muse, T. Thompson, J. Whittier, K. Johnson, and M. Bean. 2019. Partnering on multispecies aquatic assessments to inform efficient conservation delivery. Pages 11-32. In D. Dauwalter, T. Birdsong, and G. Garrett, editors. Multispecies and watershed approaches to freshwater conservation. American Fisheries Society, Symposium 91, Bethesda, Maryland.

Birdsong, T., G. Garrett, B. Labay, M. Bean, P. Bean, J. Botros, M. Casarez, A. Cohen, T. Heger, A. Kalmbach, D. Hendrickson, S. Magnelia, K. Mayes, M. McGarrity, R. McGillicuddy, M. Parker, and S. Robertson. 2019. Texas native fish conservation areas network: strategic investments in restoration and preservation of freshwater fish diversity. Pages 183-230. In D. Dauwalter, T. Birdsong, and G. Garrett, editors. Multispecies and watershed approaches to freshwater conservation. American Fisheries Society, Symposium 91, Bethesda, Maryland.

Garrett, G., T. Birdsong, M. Bean, and B. Labay. 2019. Chihuahuan desert native fish conservation areas: a multispecies and watershed approach to preservation of freshwater fish diversity. Pages 231-252. In D. Dauwalter, T. Birdsong, and G. Garrett, editors. Multispecies and watershed approaches to freshwater conservation. American Fisheries Society, Symposium 91, Bethesda, Maryland.

Magnelia, S., K. Mayes, M. Bean, C. Loeffler, and D. Bradsby. 2019. Four decades of conserving native fish in the Colorado River watershed. Pages 269-292. In D. Dauwalter, T. Birdsong, and G. Garrett, editors. Multispecies and watershed approaches to freshwater conservation. American Fisheries Society, Symposium 91, Bethesda, Maryland.

Garrett, G., T. Birdsong, M. Bean, and R. McGillicuddy. 2015. Guadalupe Bass restoration initiative. In M. Tringali, J. Long, T. Birdsong, and M. Allen, editors. Black Bass Diversity: Multidisciplinary Science for Conservation. American Fisheries Society, Symposium 82, Bethesda, MD 685 pp.

Birdsong, T., M. Bean, T. Grabowski, T. Hardy, T. Heard, D. Holdstock, K. Kollaus, S. Magnelia, and K. Tolman. 2015. Application and utility of a low-cost unmanned aerial system to manage and conserve aquatic resources in four Texas rivers. Jornal of the Southwestern Association of Fish and Wildlife Agencies 2:80-85.

Bean, M. and T. Bonner. 2010. Spatial and temporal distribution of Bothriocephalus acheilognathi (Cestoda: Bothriocephalidae) in the Rio Grande (Rio Bravo del Norte). Journal of Aquatic Animal Health 22:182-189.

Bean, M. and T. Bonner. 2009. Impact of Bothriocephalus acheilognathi (Cestoda: Pseudophyllidae) on Cyprinella lutrensis condition and reproduction. Journal of Freshwater Ecology 24(3):383-391.

Bean, P., M. Bean, and T. Bonner. 2009. Threatened fishes of the world: Moxostoma congestum (Baird and Girard 1854) (Catastomidae). Environmental Biology of Fishes 85(2):173-174.

Bean, M., A. Skerikova, T. Bonner, T. Scholz, D. Huffman. 2007. First record of Bothriocephalus acheilognathi (Cestoda: Pseudophllidae) in the Rio Grande with comparative analysis of ITS2 and V4-18S rRNA gene sequences. Journal of Aquatic Animal Health 19(2):71-76.

REPORTS

Bean, M. and M. Parker. In Prep. Conservation and Restoration of Desert Streams in the Big Bend Region. National Fish and Wildlife Foundation.

Norris, C., W. Nowlin, M. Bean, N. Noreika, M. Kelly, D. Lutz-Carillo, P. Diaz, and R. Gibson. In review. Baseline biomonitoring of springs associated with the San Solomon Springs system. Texas Parks and Wildlife Department. Austin, TX.

Birdsong, T., G. Garrett, M. Bean, P. Bean, S. Curtis, P. Fleming, A. Grubh, D. Lutz-Carillo, K. Mayes, C. Robertson, S. Robertson, J.W. Schlechte, and N. Smith. 2020. Conservation of Texas freshwater fish diversity: selection of Species Greatest Conservation Need. Texas Parks and Wildlife Department. PWD RP T3200-2780 (10/20). Austin, TX.

Birdsong, T., M. Bean, P. Bean, J. Botros, M. De Jesus, A. England, P. Flemming, P. Ireland, C. Kittel, G. Linam, D. Lutz-Carillo, S. Magnelia, M. Matthews, M. McGarrity, R. McGillicuddy, M. Parker, N. Smith, and P. Thompson. 2018. Guadalupe Bass Restoration Initiative 2018 Annual Report. Texas Parks and Wildlife Department. Austin, TX.

Birdsong, T., D. Dauwalter, G. Garrett, B. Labay, M. Bean, J. Broska, J. Graham, S. Magnelia, K. Mayes, M. McGarrity, K. Johnson, S. Robertson, T. Thompson, S. Vail-Muse, and J. Whittier. 2018. Native Fish Conservation Areas of the southwestern USA: facilitating landscape-scale conservation of aquatic habitats and freshwater fishes. Final report submitted to the Wildlife Institute in fulfillment of Grant Agreement GPLCC 2015-01, Watershed-based Conservation Planning to Inform Selection and Implementation of a Network of Native Fish Conservation Areas.

Bean, M. 2016. Guadalupe Bass Restoration Initiative: Llano and Guadalupe River watersheds. Texas Parks and Wildlife Department. Austin, TX.

Bean, M. 2016. Guadalupe Bass Restoration Initiative: James River watershed. Texas Parks and Wildlife Department. Austin, TX.

Bean, M., G. Garrett, S. Magnelia, K. Saunders, R. Myers, J. Dennis, and W. Schlechte. 2012. Devils River standardized aquatic monitoring plan: from the headwaters to the confluence of Amistad Reservoir. Texas Parks and Wildlife Department. Austin, TX.

Heard, T., D. Runyan, R. Marfurt, M. Bean, and T. Bonner. 2008. Ecological characterization of the Rio Grande fish assemblages in Big Bend and Lower Canyons areas. River Systems Institute. San Marcos, TX.

PRESENTATIONS AND POSTERS

Bean, M., S. Robertson, A. Hoffmann, T. Birdsong, and P. Bean. 2021. Public and landowner engagement in river and riparian conservation through social media. Texas Urban Riparian Symposium. Virtual Conference.

Bean, M.G., S. Robertson, A. Hoffman, T. Birdsong, and P. Bean. 2021. Public engagement in river and riparian conservation through social media. Texas Chapter of the American Fisheries Society. Virtual Conference.

Acre, M., J. Perkin, and M.G. Bean. 2021. Multiple survey methods reveal greater abundance of endangered pupfish in restored habitats. Texas Chapter of the American Fisheries Society. Virtual Conference.

Parker, S., J. Perkin, M. Bean, D. Lutz-Carillo, and M. Acre. 2021. Temporal distribution modeling reveals upstream habitat drying and downstream non-native introgression are squeezing out an imperiled headwater fish. Texas Chapter of the American Fisheries Society. Virtual Conference.

Hendrickson, D., A. Cohen, M. Casarez, G. Garrett, T. Birdsong, S. Robertson, S. Curtis, and M. Bean. 2021. The Fishes of Texas project's impact on both conservation science and management and a fish collection. Society for the Preservation of Natural History Collections.

Bean, M. and G. Garrett. 2020. Highlights from the Chihuahuan Desert in Texas and New Mexico. Desert Fishes Council 52nd Annual Meeting. Virtual Conference.

Birdsong, T., G. Garrett, B. Labay, M. Bean, S. Curtis, K. Mayes, and S. Robertson. 2020. Managing watersheds and riverscapes for aquatic ecosystem resiliency in a rapidly urbanizing private lands state. American Fisheries Society 150th Annual Meeting. Columbus, OH.

Birdsong, T., G. Garrett, B. Labay, M. Bean, S. Curtis, K. Mayes, and S. Robertson. 2020. Integrating landscape-scale assessments into state-based conservation planning and delivery: challenges, opportunities, and effective case studies. Southern Division American Fisheries Society. Little Rock, AR.

Birdsong, T., M. Bean, S. Curtis, K. Mayes, S. Magnelia, M. Parker, and S. Robertson. 2020. Conservation status of Texas freshwater fishes and protected species recommendations. Southeast Association of Fish and Wildlife Agencies Conference.

Birdsong, T., M. Bean, S. Curtis, K. Mayes, S. Magnelia, M. Parker, and S. Robertson. 2020. Conservation status of Texas freshwater fishes and protected species recommendations. Texas Chapter American Fisheries Society. Waco, TX.

Perkin, J., S. George, M. Bean, and D. Lutz-Carillo. 2020. Conservation biogeography of Headwater catfish in the United States. Texas Chapter American Fisheries Society. Waco, TX.

Acre, M., J. Perkin, and M. Bean. 2020. Hands-off: a visual approach to monitor a threatened pupfish. Texas Chapter of the American Fisheries Society. Waco, TX.

Acre, M., J. Perkin and M. Bean. 2019. Spatial structure and survey method influence population estimates for endangered Comanche Springs Pupfish. Desert Fishes Council 51st Annual Meeting. Alpine, TX.

Garrett, G. and M. Bean. 2019. Conservation of Chihuahuan Desert fishes - past and present. Desert Fishes Council 51st Annual Meeting. Alpine, TX.

George, S., J. Perkin, M. Bean and D. Lutz-Carrillo. 2019. Conservation biogeography of Headwater Catfish (Ictalurus lupus) in the United States. Desert Fishes Council 51st Annual Meeting. Alpine, TX.

Acre, M., J. Perkin, and M. Bean. 2019. Tradeoffs in spatially structured abundance estimates for endangered Comanche Springs Pupfish using hotspot analysis and n-mixture modelling. American Fisheries Society 149th Annual Meeting. Reno, NV.

Garrett, G., T. Birdsong, and M. Bean. 2019. Chihuahuan Desert native fish conservation areas: a multispecies and watershed approach to preservation of freshwater fish diversity. American Fisheries Society 149th Annual Meeting. Reno, NV.

Bean, M. G. 2019. Fish community research and monitoring for the Balmorhea springs complex. TransPecos Workgroup. Austin, TX.

McGillicuddy, R., G. P. Garrett, T. B. Birdsong, M. G. Bean, P. T. Bean, and S. Magnelia. 2019. Restoring the State Fish of Texas, Guadalupe Bass *Micropterus treculii*. Annual meeting of the Southern Division of the American Fisheries Society, Galveston, TX.

Bean, M. G. 2018. Watershed ecology and management in Texas. Annual Training Program for the Ellis Unit Texas Master Naturalists. Huntsville, TX.

Bean, M. G. 2018. Aquatic communities, research, and management in Texas. Annual Training Program for the Ellis Unit Texas Master Naturalists. Huntsville, TX.

Bean, M. G. 2018. Watershed ecology and aquatic ecosystem management in Texas. Annual Training Program for the Hill Country Chapter Texas Master Naturalists. Fredericksburg, TX.

Bean, M. G., G. P. Garrett, R. Martin, and S. Robertson. 2018. Desert Fish Management and Research in Texas: Rio Grande, Pecos, and Devils Rivers. Desert Fishes Council 50th Annual Meeting. Death Valley, CA.

Garrett, G., M. Bean, R. Edwards, and D. Hendrickson. 2018. Mining hidden waters: groundwater depletion, aquatic habitat degradation, and loss of fish diversity in the Chihuahuan Desert ecoregion of Texas. Desert Fishes Council 50th Annual Meeting. Death Valley, CA.

Bean., M., A. Kalmbach, T. Birdsong, G. Garrett, P. Bean, M. Parker, and J. Drebelbis. Building intra-agency collaborative partnerships to implement watershed-based conservation. 2017. American Fisheries Society 147th Annual Meeting. Tampa, FL.

Magnelia, S., M. Bean, and K. Mayes. 2017. Conservation of native fishes in the Colorado River basin, Texas. American Fisheries Society 147th Annual Meeting. Tampa, FL.

Garrett, G., T. Birdsong, B. Labay, and M. Bean. 2017. Native fish conservation areas of the Chihuahuan desert of Texas. American Fisheries Society 147th Annual Meeting. Tampa, FL.

Dauwalter, D., G. Vail-Muse, T. Thompson, M. Bean, K. Johnson, and Joanna Whittier. 2017. Partnering on multispecies aquatic assessments to inform efficient conservation delivery. American Fisheries Society 147th Annual Meeting. Tampa, FL.

Birdsong, T., S. Magnelia, M. Parker, S. Plante, and M. Bean. 2017. Restoring and preserving native fishes by spawning river conservation advocates. American Fisheries Society 147th Annual Meeting. Tampa, FL.

Bean, P., T. Birdsong, M. Bean, and G. Garrett. 2017. Watershed-based conservation assessments and planning to guide range-wide conservation of Guadalupe Bass. American Fisheries Society 147th Annual Meeting.

Bean, M., T. Birdsong, M. Parker, J. Moore, M. Shelley, and A. Kalmbach. 2015. Riparian Restoration projects on public and private lands in the Llano river Watershed. Urban Riparian Symposium. Austin, TX.

Bean, M., T. Birdsong, M. Parker, M. Shelley, and A. Kalmbach. 2015. TPWD's cross divisional efforts in the Llano River watershed to benefit aquatic resources. Texas Chapter American Fisheries Society. Tyler, TX.

Bean, P., M. Bean, J. Moore, and T. Birdsong. 2015. Watershed-scale conservation of fish habitats in the Edwards Plateau ecoregion of Texas. American Fisheries Society 145th Annual Meeting. Portland, OR.

Bean, M., J. Moore, P. Bean, T. Birdsong. 2015. Restoration of spring and stream aquatic systems in arid and semi-arid Texas regions through the Desert Fish Habitat Partnership and Southeast Aquatic Resources Partnership. American Fisheries Society 145th Annual Meeting. Portland, OR.

Bean, P., M. Bean, G. Garrett, and D. Lutz-Carrillo. 2013. Hybridization between Largemouth Bass and Florida Bass in the Devils River, Texas: Influence of reservoir stocking on upstream populations. Southern Division American Fisheries Society 143rd Annual Meeting. Nashville, TN.

Garrett, G., T. Birdsong, and M. Bean. 2013. Guadalupe Bass Restoration Initiative. Southern Division American Fisheries Society. Nashville, TN.

Bean. M., G. Garrett, T. Birdsong, R. McGillicuddy, P. Fleming, and N. Smith. 2013. Guadalupe Bass Restoration Initiative. American Fisheries Society 143rd Annual Meeting. Little Rock, AR.

Bean, P., M. Bean, G. Garrett, and D. Lutz-Carrillo. 2013. Hybridization between Largemouth Bass and Florida Bass in the Devils River, Texas: Influence of reservoir stocking on upstream populations. American Fisheries Society 143rd Annual Meeting. Little Rock, AR.

Birdsong, T., G. Garrett, M. Bean, and M. Montagne. 2012. Landscape-scale approaches to conservation of native fishes in the Edwards Plateau ecoregion of Texas: facilitating on-the-ground conservation actions through the development of private landowner networks. American Fisheries Society 142nd Annual Meeting. Minneapolis, MN.

Birdsong, T., G. Garrett, M. Bean, M. Montagne, R. Smith, S. Magnelia. 2011. Landscape-scale approaches to conservation of native fishes: use of a decision support framework to facilitate on-the-ground conservation actions in the Edwards Plateau ecoregion of Texas. American Fisheries Society 141th Annual Meeting. Seattle, WA.

Birdsong, T., M. Bean, and S. Robinson. 2010. Application of the National Fish Habitat Assessment as a conservation planning tool in the Southeastern US. American Fisheries Society 140th Annual Meeting. Pittsburgh, PA.

ARTICLES

Briggs, M., M. Bean, J. Bennett, R. Martin, J.J. Ochoa, A. Roberson, and O. Sanchez. 2019. Habitat restoration in the Big Bend and Northern Mexico: Success through binational collaboration, partnerships, and diversity. TPWD Landowner Incentive Program Newsletter.

Siegmund, T., A. Kalmbach, and M. Bean. 2019. Investing in Conservation. Texas Wildlife. Texas Wildlife Association.

Birdsong, T., M. Bean, J. Botros, S. Magnolia, M. Parker, S. Plante, and S. Robertson. 2018. Partnering with private landowners to expand paddling and fishing opportunities on Texas Rivers. TPWD Landowner Incentive Program Newsletter.

Bean, M. 2016. Landscape conservation through the Guadalupe Bass Restoration Initiative: a collaborative initiative between state, federal, and local partners. TPWD Landowner Incentive Program Newsletter.

Bean, M., USFWS, and TNC. 2013. Holistic spring and cienega restoration projects in west Texas. TPWD Landowner Incentive Program Newsletter.

Bean, M. 2012. The Rio Grande tributaries: habitat restoration in the Big Bend region. TPWD Texas Watersheds Newsletter.

Bean, M. 2011. Watershed BMP website coming soon: comprehensive site will provide a unique tool for conservation in Texas. TPWD Texas Watersheds Newsletter.

TRAINING AND COURSES

- CPR/AED/First Aid
- SCUBA Certified
- Stream Functions Pyramid Workshop (2019)
- Riparian Habitat Restoration for the Arid Southwest (2019)
- Senior Leadership Development Program (2017- 2018)
- River Morphology and Application (2016)
- Communication Across Generations (2016)
- Introduction to the Wildlife and Sport Fish Restoration Program (2016)
- The Grants Management Process (2016)
- Certified Texas Master Naturalist (2016)
- Cultural Resources
- Successful First Line Management (2015)
- Social Media (2015)
- What's What and How To: Human Resources Process Training Personnel Administration (2015)
- What's What and How To: Human Resources Process Training Personnel Classification (2015)
- What's What and How To: Human Resources Process Training Personnel Leave and Benefits (2015)
- Learning to Listen (2014)

- Building Effective Communication Skills (2014)
- Decision Analysis For Climate Change (January - March 2014)
- Oil and Gas 101 (October 2014)
- Texas Conservation Banking Training Course (April 2012)
- Stakeholder Facilitation Training (January 2012)
- Problem Definition: An overview of structured decision making (2011)
- Office Ergonomics (2011)
- Applied Fluvial Geomorphology (2010)
- Business Writing Skills (2010)
- Texas Watershed Steward Workshop (2010)
- Instream Flows 101 (2008)
- Assessing Instream Flows (2008)
- Instream Flows - Integration and Interpretation of Study Results (2008)
- Instream Flows 101 (2008)

SOFTWARE PROFICIENCY

- Adobe Acrobat and Photoshop
- Microsoft Word, Excel, PowerPoint, Access, Outlook, OneDrive, Teams
- Google Docs, Sheets, Slides, Forms, Drive, YouTube
- Zoom and WebEx
- R, Sigma Plot, ArcGIS, Google Earth Pro

AWARDS

- Inland Fisheries Division Award - Outstanding Teamwork with Sarah Robertson
- Texas Parks and Wildlife Department Employee Recognition Award - Outstanding Team (River Access and Conservation Areas Team)
- Texas Chapter of the American Fisheries Society - Outstanding Fisheries Worker of the Year (for the Watershed Conservation Program)
- Canyon Bass Club Scholarship
- Texas Chapter of the American Fisheries Society Student Scholarship
- Richan Aquatic Biology Scholarship
- Joan Austin Memorial Scholarship
- Graduate College Scholarship
- Howard D. Schulze Endowed Scholarship in Biology
- Celanese Chemicals Division Scholarship
- C.C. and Alma K. Schmidt Memorial Physics Scholarship
- Texas Tech University Merit Scholarship

SELECT COMMUNITY VOLUNTEER ACTIVITIES

- City of Kerrville Library Advisory Board - Chairperson
- Board Member of the Guadalupe Watercolor Group
- Graphic Design and IT support for the Guadalupe Watercolor Group
- Hill Country American Youth Soccer Association Coach (2 seasons)
- Hays-Caldwell Women's Center - Sexual and Domestic Violence HEARTeam Advocate
- Operation Write Home

Jason Philip Martina

Assistant Professor, Department of Biology
Texas State University · San Marcos, TX 78666
Tel: 512.245.0565 · Cell: 815.355.6814 · jpmartina@txstate.edu

---

Education

Ph.D. in Plant Biology and Ecology, Evolutionary Biology and Behavior, 2012
Michigan State University, East Lansing, MI.
Co-Advised by Dr. Stephen K. Hamilton and Dr. Merritt R. Turetsky (University of Guelph)

M.S. in Biological Sciences, 2006
Northern Illinois University, DeKalb, IL.
Advised by Dr. Carl N. von Ende

B.S. in Biological Sciences (*magna cum laude*), 2004
Northern Illinois University, DeKalb, IL.

Professional Experience

2019 – present	**Assistant Professor**, Department of Biology, Texas State University, San Marcos TX.
2016 – 2020	**Adjunct Assistant Professor**, Department of Ecosystem Science and Management, Texas A&M University
2016 – 2019	**Program Coordinator**, Ecology and Evolutionary Biology Doctoral Program and Applied Biodiversity Science Program, Texas A&M University
2015 – 2017	**Visiting Scholar**, Department of Biology, Trinity University, TX.
2014 – 2016	**Assistant Professor** of Biology, Department of Mathematics and Sciences, Our Lady of the Lake University, TX.
2012 – 2014	**Postdoctoral Research Fellow** with Dr. Deborah Goldberg (Ecology and Evolutionary Biology) and Dr. William Currie (Natural Resources and Environment), University of Michigan
2008 – 2011	**Teaching Assistant**, Department of Plant Biology, Michigan State University
2007 – 2010	**Science To Achieve Results (STAR) Fellow**, US EPA
2006 – 2008	**Research Assistant**, Department of Plant Biology, Michigan State University
2004 – 2006	**Teaching Assistant**, Department of Biological Sciences, Northern Illinois University
2004	**Restoration Intern**, McHenry County Conservation District, McHenry, IL.

Awards, Grants, and Fellowships

Funded Proposals:

- TPWD Aquatic Invasive Species Research Grant, "Using remote sensing to map *Arundo donax* populations in Native Fish Conservation Areas throughout Texas to better understand causal factors of invasion and set management priorities". $98,537. 2021-2023. *Principal Investigator*
- NASA OCEAN, "Integrating Systems Models and Remote Sensing to Explore Aquatic Ecosystem Vulnerability to Global Change in Lake Huron". $749,428. 2021-2024. *Principal Investigator*

- Texas Parks and Wildlife Traditional Section 6, "Habitat assessment, monitoring and landowner outreach for *Leavenworthia texana* and *Physaria pallida*". $99,292. 2021-2023 *Principal Investigator*
- NASA Interdisciplinary Research in Earth Science Program, "Quantifying How Global Change and Land Use Legacies Affect Ecosystem Processes at the Land Water Interface Across the Great Lakes Basin". $1,598,346. 2017-2021. *Co-Principal Investigator*
- EPA Great Lakes Restoration Initiative Program, "Implementing Adaptive Management and Monitoring for Restoration of Wetlands invaded by *Phragmites*." $648,799. 2016-2018. *Participant in cross-institutional collaborative team funded by this award*.
- Michigan Invasive Species Grant Program, "Comprehensive Invasive *Phragmites* Management Planning". $203,000. 2015-2018. *Co-Principal Investigator*
- University of Michigan Water Center Grant, "Assessing Ecosystem Services Provided by Restored Wetlands Under Current and Future Climate and Land-Use Scenarios". $50,000. 2013-2014.
- EPA STAR Fellowship, "Effects of Plant Diversity and Functional Identity on Ecosystem Nitrogen Retention and Removal in Great Lakes Wetlands". $110,000. 2007-2010.

Proposals not funded:

- USDA CRP Climate Change Mitigation Assessment Initiative, "Exploring the climate change mitigation potential of Conservation Reserve Program grasslands by assessing the relationship between vegetation communities and soil carbon sequestration", submitted July 2021, *Co-Principal Investigator*
- NASA Carbon Cycle Science, "Understanding the Effects of Changes in Land Management, Climate, and Hydrology on Carbon Dynamics from Great Lakes Watersheds to Coastal Wetlands", submitted December 2020, *Co-Principal Investigator*
- DOE Environmental System Science, "Simulating the Dynamic Effects of Perturbations on Ecosystem Function Along the US Great Lakes Terrestrial Aquatic Interface", Submitted December 2020", pre-application *Co-Principal Investigator*
- NSF EAGER SAI, "Optimizing Post-buyout Land Use to meet Stakeholder Needs though Ecological and Structural Infrastructure", pre-application *Co-Principal Investigator*
- NASA Ocean Biology and Biogeochemistry, "Quantifying Great Lakes aquatic ecosystem vulnerability to climate change by integrating systems models and remote sensing", submitted July 2020. *Co-Principal Investigator*
- National Science Foundation Division of Environmental Biology (DEB), "The physiological responses underlying grassland community and ecosystem responses to soil nitrogen", submitted December 2019. *Co-Principal Investigator*
- Texas State University Research Enhancement Program, "Assessing soil carbon storage potential of Texas grasslands after 20 years of restoration". *Principal Investigator*
- National Science Foundation Frontier Research in Earth Sciences (FRES), "Carbon Fluxes Down the Hydrologic Connectivity Cascade: Cross-scale Interactions of Water, Nutrients, and Plants in Freshwater Wetlands", submitted February 2019
- Texas A&M University Tier One Program, "Creating and Integrating Sustainable Experiential Learning for Undergraduate and Graduate Students in Ecology and Evolutionary Biology", submitted March 2017
- National Science Foundation Ecosystem Science Pre-Proposal, "Canopy structure and standing litter-NPP feedbacks governing invasion dynamics, lateral colonization, and C accumulation in herbaceous coastal wetlands", submitted January 2015

- National Science Foundation MacroSystems Biology, "Carbon Fluxes Down the Hydrologic Connectivity Cascade: Cross-scale Interactions of Water, Nutrients, and Plants in Freshwater Wetlands", submitted April 2014
    - **Note**: Top 4 proposal, rated "Outstanding", recommended for funding, declined due to reallocation of funds

Smaller grants and fellowships:

- Texas State University Undergraduate Research Fellowship – Ryan Kridler ($1000)
- College of Natural Science, MSU, Dissertation Completion Fellowship 2011 ($6000)
- College of Natural Science, MSU, Dissertation Continuation Fellowship 2010 ($6000)
- EEBB Travel Grant, MSU, 2007-2012 (Total awarded: $2400)
- Paul Taylor Travel Grant, MSU, 2007-2011 (Total awarded: $3875)
- Long-Term Ecological Research (LTER) Small Grant, 2010 ($1500)
- MSU Graduate School Travel Grant 2008 and 2009 (Total awarded: $500)
- Biogeochemistry Environmental Research Initiative Summer Fellowship, 2007 and 2008 ($3000)
- Society of Wetland Scientists Research Grant, 2007 ($1000)
- Kellogg Biological Station Visiting Graduate Fellowship, 2007 ($2000)
- Northern Illinois University Fellowship, 2005-2006 ($6000)
- McHenry County Conservation District Research Grant, 2006 ($250)

Teaching:

- Department of Residence Life (MSU) Teaching Recognition, 2010

Refereed Publications (*co-first author, ^ *denotes undergraduate student*) Ladouceur, E., Ladouceur, E., S.A. Blowes, J.M. Chase, A.T. Clark, M. Garbowski, J. Alberti, C.A. Arnillas, J.D. Bakker, I.C. Barrio, S. Bharath, E.T. Borer, L.A. Brudvig, M.W. Cadotte, Q. Chen, S.L. Collins, C.R. Dickman, I. Donohue, G. Du, A. Ebeling, N. Eisenhauer, P.A. Fay, N. Hagenah, Y. Hautier, A. Jentsch, I.S. Jónsdóttir, K. Komatsu, A. MacDougall, J.P. Martina, J.L. Moore, J.W. Morgan, P.L. Peri, S.A. Power, Z. Ren, A.C. Risch, C. Roscher, M.A. Schuchardt, E.W. Seabloom, C.J. Stevens, G.F. Veen, R. Virtanen, G.M. Wardle, P.A. Wilfahrt, W.S. Harpole. Species losses, gains and changes in persistent species are associated with distinct effects in ecosystem functioning in global grasslands. Ecology Letters (*In Review*)

Jameson, E.E., Elgersma, K.J., **J.P. Martina,** W.S. Currie, and D.E. Goldberg. Size-dependent analyses provide insights into the reproductive allocation and plasticity of invasive and native *Typha*. *Biological Invasions* (*In Review*)

Currie, W.S, L. Bourgeau-Chavez, K.J. Elgersma, P. Higman, **J.P. Martina,** S.J. Sharp and M. Vanderhaar. Wetland process modeling for adaptive management: Restoration of *Phragmites*-invaded coastal wetlands in the Great Lakes region. Special Issue of *Ecological Informatics (In Revision)*

Rogan, J., M.R. Parker, Z.B. Hancock, A.D. Earl, E.K. Buchholtz, K. Chyn, **J.P. Martina**, L.A. Fitzgerald. Paths to annihilation: Genetic and demographic consequences of range contraction patterns. *The American Naturalist* (*Revisions Submitted*)

Carroll, O., E. Batzer, S. Bharath, E.T. Borer, S. Campana, E. Esch, Y. Hautier, T. Ohlert, E.W. Seabloom, P.B. Adler, J.D. Bakker, L. Biederman, M.N. Bugalho, M. Caldeira, Q. Chen, K. Davies, P.A. Fay, J.M.H. Knops, K. Komatsu, **J.P. Martina**, K.S. McCann, J.L. Moore, J.W. Morgan, T.O. Muraina, B. Osborne, A.C. Risch, C. Stevens, P.A. Wilfhart, L. Yahdjian, and A.S. MacDougall. Does multiple nutrient enrichment impact the stability of grassland biomass production? *Ecology Letters (Accepted)*

Yuan, Y., K.J. Elgersma, **J.P. Martina**, S. Sharp and W.S. Currie. 2021. Global warming potential driven by nitrogen inflow and hydroperiod in a model of Great Lakes coastal wetlands. *JGR – Biogeosciences* 126, e2021JG006242. https://doi. org/10.1029/2021JG006242

Novak, E.N., M. Bertelsen, R. Davis, D.M. Grobert, K.G. Lyons, **J.P. Martina**, M. McCaw, M. O'Toole, J.W. Veldman. 2021. Season of prescribed fire determines grassland restoration outcomes after fire exclusion and overgrazing. *Ecosphere* 12(9):e03730. 10.1002/ecs2.3730

Weinstein, C., L. Bourgeau-Chavez, S.L. Martin, W.S. Currie, K. Grantham, Q.F. Hamlin, D.W. Hyndman, K.P. Kowalski, **J.P. Martina**, D. Pearsall. 2021. Enhancing Great Lakes coastal ecosystems research by initiating engagement between scientists and decision-makers. *Journal of Great Lakes Research* 47: 1235-1240

Sharp, S.J., K.J. Elgersma, **Martina, J.P.** and W.S. Currie. 2021. Hydrologic flushing rates drive nitrogen cycling and plant invasion in freshwater coastal wetland model. *Ecological Applications* 31(2):e02233.10.1002/eap.2233

Borer, E.T, W.S. Harpole, P.B. Adler, M.N. Bugalho, M.W. Cadotte, M.C. Caldeira, M.S. Campana, A. Carlos-Albert, C.R. Dickman, T.L. Dickson, I. Donohue, A. Eskelinen, P.A. Fay, J.L. Firn, P.B. Graff, D.S. Gruner, R.W. Heckman, A.M. Koltz, K.J. Komatsu, L.S. Lannes, A.S. MacDougall, **J.P. Martina**, J.L. Moore, B. Mortensen, R. Ochoa-Hueso, H. Olde Venterink, S.A. Power, J.N. Price, A.C. Risch, M. Sankaran, M. Schütz, J. Sitters, C.J. Stevens, R. Virtanen, P.A. Wilfahrt, E.W. Seabloom. 2020. Nutrients cause grassland biomass to outpace herbivory. *Nature Communications* 11, 6036. https://doi.org/10.1038/s41467-020-19870-y

*Siciliano-Martina, L.M. and ***J.P. Martina**. 2020. Shifting barriers to the acceptance of evolution in an underrepresented student group. *International Journal of Science Education* 42: 2205-2223

Goldberg, D.E., E.E. Batzer, K.J. Elgersma, **J.P. Martina**, and J. Klimesova. 2020. Allocation to clonal growth: critical questions and protocols to answer them. *Perspectives in Plant Ecology, Evolution and Systematics* 43: 125511

Siciliano-Martina, L.M. and **J.P. Martina**. 2018. Stress and social behaviors of maternally-deprived captive giraffes (*Giraffa camelopardalis*). *Zoo Biology* 37: 80-89

^Batzer, E.E., **J.P. Martina**, K.J. Elgersma and D.E. Goldberg. 2017. Clonal plant allocation to daughter ramets is a simple function of parent size across species and nutrient levels. *Plant Ecology* 218: 1299-1311 DOI: https://doi.org/10.1007/s11258-017-0769-z

Goldberg, D.E., **J.P. Martina**, K.J. Elgersma, and W.S. Currie. 2017. Plant size and competitive dynamics along nutrient gradients. *American Naturalist* 190: 229-243

Elgersma, K.J., **J.P. Martina**, W.S. Currie, and D.E. Goldberg. 2017. Effectiveness of cattail (*Typha* spp.) management techniques depends on exogenous nitrogen inputs. *Elementa* 5:19, DOI: https://doi.org/10.1525/elementa.147

Martina, J.P., Currie, W.S., Goldberg, D.E., and K.L. Elgersma. 2016. Nitrogen loading leads to increased carbon accretion in both invaded and uninvaded coastal wetlands. *Ecosphere* 7(9): e01459. 10.1002/ec2.1459

Elgersma, K.J., Wildova, R., **Martina, J.P.**, Currie, W.S. and D.E. Goldberg. 2015. Does clonal resource translocation relate to invasiveness of *Typha* taxa? Results from a common garden experiment. *Aquatic Botany* 126: 48-53

Martina, J.P., Hamilton, S.K., Turetsky, M.R. and ^C.J. Phillippo. 2014. Organic matter stocks increase with degree of invasion in temperate inland wetlands. *Plant and Soil* 385: 107-123

Currie, W.S., Goldberg, D.E., **Martina, J.P.**, Wildova, R., Farrer, E., and K. Elgersma. 2014. Emergence of nutrient-cycling feedbacks related to plant size and invasion success in a wetland community-ecosystem model. *Ecological Modelling* 282: 69-82

Martina, J.P. and C.N. von Ende. 2013. Increased spatial dominance in high nitrogen, saturated soil due to clonal architecture plasticity of the invasive wetland plant, *Phalaris arundinacea*. *Plant Ecology* 214: 1443-1453

Martina, J.P. and C.N. von Ende. 2012. Highly plastic response in morphological and physiological traits to light, soil-N and moisture in the model invasive plant, *Phalaris arundinacea. Environmental and Experimental Botany* 82: 43-53.

Ball, B.A., Kominoski J.S., Adams, H.E., Jones, S.E., Kane, E.S., Loecke, T.D., Mahaney, W.M., **Martina, J.P.**, Prather, C.M., Robinson, T.M.P., and C.T. Solomon. 2010. Direct and terrestrial vegetation-mediated effects of environmental change on aquatic ecosystem processes. *Bioscience* 60: 590-601.

Martina, J.P. and C.N. von Ende. 2008. Correlation of soil nutrient characteristics and reed canarygrass (*Phalaris arundinacea*: Poaceae) abundance in northern Illinois, USA. *American Midland Naturalist* 160: 430-437.

Manuscripts in Preparation

Martina, J.P., R. Ramirez, K.L. Elgersma, S. Sharp, W.S. Currie, D.E. Goldberg. Propagule pressure and disturbance interact along a nitrogen gradient to influence invasion outcomes in a simulated wetland system. (*In Prep*)

Martina, J.P., K.J. Elgersma, W.S. Currie, and D.E. Goldberg. Can invasion be reversed by removing the main driver or has a regime shift occurred? A test case using a simulated wetland ecosystem. (*In Prep*)

Martina, J.P., R. O'Connor, S.K. Hamilton and M.R. Turetsky. Litter diversity and interactive effects between litter and soil control decomposition and nitrogen transformation in invaded wetlands. (*In Prep*)

Ruiz, C.M., **J.P. Martina**, D.E. Goldberg and K.J. Elgersma. The effects of nutrient resorption on the success of *Typha* x *glauca*. (*In Prep*)

Thesis Publications

Martina, J.P. 2012. Invasive plant species impacts on carbon and nitrogen cycling in inland Michigan wetlands. Dissertation, Michigan State University, East Lansing, MI.

Martina, J.P. 2006. Effects of soil nutrient characteristics, moisture, and light on the growth response and resource allocation of *Phalaris arundinacea*, an invasive wetland plant. Master's Thesis, Northern Illinois University, Dekalb IL.

Teaching Experience and Training

Participant in The Prairie Project Education Cohort, 2021-2023
USDA funded project aimed to examine how pyric-herbivory and mixed-species grazing can support the sustainability of livestock production and ecosystem services in the Great Plains region. The education component trains regional educators to develop modules that introduce relevant science to their students through experiential learning and citizen science research.

Certificate in College Science Teaching, 2013
Postdoctoral Short-Course offered by the Rackham School of Graduate Studies and the Center for Research on Learning and Teaching
University of Michigan, Ann Arbor, MI.

Courses Taught:

Texas State University

Wetland Plant Ecology and Management (Lecture & Lab)	2020 – 2022
Ecology and Management of Aquatic Macrophytes (Lecture & Lab)	2020 – 2022
Population and Conservation Seminar: Plant-Soil Feedbacks	2021
Global Change Biology (Lecture)	2020 – 2021

Texas A&M University

Fundamentals of Environmental Decision Making (Lecture)	2018
First Year Graduate Seminar in EEB	2016 - 2018

Our Lady of the Lake University

Environmental Science (Lecture & Lab)	2015 - 2016
Vascular Plants (Lecture & Lab)	2014 - 2016
Introduction to Evolution (Online)	2015 - 2016
Aquatic Biology (Lecture & Lab)	2015
General Ecology (Lecture & Lab)	2014 - 2015

University of Michigan

Practice Teaching Facilitator, CRLT Teaching Orientation	2013 – 2014

Michigan State University (Teaching Assistant)

Tropical Biology (Lecture)	2011
Organisms and Populations (Lab)	2010 - 2011
Experiments in Plant Biology (Lab)	2010

General Plant Biology (Lab) 2009
General Ecology (Lecture & Lab) 2008

Northern Illinois University (Teaching Assistant)
Fundamentals of Biology (Lab) 2004 - 2006

Guest Lectures

BIO 3460 Aquatic Biology, Fall 2019, 2020, Title: Plant adaptations to wetland environments. Texas State University.

BIO 4400 Plants Important for Wildlife, Fall 2019, Title: Causes and impacts of plant invasions. Texas State University

WFSC 628 Wetland Ecology and Pollution, Fall 2017, Title: The quest for control: adaptive management of invasive species in wetlands. Texas A&M University

RENR 205 Introduction to Ecology, Fall 2017, Lecture Title: Ecological principles in conservation and management. Texas A&M University

NRE 509 Ecology: Science of Context and Interaction, Fall 2013, Lecture Title: Nr and the N cascade. University of Michigan

NRE 501 Biofuels and Sustainability, Winter 2013, Lecture Title: Biofuels and invasive plant species. University of Michigan

FW 417 Wetland Ecology and Management, Fall 2007-2013, Lecture Title: Invasive plant species in wetlands. Michigan State University

ZOL 485 Tropical Biology, Fall 2011, Lecture Title: Decomposition: mechanisms and global patterns. Michigan State University

ZOL 897 Ecosystem Ecology and Global Change, Spring 2011, Discussion of the rise and fall of the phosphorus paradigm in limnology. Michigan State University

PLB 105 Plant Biology, Spring 2009, Lecture Title: Humans and the environment. Michigan State University

Invited Seminars

Studying global change in wetlands and grasslands. Environmental Science and Sustainability Seminar Series. Department of Mathematics and Sciences. Our Lady of the Lake University, San Antonio, TX. November 2021

Using experimental and modeling approaches to reconcile the past, present, and future of wetland plant invasions. Department of Biology Seminar Series. Texas State University, San Marcos, TX. January 2019

Merging remote sensing, modeling, and field data to understand and manage plant invasions in Great Lakes coastal wetlands. Seminar Series cohosted by the Ecology and Evolutionary Biology and Applied Biodiversity Science Programs. Texas A&M University, College Station, TX. October 2016

Plant invasion in coastal Great Lakes wetlands: Merging satellite, modeling, and field data to understand causes and consequences. Department of Biology Sciences Seminar Series. Trinity University, San Antonio, TX. October 2015

Invasive plants in wetlands: using an experimental and modeling framework to understand causes and consequences. Department of Biological Sciences Seminar Series. Northern Illinois University, DeKalb, IL. April 2014

Invasive plants in wetlands: using an experimental and modeling framework to understand causes and consequences. Conservation Ecology Seminar Series. University of Michigan, Ann Arbor, MI. February 2014

The effects of organic pollutants in urban lakes. Department of Mathematics and Sciences. Our Lady of the Lake University, San Antonio, TX. January 2014

Biodiversity: definition, benefits, and threats. Department of Biology Seminar. Angelo State University, San Angelo, TX. January 2014

Understanding causes and consequences of plant invasion in coastal wetlands. Department of Biology Seminar. Angelo State University, San Angelo, TX. January 2014

Invasive species effects on biogeochemical cycling in temperate wetlands. Plant Ecology Discussion Group. University of Michigan, Ann Arbor, MI. Spring 2011.

First-Author Conference Presentations (*denotes an invited talk)

Martina, J.P., K.L. Elgersma, D.E. Goldberg, S.J. Sharp, W.S. Currie. Tipping the tipping point: After a regime shift to invader dominance can management or high water levels push a wetland plant community back to a pre-invaded state? Society for Ecological Restoration. Virtual. June 2021. (*oral presentation*)

Martina, J.P., K.J. Elgersma, D.E. Goldberg, S.J. Sharp, W.S. Currie. Tipping the tipping point: After a regime shift to invader dominance can management or high water levels push a wetland plant community back to a pre-invaded state? American Geophysical Union Fall Meeting. Virtual. December 2020. (*eLightning Poster*)

***Martina, J.P.**, K.L. Elgersma, W.S. Currie, D.E. Goldberg. Can invasion be reversed by removing the main driver or has a regime shift occurred? A test case using a simulated wetland ecosystem. Texas Aquatic Plant Management Society Annual Conference. Bryan, TX. November 2019. (*oral presentation*)

Martina, J.P., K.L. Elgersma, W.S. Currie, D.E. Goldberg. Can invasion be reversed by removing the main driver or has a regime shift occurred? A test case using a simulated wetland ecosystem. Texas Chapter of the Society of Ecological Restoration. Galveston, TX. November 2019. (*oral presentation*)

Martina, J.P., R. Ramirez, K.L. Elgersma, S. Sharp, W.S. Currie, D.E. Goldberg. Propagule pressure and clonal branching architecture interact along a nitrogen gradient to influence invasion outcomes in a simulated wetland system. Annual Meeting of the Ecological Society of America. Louisville, KY. August 2019. (*oral presentation*)

Martina, J.P., K.L. Elgersma, W.S. Currie, D.E. Goldberg. Can invasion be reversed by removing the main driver or has a regime shift occurred? A test case using a simulated wetland ecosystem. Annual Meeting of the Ecological Society of America. New Orleans, LA. August 2018. (*oral presentation*)

Martina, J.P., K.L. Elgersma, W.S. Currie, D.E. Goldberg. What are the effects of management duration and type (burning, herbiciding, mowing) on the success of invasive cattail and C and N cycling? Society of Wetland Scientists Annual Meeting. Corpus Christi, TX. May-June 2016. (*oral presentation*)

Martina, J.P., K.L. Elgersma, W.S. Currie, D.E. Goldberg. Evaluating the efficacy of management techniques (mowing, burning, and herbiciding) on the control of cattail (*Typha* spp.) across a gradient of nitrogen loading. Texas Chapter of the Society of Ecological Restoration. San Antonio, TX. November 2015. (*oral presentation*)

Martina, J.P., K.L. Elgersma, W.S. Currie, D.E. Goldberg. Effectiveness of cattail (*Typha* spp.) management techniques (mowing, burning, and herbiciding) depends on exogenous nitrogen inputs. Annual Meeting of the Ecological Society of America. Baltimore, MD. August 2015. (*oral presentation*)

Martina, J.P., W.S. Currie, D.E. Goldberg, K.L. Elgersma. Physiological trait variation in plant invaders influences invasion success and C cycling across a nitrogen gradient in a simulated wetland ecosystem. Annual Meeting of the Ecological Society of America. Sacramento, CA. August 2014. (*oral presentation*)

***Martina, J.P.**, W.S. Currie, D.E. Goldberg, K.L. Elgersma. Investigating the major drivers of C storage in coastal wetlands using a simulation model: Do plant invasions matter? Joint Aquatic Sciences Meeting. Portland, OR. May 2014. (*oral presentation*)

Martina, J.P., W.S. Currie, D.E. Goldberg, K.L. Elgersma. Interactive effects of invasion and hydrology influence C storage along a nitrogen gradient in a simulated clonal wetland ecosystem. 98th Annual Meeting of the Ecological Society of America. Minneapolis, MN. August 2013. (*oral presentation*)

Martina, J.P., W.S. Currie, D.E. Goldberg. The interaction between litter and N loading determines invader success and N retention in a simulated clonal wetland ecosystem. American Geophysical Union Fall Meeting. San Francisco, CA. December 2012. (*oral presentation*)

Martina, J.P., W.S. Currie, D.E. Goldberg. The interaction between litter, N loading, and allocation requirement determines invader success in a simulated clonal wetland ecosystem. Society of Wetland Scientists North Central Chapter Meeting. Indiana Dunes National Lakeshore, IN. September 2012. (*oral presentation*)

Martina, J.P., S.K. Hamilton and M.R. Turetsky. Effects of aboveground biomass and litter on biogeochemical cycling in stands of the invasive wetland plant, *Phragmites australis*. 97th Annual Meeting of the Ecological Society of America. Portland, OR. August 2012. (*oral presentation*)

Martina, J.P., M.R. Turetsky and S.K. Hamilton. Invasive plants in wetlands: Effects of litter and soil conditioning on decomposition and N transformation rates. 96th Annual Meeting of the Ecological Society of America. Austin, TX. August 2011. (*oral presentation*)

Martina, J.P. Dominant species effects on C and N cycling in temperate wetlands. Kellogg Biological Station Brown Bag Series. Hickory Corners, MI. Fall 2010. (*oral presentation*)

Martina, J.P., C.J. Phillipo, S.K. Hamilton and M.R. Turetsky. Dominant species effects on carbon and nitrogen cycling in temperate wetlands. 95th Annual Meeting of the Ecological Society of America. Pittsburgh, PA. August 2010. (*oral presentation*)

Martina, J.P., C.J. Phillipo, S.R. Rubin and M.R. Turetsky. Consequences of plant invasion on carbon and nitrogen transformation and storage in temperate wetlands. 94th Annual Meeting of the Ecological Society of America. Albuquerque, NM. August 2009. (*poster*)

Martina, J.P., C.J. Phillipo, S.R. Rubin and M.R. Turetsky. Consequences of plant invasion on carbon and nitrogen transformation and storage in temperate wetlands. Great Lakes Regional Biogeochemistry Symposium. KBS. May 2009. (*poster*)

Martina, J.P. Consequences of plant invasion on nitrogen transformations and C and N storage in Michigan Wetlands. Kellogg Biological Station Brown Bag Series. Hickory Corners, MI. Spring 2009. (*oral presentation*)

Martina, J.P. and C.N. von Ende. Effects of light, soil-N, and moisture on the biomass and resource allocation of *Phalaris arundinacea*. 93rd Annual Meeting of the Ecological Society of America. Milwaukee. August 2008. (*poster*)

Martina, J.P., C.J. Phillipo and M.R. Turetsky. Organic matter accumulation and quality in Michigan wetlands: consequences of plant diversity and biological invasion. Society of Wetland Scientists. Washington, D.C. May 2008. (*poster*)

Martina, J.P. and C.N. von Ende. Effects of light, soil-N, and moisture on the biomass and resource allocation of *Phalaris arundinacea*. Botany and Plant Biology 2007 Joint Congress, Chicago, IL. July 2007. (*poster*)

Martina, J.P. and C.N. von Ende. Effects of light, soil-N, and moisture on the biomass and resource allocation of *Phalaris arundinacea*. Invasive Species Research Symposium. Michigan State University, East Lansing, Michigan. May 2006. (*poster*)

Martina, J.P. and C.N. von Ende. Light, nitrogen, and moisture effects of biomass allocation in reed canarygrass (*Phalaris arundinacea*). Phi Sigma Research Symposium. Northern Illinois University, Dekalb, IL. May 2004. (*poster*)

Co-Authored Presentations (*Bold indicates presenter, * denotes invited talk, ^ denotes student*)

Sharp, S.J., K.J. Elgersma, J.P. Martina, Y. Yuan, W.S. Currie. Nutrient loading regime determines N and P limitation and alters ecosystem function in simulated coastal wetlands along a climate change gradient. American Geophysical Union Fall Meeting. Virtual. December 2020. (*eLightning Poster*)

^Yuan Y, S.J. Sharp, J.P. Martina, K.J. Elgersma, W.S. Currie. Modeling the effects of nitrogen and hydroperiod on greenhouse gas emissions in Great Lakes coastal wetlands. American Geophysical Union Fall Meeting. Virtual. December 2020. (*Poster*)

Kendall, A.D., M. Battaglia, L.L. Bourgeau-Chavez, W.S. Currie, K.J. Elgersma, D.E. Goldberg, Q.F. Hamlin, D.W. Hyndman, S.L. Martin, J.P. Martina, S.J. Sharp, L. Wan. Connecting landscape-applied nutrients to widespread coastal wetland invasion across the Laurentian Great Lakes. American Geophysical Union Fall Meeting. Virtual. December 2020. (*eLightning Poster*)

Sharp, S.J., ^Y. Yuan, A. Kendall, K.J. Elgersma, S. Martin, L. Wan, J.P. Martina, and W.S. Currie. Mapping watershed nitrogen removal in emergent wetlands of the Great Lakes. The Stewardship Network Conference. East Lansing, MI. January 2020. (*poster*)

Currie, W.S., K.J. Elgersma, J.P. Martina, S.J. Sharp and ^Y. Yuan. Modeling nutrient cycling and retention in wetlands as a simultaneous driver and outcome of ecosystem self-organization. American Geophysical Union Fall Conference, San Francisco, CA. December 2019. (*poster*)

Sharp, S.J., K.J. Elgersma, J.P. Martina, D.E. Goldberg, W.S. Currie. Disentangling interactions of Phragmites invasion, hydrology and nutrient loading helps predict N-removal in freshwater coastal wetlands. Annual Meeting of the Ecological Society of America. Louisville, KY. August 2019. (*oral presentation*)

Currie, W.S., K.J. Elgersma, J.P. Martina, S. Sharp, D.E. Goldberg. Plant functional traits, community composition, and environmental conditions combine to produce ecosystem-level N cycling dynamics in an individual-based model of wetlands. Annual Meeting of the Ecological Society of America. Louisville, KY. August 2019. (*oral presentation*)

^Yuan, Y., S. Sharp, J.P. Martina, K.J. Elgersma, W.S. Currie. Hydroperiod and water levels effects on GHG exchanges in Great Lakes coastal wetlands. Annual Meeting of the Ecological Society of America. Louisville, KY. August 2019. (*poster*)

Bourgeau-Chavez, L.L., W.S. Currie**,** K.J. Elgersma, D.E. Goldberg, D.W. Hyndman, J.P. Martina. Human and environmental effects on Great Lakes coastal ecosystems. NASA Land Cover Land Use Change Program. Rockville, MD. May 2019. (*poster*)

Sharp, S., K.J. Elgersma, J.P. Martina, W.S. Currie, D.E. Goldberg. Hydrologic drivers of N-removal and *Phragmites* invasion of Great Lakes coastal wetlands. The Stewardship Network: Restoring Native Ecosystems Conference. East Lansing, MI. January 2019. (*oral presentation*)

^Jameson, E., K.J. Elgersma, J.P. Martina, D.E. Goldberg. More invasive cattails allocate less to sexual reproduction and are less plastic over nutrient gradients. Annual Meeting of the Ecological Society of America. New Orleans, LA. August 2018. (*poster presentation*)

Goldberg, D.E., E. Batzer, J.P. Martina, K.L. Elgersma. Allocation to clonal growth: approaches and questions. 12th Clonal Plant Symposium. Brunswick, ME. July 2018. (*oral presentation*)

Currie, W.S., J.P. Martina and K.J. Elgersma. The Mondrian model: Introduction of an interactive web-based tool for Great Lakes coastal wetland management and restoration. Presented to the United States Geological Survey. Michigan Tech Research Institute, MI. June 2018. (*oral presentation*)

Currie, W.S., K.J. Elgersma, J.P. Martina, and L.L. Borgeau-Chavez. The Mondrian model: a tool to develop an adaptive management framework to restore invaded wetlands. The Stewartship Network: Restoring Native Ecosystems Conference. East Lansing, MI. January 2018. (*oral presentation*)

Currie, W.S., K.J. Elgersma, J.P. Martina, and L.L. Borgeau-Chavez. The Mondrian model: a tool to develop an adaptive management framework to restore invaded wetlands. International Association of Great Lakes Researchers (IAGLR). Detroit, MI. May 2017. (*oral presentation*)

^Coulter, S., J. Hall and J.P. Martina. Deep sea ocean oil degradation: varying nutrient levels in efforts to increase anaerobic oil degradation rates. OLLU McNair Scholars and Student Research Symposium. San Antonio, TX. April 2017. (*oral presentation*)

^Ramirez, R. and J.P. Martina. Investigating the effects of propagule pressure and biotic resistance on the invasion success of *Typha* x *glauca* across a nitrogen gradient using a simulation model. Society of Wetland Scientists Annual Meeting. Corpus Christi, TX. May-June 2016. (*poster*)

^Ramirez, R. and J.P. Martina. Investigating the effects of propagule pressure and biotic resistance on the invasion success of *Typha* x *glauca* across a nitrogen gradient using a simulation model. OLLU McNair Scholars and Student Research Symposium. San Antonio, TX. April 2016. (*oral presentation*)

Currie, W.S., L.L. Bourgeau-Chavez, K.J. Elgersma, N.H.F. French, D.E. Goldberg, S.K. Hart, D.W. Hyndman, A.D. Kendall, S.L. Martin, J.P. Martina. Nutrient-driven plant invasions in wetlands around the Michigan coastline: Using satellite and field data to test model linkage across scales. Annual Meeting of the Ecological Society of America. Baltimore, MD. August 2015. (*oral presentation*)

Elgersma, K.J., Martina, J.P., Currie, W.S. and D.E. Goldberg. Native wetland plants provide biotic resistance against non-native cattail invasion in oligotrophic and eutrophic wetlands. Annual Meeting of the Ecological Society of America. Baltimore, MD. August 2015. (*poster*)

Elgersma, K.J., Martina, J.P., **Currie, W.S.** and D.E. Goldberg. Assessing ecosystem services provided by restored wetlands under current and future land-use scenarios. UM Water Center Annual Meeting, Ann Arbor, MI. July 2015. (*poster*)

Currie, W.S., L.L. Bourgeau-Chavez, K.J. Elgersma, N.H.F. French, D.E. Goldberg, S. Hart, D.W. Hyndman, A.D. Kendall, S.L. Martin, J.P. Martina. Modeling water levels, nutrient inflows, plant invasions and C storage in coastal Great Lakes wetlands. University of Michigan Biological Station Winter Research Meeting. Ann Arbor, MI. February 2015. (*oral presentation*)

***Currie, W.S.**, L.L. Bourgeau-Chavez, K.J. Elgersma, N.H.F. French, D.E. Goldberg, S. Hart, D.W. Hyndman, A.D. Kendall, S.L. Martin, J.P. Martina. Linking a large-watershed hydrogeochemical model to a wetland community-ecosystem model to estimate plant invasion risk in the coastal Great Lakes region, USA. American Geophysical Union Fall Meeting. San Francisco, CA. December 2014. (*oral presentation*)

Elgersma, K.L., J.P. Martina, W.S. Currie, D.E. Goldberg. Nitrogen loading in Great Lakes coastal wetlands affects N retention, plant community composition, and non-native invasion success. Annual Meeting of the Ecological Society of America. Sacramento, CA. August 2014. (*oral presentation*)

^Batzer, E.E., D.E. Goldberg, J.P. Martina, K.J. Elgersma. Clonal reproduction within Cyperaceae: Allocation, translocation, and response to nutrient availability. Annual Meeting of the Ecological Society of America. Sacramento, CA. August 2014. (*poster*)

Elgersma, K.L., **J.P. Martina**, W.S. Currie, D.E. Goldberg. Assessing ecosystem services provided by restored wetlands under current and future climate and land-use scenarios. University of Michigan Water Center Annual Meeting, Ann Arbor, MI. June 2014. (*poster*)

Elgersma, K.L., J.P. Martina, W.S. Currie, D.E. Goldberg. Effect of nutrients on invasive wetland plant establishment and competition between native and invasive plants. 3rd Annual Winter Research Meeting, U of M Biological Station, Ann Arbor, MI. February 2014. (*oral presentation*)

Elgersma, K.L., J.P. Martina, W.S. Currie, D.E. Goldberg. Wetland responses to nutrient inputs: community composition, nutrient retention, and invasion risk. 98th Annual Meeting of the Ecological Society of America. Minneapolis, MN. August 2013. (*poster*)

Currie, W.S., D.E. Goldberg, J.P. Martina. Exploring interwoven cause and effect in nutrient cycling, plant size, and invasion success in a wetland community-ecosystem model. Society of Wetland Scientists North Central Chapter Meeting. Indiana Dunes National Lakeshore, IN. September 2012. (*oral presentation*)

***Goldberg, D.E.**, K.J. Elgersma, W.S. Currie, J.P. Martina. Building an integrated program to understand wetland plant invasions. Society of Wetland Scientists North Central Chapter Meeting. Indiana Dunes National Lakeshore, IN. September 2012. (*oral presentation*)

von Ende, C.N. and J.P. Martina. Highly plastic response in morphological and physiological traits to light, soil-N and moisture in the model invasive plant, *Phalaris arundinacea*. Wisconsin Wetland Association's 17th Annual Wetland Conference. Lake Geneva, WI. February 2012. (*poster*)

Webinars and Other Online Products

Martina, J.P., Currie, W.S., and K.J. Elgersma. A primer on the user-friendly Mondrian model for wetland ecology and invasive species management. Hosted by the Great Lakes *Phragmites* Collaborative. July 2018. https://www.greatlakesphragmites.net/resources/webinars/

Phragmites Management Look-Up Table: A Tool for *Phragmites* Adaptive Management Strategies. Developed by the Mondrian Team. https://sites.google.com/uni.edu/phragmiteslookuptable

Mentoring and Supervising Experience

Graduate Students Advised
Tilak Chaudhary (Ph.D. Student)
Megan Herod (M.S. Student, thesis)
Brianna Fogel (M.S. Student, thesis)
Traci Foulkes (M.S. Student, thesis)
Jenna DeMent (M.S. Student, thesis)
Anthony Omofoma (M.S. Student, non-thesis) – Graduated Fall 2021

Graduate Student Thesis Committee Member
Alexandra Salinas (M.S. Student)
Kristen K. Sustaita (M.S. Student)
Shelby Conway (M.S. Student)
Emily Lorkovic (M.S. Student)
Joseph Plappert (M.S. Student) – Graduated Fall 2021

Michael McClellan (M.S. Student, non-thesis) – Graduated Fall 2021

Undergraduate Research Project Advisor (TXST-BIO 4299)
Sydney Scace (current)
Alex Badgwell (graduated Spring 2021)
Ryan Kridler (graduated Fall 2021)

Current Texas State University Undergraduate Students
Alex Badgwell, Ryan Kridler, Sydney Scace, Emily Horan, Andrew Martinez, Courtney Velasquez

Past Texas State University Undergraduate Students
James Caulfield (2020-2021)
Sabrina Sanders (2020-2021)
Claudia Arias (2020)
David Molnar (2019-2020)
Jair G-Aviles (CoSE Undergraduate Research Program, 2020)

Texas A&M University
Research Assistants (November 2017 – August 2019). I supervised four undergraduates, Grace Vielleux, Ryan Doner, Michael Behrendt, and Aaron Banks, in modelling management scenarios associated with Great Lakes coastal wetlands research.

Our Lady of the Lake University
Undergraduate Capstone Project (May 2015 - May 2017). I mentored three senior undergraduates (Ramiro Ramirez (2015), Danielle Herrera (2015), and Sydney Coulter (2016)) in independent research on invasive plant ecology and oil degradation by microbes.

Independent Study Mentorship Program at John Jay High School (August 2015-May 2016). I mentored Carter Guffey (Senior, JJHS) in independent research using a greenhouse study to examine the effects of crop plant biodiversity on ecosystem function.

Honors Capstone Thesis (January – May 2016). I was the faculty advisor for Valarie Villarreal's senior honors thesis, titled "The Unknown Future of the Banana".

University of Michigan
Full-time and Part-time Research Assistants (May 2012 – August 2014). I supervised Derek Ager, Evan Batzer, Hannah Reses, Jerry Tyrell, and Paige Meyers in field and lab techniques associated with Great Lakes coastal wetlands research (postdoctoral research).

Michigan State University
Undergraduate Field and Lab Assistants (May 2010 – January 2012). I supervised Matt Chansler, Matt Kolp, and Claire Taylor (undergraduates, Plant Biology) in field and lab techniques associated with inland wetlands research (dissertation project).

Undergraduate Field and Lab Assistant (May 2009-May 2010). I mentored Ryan O'Connor (undergraduate, Zoology) in independent research and lab and field techniques.

Undergraduate Senior Project (August 2007-May 2009). I mentored two senior undergraduates (Colin Phillippo and Spencer Rubin) in the Department of Plant Biology in independent research in both field and laboratory techniques leading to the completion of their senior projects.

Program for Undergraduate Research in the Life Sciences (PURL) (August 2007-May 2008). I mentored seven undergraduates who rotated through the Turetsky lab (MSU) in wetland biogeochemistry techniques, as well as basics in scientific methodology and inquiry.

University Service

Strategic Planning Committee – Department of Biology, TXST, 2021
Graduate College's Outstanding Thesis Award Committee in the Life Sciences, TXST, 2021
Environment and Sustainability Committee, Faculty Senate Committee, TXST, 2021
Greenhouse Committee, Department of Biology, TXST, 2021
Faculty reviewer for the Undergraduate Research Fellowship program, TXST, 2019-2021
Women in Science and Engineering (WiSE) poster judge, TXST, 2020
Faculty advisor for *Ecology and Evolutionary Biology Independent Student Organization*, a TAMU graduate student organization, 2017 - 2019
Faculty advisor for *Earth Club*, an OLLU student organization, 2015-2016
Honors Faculty Council, Our Lady of the Lake University, 2014-2016
Alternate, Westside Creeks Restoration Oversight Committee, San Antonio River Authority, 2014-2016
Panelist, Professional Development Series: Exploring Academic Publishing, OLLU, February 10, 2015
Graduate Student Organization (Plant Biology) Treasurer, MSU, 2009-2012
Dean's Student Advisory Council Plant Biology Representative, MSU, 2008-2009
Graduate Student Organization (Plant Biology) President, MSU, 2007- 2008
Biogeochemistry Environmental Research Initiative (BERI) Coordinator, MSU, 2007-2008

Major University Coordinating Activities

Texas A&M University

EEB Core Modules (EEBL 601-608)	2017 – 2019
Open Source for Open Science Workshop	2016 – 2019
EEB Recruiting Weekend	2016 – 2019
EEB and ABS Seminar Series	2016 – 2019
Darwin Day	2016 – 2019
4th Southeast Texas Evolutionary Genetics and Genomics Symposium	2019

Professional Service and Membership

Manuscript Reviewer for *Freshwater Biology*, *Science of the Total Environment*, *Plant Ecology, Ecology and Evolution*, *Ecological Applications*, *Biogeochemistry, Nature – Scientific Reports, PLOS ONE*, *New Phytologist, Oecologia, Ecosphere, Chemistry and Ecology*, *Geoderma, Aquatic Sciences, Weed Research, Flora, Soil Science Society of America Journal, Ecological Engineering, Restoration Ecology*

External Proposal Reviewer for the French National Research Agency (ANR) "Terre vivante"– 2021
Proposal Review Panel Participant for DOE Environmental System Science – 2021
External Proposal Reviewer for Graduate Women in Science Fellowships – 2018, 2019
External Proposal Reviewer for NSF Division of Environmental Biology – Ecosystems 2017
External Proposal Reviewer for Maryland Sea Grant College Program 2015

Conference symposia/sessions organized:

- American Geophysical Union 2020 Annual Conference Session titled: Understanding impacts of climate, land use, and hydrologic linkages from the land to the shore on coastal ecology
- Society of Wetland Scientists 2016 Annual Conference Symposium titled: Ecosystem management impacts on biogeochemical cycling in wetlands

Society of Wetland Scientists (Member)
Served as Chair of the Biogeochemistry Section from 2014-2017
Society for Ecological Restoration (Member)
Ecological Society of America (Member)
American Geophysical Union (Member)
Sigma Xi (Full member)
Phi Kappa Phi (graduate, MSU Chapter)
Golden Key International Honour Society (graduate, MSU Chapter)
Golden Key International Honour Society (undergraduate, NIU Chapter)

Appendix M6 | **Adaptive Management Science Committee Meeting Materials**

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Science Committee

Tuesday, February 15, 2022 | **9:00 AM** | **Web Conference**

A meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Program Announcements

3.1

- Hydrologic update
- EAHCP Permit Renewal update

4. Approval of Minutes

4.1 **Approval of previous Committee meeting minutes.**

- September 15, 2021

5. Reports

5.1 **Receive report from Hakan Basagaoglu, EAA Senior Modeler, on the published report: "Explainable AI reveals new hydroclimatic insights for ecosystem-centric groundwater management."**

5.2 **Receive report from Chad Furl, Chief Science Officer, on the Springflow Habitat Protection Work Group proceedings related to EAHCP low-flow environmental monitoring programs.**

5.3 **Receive report from Chad Furl, Chief Science Officer, on the Springflow Habitat Protection Work Group proceedings related to the performance of EAHCP water quality modeling during 2014 low flow periods.**

6. Future Meetings

7. Questions from the Public

8. Adjourn

Kristina Tolman
Habitat Conservation Plan Coordinator

This meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.9.3 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Science Committee

Tuesday, February 15, 2022 | **9:00 AM** | **Web Conference**

A meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chad Furl, EAHCP Chief Science Officer, called the meeting to order at 9:00 AM. Committee Members Present: Tom Arsuffi, Janis Bush, Jacquelyn Duke, Charles Kreitler, Conrad Lamon, Chad Norris, Butch Weckerly, and Jack Sharp.

2. Public Comment

There were no citizens who requested to address the Science Committee.

3. Program Announcements

3.1

- Hydrologic update
- EAHCP Permit Renewal update

4. Approval of Minutes

4.1 **Approval of previous Committee meeting minutes.**

- September 15, 2021

A motion was made by Tom Arsuffi, seconded by Janis Bush, to approve the meeting minutes from September 15, 2021.

5. Reports

5.1 **Receive report from Hakan Basagaoglu, EAA Senior Modeler, on the published report: "Explainable AI reveals new hydroclimatic insights for ecosystem-centric groundwater management."**

Hakan Basagaoglu presented an overview of the preliminary results of the ecosystem-centric groundwater modeling that uses artificial intelligence modeling to predict future J17 index well levels. Members discussed the difficulty in predicting

future precipitation conditions and projecting to groundwater levels.

5.2 Receive report from Chad Furl, Chief Science Officer, on the Springflow Habitat Protection Work Group proceedings related to EAHCP low-flow environmental monitoring programs.

Chad Furl presented an overview of the current low-flow environmental monitoring program. This presentation is in response to low-flow monitoring questions that were prioritized by the Springflow Habitat Protection Work Group. Their concerns centered around monitoring and identification of springs that will continue to flow during low-flow conditions and whether changes in water quality from low-flow impact aquatic vegetation. Currently, the low-flow monitoring program includes surveys of Comal Spring Run discharge, Landa Lake flow partitioning, and habitat evaluations.

Members discussed that there is a need to know if the springs that continue to flow during low-flow are occupied by the endangered species, however, they agreed the current equipment and methodology is generally sufficient. Members supported the recommendation to improve the low-flow monitoring by collecting the Comal Spring Run and Landa Lake flow measurements at the same time, twice a month during critical periods and to consider ways to improve flow monitoring in the San Marcos Springs system.

5.3 Receive report from Chad Furl, Chief Science Officer, on the Springflow Habitat Protection Work Group proceedings related to the performance of EAHCP water quality modeling during 2014 low flow periods.

Chad Furl has received the engineering reports related to the hydraulic infrastructure of Landa Lake and will discuss the related items with the Science Committee in April.

6. Future Meetings

The next meeting of the Science Committee will be on April 27, 2022.

7. Questions from the Public

There were no comments from the public.

8. Adjourn

There being no business to discuss, the meeting adjourned at 11:45 AM.

Kristina Tolman
Habitat Conservation Plan Coordinator

This meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.9.3 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Science Committee

Wednesday, April 27, 2022 | **9:00 AM** | **The Meadows Center**

A meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Program Announcements

3.1

- Hydrologic update
- Science Committee Membership
- Science Committee Vacancy Work Group
- Technical Services for USFWS ITP Renewal Application Contract

4. Approval of Minutes

4.1 **Approval of previous Science Committee meeting minutes.**

- February 15, 2022

5. Reports

5.1 **Receive report from Chad Furl, EAHCP Chief Science Officer, on amendments to the Biological Monitoring Program.**

5.2 **Receive report from Chad Furl, EAHCP Chief Science Officer, on the 2023 Edwards Aquifer Authority Work Plan.**

5.3 **Receive report from Melani Howard, City of San Marcos Habitat Conservation Plan Manager, on the 2023 City of San Marcos Work Plan.**

5.4 **Receive report from Mark Enders, City of New Braunfels Watershed Program Manager, on the 2023 City of New Braunfels Work Plan.**

5.5 **Receive report from Chad Furl, EAHCP Chief Science Officer, on the performance of EAHCP water quality modeling during 2014 low-flow periods.**

6. Individual Consideration

6.1 **Receive report from Melani Howard, City of San Marcos Habitat Conservation Plan Manager, and consider recommendation to approve routine adaptive management to add additional native aquatic plants to the list of submerged aquatic vegetation restoration plants.**

7. Future Meetings

8. Questions from the Public

9. Adjourn

Kristina Tolman
Habitat Conservation Plan Coordinator

This meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.9.3 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Science Committee

Wednesday, April 27, 2022 | **9:00 AM** | **The Meadows Center**

A meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chad Furl, EAHCP Chief Science Officer, called the meeting to order at 9:00 AM. Committee Members Present: Tom Arsuffi, Jacquelyn Duke, Charles Kreitler, Conrad Lamon, Chad Norris, Butch Weckerly, and Jack Sharp. Janis Bush was unable to attend.

2. Public Comment

There were no citizens who requested to address the Science Committee.

3. Program Announcements

3.1

- Hydrologic update
- Science Committee Membership
- Science Committee Vacancy Work Group
- Technical Services for USFWS ITP Renewal Application Contract

Hydrologic update
Current hydrologic conditions are below long-term averages for this time of year. Recharge for calendar year 2021 was provided by the USGS and amounts were below average. There will be no ASR forbearance in 2023. Low water levels could potentially trigger VISPO programs in October. The region is approximately 5-7 inches below the average precipitation.

Science Committee Membership
Chad Furl introduced the newest member of the Science Committee, Nathan Bendik. Nathan is a salamander expert that works for the City of Austin in the Watershed Protection Department, he has almost two decades of experience with central Texas salamanders.

Science Committee Vacancy Work Group
The Work Group is seeking two new members to fill the positions vacated by Glenn Longley and Jackie Poole. New members will be appointed by the Stakeholder Committee in October. Members discussed a need for the following expertise: fish, hydrological modeling, climate change, land-use planning, or submerged aquatic

vegetation.

Technical Services for USFWS ITP Renewal Application Contract
ICF has been contracted by EAA to assist with a 6-year process to renew the Incidental Take Permit (ITP). The first phase of permit renewal starts with the "Listen and Learn" workshops. These Work Shops will cover four topics: permit renewal approach, biological goals and objectives, climate change, and conservation measures.

4. Approval of Minutes

4.1 Approval of previous Science Committee meeting minutes.

- February 15, 2022

A motion was made by Jack Sharp, seconded by Jacquelyn Duke, to approve the meeting minutes from February 15, 2022.

5. Reports

5.1 Receive report from Chad Furl, EAHCP Chief Science Officer, on amendments to the Biological Monitoring Program.

The Springflow Habitat Protection (SHP) Work Group prioritized several questions related to data collection and monitoring plans during low-flow conditions. Chad Furl presented an overview of the SHP Work Group monitoring questions and how the biological monitoring program currently addresses, or will be amended to address, the SHP questions.

5.2 Receive report from Chad Furl, EAHCP Chief Science Officer, on the 2023 Edwards Aquifer Authority Work Plan.

Chad Furl presented an overview of the 2023 Edwards Aquifer Authority Work Plan which includes operations related to the refugia program, VISPO, ASR leasing and forbearance, water quality monitoring, biological monitoring, applied research and program administration.

5.3 Receive report from Melani Howard, City of San Marcos Habitat Conservation Plan Manager, on the 2023 City of San Marcos Work Plan.

Melani Howard presented an overview of the 2023 City of San Marcos (COSM) Work Plan activities. Featured activities included Texas wild-rice (TWR) enhancement, non-native plant management, management of floating plant mats and littler, control of non-native species, native riparian restoration, management of recreation in key areas, impervious cover and water quality protection, and HHW management.

There will be no active planting of TWR in 2023, TWR has not been planted between Spring Lake Dam to IH-35 since 2017. COSM was awarded a grant from the Army Corps of Engineers that covered planting of TWR below IH-35. COSM also received additional grants for native riparian restoration. Sessom Creek bank stabilization has started and work will continue into 2023. COSM is relocating wastewater lines that were exposed above the creek, HCP work will cover stabilization of highly eroded parts of

the creek and help reduce sediment transport and deposition in the San Marcos River.

5.4 Receive report from Mark Enders, City of New Braunfels Watershed Program Manager, on the 2023 City of New Braunfels Work Plan.

Mark Enders presented an overview of the 2023 City of New Braunfels (CONB) Work Plan. Featured activities included Old Channel flow split management, aquatic vegetation restoration and maintenance, non-native animal species control, gill parasite monitoring, litter and floating vegetation management, native riparian habitat restoration, and impervious cover and water quality protection.

5.5 Receive report from Chad Furl, EAHCP Chief Science Officer, on the performance of EAHCP water quality modeling during 2014 low-flow periods.

Chad Furl presented an overview of the performance of EAHCP water quality modeling during 2014 low-flow period. The Spring flow Habitat Protection Work Group requested that the EAHCP examine the performance of the QUAL2E water quality model during drought conditions in 2014. The study found that the Hardy model overestimates maximum temperatures and underestimates dissolved oxygen. Overall, this study found that environmental conditions for fountain darters were resilient during the 2014 period.

6. Individual Consideration

6.1 Receive report from Melani Howard, City of San Marcos Habitat Conservation Plan Manager, and consider recommendation to approve routine adaptive management to add additional native aquatic plants to the list of submerged aquatic vegetation restoration plants.

Melani Howard presented a routine adaptive management request to the Science Committee to add two new native aquatic species, Heteranthera dubia (stargrass) and Myriophyllum heterophyllum, as acceptable species for submerged aquatic vegetation restoration for fountain darter habitat in the San Marcos River. Recent monitoring has shown a reduction in the biological diversity of native aquatic vegetation within the San Marcos River, adding these species will help improve diversity and establishment of fountain darter habitat in the San Marcos River. Melani presented results from a recent study that assessed competition between stargrass, Texas wild-rice (TWR), and Hydrilla. Results showed that stargrass did not out-compete TWR and reduced the growth of Hydrilla. Some members expressed concerns that stargrass grows too aggressively and may out-compete other native plants, thus reducing biodiversity. One member noted removal efforts of stargrass in a different river due to the species displacing other natives and creating a monoculture.

Citing concerns for expansion of Heteranthera dubia and loss of biodiversity, the Committee was reluctant to recommend Heteranthera dubia for planting. Members decided to postpone the motion to recommend adding the new species to the list of submerged aquatic vegetation restoration plants.

7. Future Meetings

The next meeting of the Science Committee will be on September 15, 2022.

8. Questions from the Public

There were no comments from the public.

9. Adjourn

There being no business to discuss, the meeting adjourned at 12:10 PM.

Kristina Tolman
Habitat Conservation Plan Coordinator

This meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.9.3 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Science Committee

Wednesday, September 14, 2022 | **9:00 AM** | **The Meadows Center**

A meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Program Announcements

4. Approval of Minutes

4.1 **Approval of previous Committee meeting minutes.**

- April 27, 2022

5. Reports

5.1 **Receive report from Chad Furl, EAHCP Chief Science Officer, on the proposed schedule and planned activities regarding springflow projections for the Permit Renewal effort.**

5.2 **Receive report from Kristy Kollaus Smith, EAHCP Environmental Scientist, on 2023 submerged aquatic vegetation Applied Research activities.**

6. Individual Consideration

6.1 **Receive report from Melani Howard, City of San Marcos Habitat Conservation Plan Manager, and consider recommendation to approve routine adaptive management to add additional native aquatic plants to the list of submerged aquatic vegetation restoration plants.**

7. Future Meetings

8. Questions from the Public

9. Adjourn

Kristina Tolman
Habitat Conservation Plan Coordinator

This meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.9.3 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

Meeting Minutes

EAHCP Science Committee

Wednesday, September 14, 2022 | **9:00 AM** | **The Meadows Center**

A meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

Chad Furl, EAHCP Chief Science Officer, called the meeting to order at 9:00 AM. Committee Members Present: Jacquelyn Duke, Tom Arsuffi, Charles Kreitler, Conrad Lamon, Chad Norris, Butch Weckerly, Jack Sharp, and Nate Bendik. Janis Bush was unable to attend.

2. Public Comment

Dianne Wassenich invited committee members to join her and other EAHCP stakeholders at the Gruene Grove on Tuesday, October 4, 1:00 - 3:00 PM to celebrate Robert Gulley and Jim Bower's new books.

3. Program Announcements

Science Committee members recommended that Robert Mace, Texas State University representative on the Implementing Committee, meet with the new President of Texas State University to inform him of the EAHCP Program and Incidental Take Permit commitments.

4. Approval of Minutes

4.1 Approval of previous Committee meeting minutes.

- April 27, 2022

A motion was made by Jack Sharp and was seconded by Chad Norris to approve the April 27th Meeting Minutes. There were no objections.

5. Reports

5.1 Receive report from Chad Furl, EAHCP Chief Science Officer, on the proposed schedule and planned activities regarding springflow projections for the Permit Renewal effort.

Chad Furl, EAHCP Chief Science Officer, presented the proposed schedule and planned activities regarding springflow projections for renewal of the Incidental Take Permit. Future springflow projections are being generated in support of the application for the next iteration of the EAHCP Incidental Take Permit. The Permit Renewal process is being led by the consultant group ICF. Adrienne Wootten, Research Scientist at South Central Climate Adaptation Science Center, will present at the next Science Committee meeting regarding future climate downscaling efforts across the Edwards Aquifer region. These downscaling efforts will be used to develop future springflow projections that are being generated in support of the application for the next iteration of the EAHCP Incidental Take Permit.

5.2 Receive report from Kristy Kollaus Smith, EAHCP Environmental Scientist, on 2023 submerged aquatic vegetation Applied Research activities.

Kristy Kollaus Smith, EAHCP Environmental Scientist, presented the 2023 submerged aquatic vegetation Applied Research. The study will analyze standing crop biomass and productivity of Vallisneria sp. in Landa Lake per the recommendation of the Springflow Habitat Protection Work Group to assess vegetative die off in Landa Lake during low-flow conditions. Vallisneria was chosen due to its abundance in Landa Lake and will provide a benchmark for average to low-flow conditions. Science Committee members will be provided an opportunity to comment on the proposed study, the request for proposals period will be this November through December, and the study is anticipated to begin next February through December 2023.

6. Individual Consideration

6.1 Receive report from Melani Howard, City of San Marcos Habitat Conservation Plan Manager, and consider recommendation to approve routine adaptive management to add additional native aquatic plants to the list of submerged aquatic vegetation restoration plants.

Melani Howard, City of San Marcos Habitat Conservation Plan Manager, requested that the Science Committee approve a recommendation to the Implementing Committee to consider the addition of Heteranthera dubia and Myriophyllum heterophyllum as acceptable species for submerged aquatic vegetation restoration for fountain darter habitat in the San Marcos River.

At the April Science Committee meeting, members were reluctant to approve Heteranthera dubia and had expressed concern for the potential invasiveness of Heteranthera dubia. To address their concerns, Melani presented an overview of the historical spatial distribution of the species in the San Marcos River which showed it has not significantly displaced the distribution of other native aquatic plants, including the endangered Zizania texana, also known as Texas wild-rice. Initial plantings of both species will occur in the IH-35 long-term biological monitoring reach so that the distribution of both species will be mapped in Spring and Fall as part of the Biological Monitoring program.

A motion was made by Jacquelyn Duke and was seconded by Chad Norris to approve the new species for aquatic vegetation restoration. There were no objections.

7. Future Meetings

The next meeting of the Science Committee will be on November 9, 2022 at The Meadows Center for Water and the Environment.

8. Questions from the Public

There were no comments from the public.

9. Adjourn

There being no business to discuss, the meeting adjourned at 11:51 AM.

Kristina Tolman
Habitat Conservation Plan Coordinator

This meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.9.3 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Edwards Aquifer Authority

900 E. Quincy
San Antonio, TX 78215
EdwardsAquifer.org

NOTICE OF OPEN MEETING

EAHCP Science Committee

Wednesday, November 9, 2022 | **9:00 AM** | **The Meadows Center**

A meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan will be held on the date, time, and location stated above.

AGENDA

1. Call to Order

2. Public Comment

3. Program Announcements

3.1

- New Science Committee Members
- Hydrologic Update
- VISPO Update
- National HCP Coalition Meeting
- Spring Communities Update

4. Approval of Minutes

4.1 **Approval of previous Committee meeting minutes.**

- September 14, 2022

5. Reports

5.1 **Receive report from Adrienne Wootten, Research Scientist with the South Central Climate Adaptation Science Center, to the Science Committee on the ongoing future climate downscaling effort that will be used in hydrologic predictions for the renewal of the EAHCP Incidental Take Permit.**

5.2 **Receive report from Chad Furl, EAHCP Chief Science Officer, to the Science Committee on the proposed Biological Objectives Work Group as part of the EAHCP Incidental Take Permit Renewal.**

6. Individual Consideration

7. Future Meetings

8. Questions from the Public

9. Adjourn

Kristina Tolman
Habitat Conservation Plan Coordinator

This meeting of the Science Committee of the Edwards Aquifer Habitat Conservation Plan complies with Section 7.9.3 of the Funding and Management Agreement (FMA), an interlocal agreement made pursuant to Texas Government Code Chapter 791 by and among the Edwards Aquifer Authority (EAA), the City of New Braunfels (New Braunfels), the City of San Marcos (San Marcos), the City of San Antonio acting by and through its San Antonio Water System (SAWS), Texas State University, and the Guadalupe-Blanco River Authority (GBRA).

Appendix M7 | **Comal Springs Riffle Beetle Work Group Meeting Materials**

Charge of the Comal Springs Riffle Beetle (CSRB) Work Group

Overview

As part of regular execution of the Edwards Aquifer Habitat Conservation Plan (EAHCP), multiple activities require physical sampling or removal of the CSRB in its habitat. A Work Group is being formed to provide input on a specific set of questions concerning management of the CSRB as part of implementation of the EAHCP.

Background

The EAHCP mandates Applied Research, Biological monitoring, and Refugia programs; all of which require in situ sampling or removal of the CSRB from the Comal system. The Biological Monitoring program (Biomonitoring) has sampled the CSRB at least twice annually at three locations since 2004. The Applied Research program has required some removal of the CSRB since 2013 to conduct ex situ experiments. The Refugia program has required regular removal of the beetle since 2016.

Historically, the CSRB have been captured (for sampling or removal) using a passive cotton lure methodology. Results from cotton lure samples as part of Biomonitoring are used in part to examine the CSRB LTBGs provided in the HCP. These LTBGs are written as number of CSRB per lure at three Comal locations, and to obtain silt-free gravel and cobble substrate (90%) at the locations. During the review of the EAHCP, the National Academies of Science expressed concern over the use of the cotton lure approach for monitoring the beetle. Additionally, members of the EAHCP Adaptive Management Science Committee have raised concern over the appropriateness of the cotton lure methodology and CSRB LTBGs.

Creation

The HCP Program Manager and the Science Committee jointly determined to create a Comal Springs Riffle Beetle Work Group comprised of members from the Science Committee as well as external experts to examine questions regarding the EAHCP handling of the CSRB.

Charge

The Work Group's charge consists of examining questions related to three primary areas 1). sampling methodology, 2). field activities, and 3). EAHCP LTBGs.

1. Cotton lure sampling methodology

Is the current cotton lure sampling methodology an appropriate means to monitor abundance at a locale?

If not, what sampling methodologies exist that would provide a better proxy of abundance at a locale?

If the previous two questions cannot be adequately answered without additional study, what would be an appropriate study to answer the questions?

2. ***Biological monitoring, Refugia collections, and Applied Research collections***

What changes are recommended for the Biological monitoring sampling program? What are the stated goals behind those changes?

What changes are recommended for Refugia removal efforts? What are the stated goals behind those changes?

Are the current and proposed levels of physical activity in the CSRB habitat protective of the species? If not, what level of activity is appropriate?

3. ***Long-term biological goals***

Are the current population and habitat LTBGs for the CSRB appropriate? What are the criteria for more appropriate goals?

What is an appropriate means to monitor the habitat quality goal?

How can Biological monitoring, Refugia efforts, and Applied Research studies be used to establish new LTBGs?

Administration

The Work Group will meet on an as needed basis. The recommendations of the Work Group will be reported in the form of a written report and communicated to the full Science Committee. The Work Group will consist of the following members:

- Conrad Lamon (SC)
- Chad Norris (SC & GBRA)
- David Britton (USFWS)
- Floyd Weckerly (SC)
- Tom Arsuffi (SC)

NOTICE OF OPEN MEETING
Available at eahcp.org

As approved by the Edwards Aquifer Habitat Conservation Plan (EAHCP) Science Committee, the Comal Springs Riffle Beetle (CSRB) Work Group has been formed to provide input on a specific set of questions concerning management of the CSRB as part of implementation of the EAHCP. An online meeting of this Work Group for the EAHCP is scheduled for **May 27th, 2022, at 2:00 p.m. on Microsoft Teams.**

Microsoft Teams meeting
Join on your computer or mobile app
Click here to join the meeting
Or call in (audio only)
+1 210-729-0064,,514095242# United States, San Antonio
Phone Conference ID: 514 095 242#

1. Call to order--Establish that all Work Group members are present – 2:00 p.m.

2. Public Comment.

3. Discussion on the study design for the CSRB distribution and abundance survey in Landa Lake.

4. Questions from the public.

5. Adjourn.

Meeting Minutes

As approved by the Edwards Aquifer Habitat Conservation Plan (EAHCP) Program Manager and Science Committee, the Comal Springs Riffle Beetle (CSRB) Work Group was formed to provide input on a specific set of questions concerning management of the CSRB as part of implementation of the EAHCP. An online meeting of this Work Group for the EAHCP occurred **May 27th, 2022, at 2p.m. on Microsoft Teams.**

1. Call to order--Establish that all Work Group members are present – *2:00pm. All members present, excluding David Britton.*

2. Public Comment. – *No comment from the public.*

3. Discussion on the study design for the CSRB distribution and abundance survey in Landa Lake.

   Dr. Ely Kosnicki from BIO-WEST presented over modifications to the proposed methods for the CSRB distribution and abundance survey. These revisions were based upon additional research and method testing since the December 2021 CSRB work group meeting. Below are the proposed revisions.

   Field sampling procedures:

   Landa Lake will be divided into four subpopulations and 50 randomly selected sites and 30 biomonitoring sites will be separated proportionally to the number of springs found in each subpopulation for a total of 80 sites. The use of the 30 biomonitoring sites is a new adjustment to the methods. The justification is to minimize the amount of disturbance to the CSRB population in Landa Lake.

   Dr. Kosnicki has also been ground truthing the randomly selected cotton lure locations to ensure that the sites have springs flowing. Therefore, some sites might be relocated to have spring flow at each lure location. To measure flow, they will do an area flow measurement to get a better idea of flow coming from each spring location.

   Dr. Kosnicki discussed lure efficacy by looking to assess the number of beetles a micro area. He would do this by placing five lures in a location and could do this repeatedly to see if there is any consistency. Conrad Lamon asked about locations and Dr. Kosnicki mentioned most sites are at spring tagged locations but there are some springs that do not have tags because they are not along margin habitats and in deeper water. They will use GPS to go to the same

location as well as some type of marker. Conrad suggested using distance between sites to look at spatial variability to relate that to the micro lure efficacy study. Chad Norris mentioned that the spring database has distances between tagged springs so if tags are missing, so spring sites can still be located. Chad Norris suggested to use markers in the deeper spring locations that do not have tags. Conrad would like the deeper spring locations to be added to the on-going CSRB database.

Statistical Analysis methods:

Dr. Kosnicki discussed issues with using an N mixture model due to the life history of the CSRB. Therefore, he suggested to use General linear mixed (GLM) models. Kyle Sullivan, also employed with BIO-WEST, discussed GLM models and what metrics would be used in the models. They will complete exploratory models to refine statistical models and variables. Conrad suggested to add error distributions into the variables in the predictive model as well. They will fit and validate the models by running diagnostics and will complete uncertainty checks and then provide model interpretation. Nathan Bendik asked how GLM solve the problem of the N-mixture model? Andy Royle from USGS mentioned that the problem with N-mixture models in this population is true replication that he believes is not possible with this species and the method of collection. The GLM does not need the replication, which is the advantage of these models. N-mixture models are also sensitive to over dispersion whereas GLM does not have the same number of issues.

With the change in analysis, Dr. Kosnicki proposed two different sampling schedules:

Sample A: Four sampling events over 11-month period between Sept 2022 and end Aug 23
Sample B: Four sampling events based on biomonitoring schedule so Sept 2022 through May 2024

Chad Furl asked if there would be a substantial difference in analysis? Dr. Kosnicki said if sampling is too close, then there may be an effect but if they were further apart, you have less of a chance of collecting the same individuals. A discussion for sampling schedule A versus B was made among CSRB work group members. Andy Royle mentioned one benefit of having sampling schedule A, it could lead to better performance of a potential N-mixture but if we are going with GLMs, then there is no need for schedule A. Chad Norris suggests schedule B would be the better option since it gives you more time to sample and less impact by using biomonitoring sampling locations. Chad Furl brought up the questions about whether sampling should be completed under stable flows instead of sampling during drought conditions. Tom Arsuffi suggested sampling occurs with spring variability and Chad Norris suggested the same to look at how flows effect CSRB distribution. After discussion, the selection was to go with schedule Sample B that would follow biomonitoring sampling schedule.

Another discussion question brought up by Chad Furl was the number of beetles collected at a time per lure that will be used as part of the EA Refugia genetic study that is occurring concurrently with the CSRB population survey. Given that we are going with Sample Schedule B, Tom Arsufii suggested collecting 25% on lures with eight or less. Kathrine Bockrath, lead

EA Refugia biologist, would like four beetles per lure to adequately compare genetics and two beetles could be collected at a time but ideally, all four beetles would be collected at one time. Some validation will be completed prior to this fall to get a clearer idea of how many beetles are needed at one time.

4. Questions from the public. – *No questions from the public.*

5. *Adjourned at 3:30pm.*

Comal Springs Riffle Beetle Population Assessment Work Plan
Contract 21-019-TES (May 2022)

Biological considerations

Comal Springs riffle beetle, (CSRB) *Heterelmis comalensis*, is found at surficial interfaces where springs are active at the Comal Springs. Our current life-history knowledge indicates that larvae take 9 – 11 months to reach maturity in captivity (BIO-WEST 2017). Wild caught adults may live over a year in captivity, but often do not live as long (Fries 2003) and captive reared adults rarely live to one year old (personal observations). Females produce eggs soon after becoming adults and are iteroparous (Kosnicki 2022). Therefore, new breeding cohorts can be expected within less than one year and interbreeding among cohorts is possible. These life-history aspects complicate mark and recapture methods, assumptions of N-mixture models, and other census methods. However, we can assume that each population census is a representation of the population size and distribution at the time of that census and if surveys are conducted far enough apart, sampling the same individuals is highly unlikely.

Field sampling design

Sample sites

Sampling will be conducted over three of the sub-populations as recognized by Lucas et al. (2016) plus the headwaters area of Comal Springs. The Spring Run 2 area will not be sampled since there are few springs along this reach and since it will be under recovery from restoration activities. Sampling will include the 30 designated sites that are used for the Edwards Aquifer Habitat Conservation Plan (EAHCP) bi-annual biological monitoring. In addition, 50 randomly selected springs from each sub-population area have been selected to represent roughly 20% of the mapped springs designated by TPWD (**Map 1**). The areas and number of sites has been selected as follows:

Spring Run 1: 10 sites
Spring Run 3: 20 (including 10 biomonitoring sites)
Western shoreline + Spring Island + Backwater: 42 (including 20 biomonitoring sites)
Spring Run 4 + Spring Run 5 + Comal headwaters + Blieder's Creek: 8 sites

Upwelling and margin habitats

Springs types will be divided into upwellings and margin spring habitats. After discussions with Marcus Gary (Edwards Aquifer Authority), it was clear that flow measures from these should be considered separately (see *Flow index measures* below). Upwellings are represented by spring flow that is vertical in direction, originating from "alluvial clusters" or karst orifices. A specific unit of area around this spring-type will be used to record flow as a means of standardizing flow measures. Margin spring habitats will be associated with more horizontal flows where the area of spring activity will be measured.

Flow index measures

A flow index will be based on velocities measured over the area around the lure. For upwelling habitats, a "bucket flow-measuring device" will be used to isolate flow from spring upwellings, incorporating a 660 cm^2 area. The bucket flow-measuring device (BFMD) will consist of an inverted 5-gal bucket with the bottom cut off. A ¾-in PVC-pipe will be positioned horizontally through the top of the bucket so that it can support a flow-meter probe in the center of the bucket and ca. 2.4 cm from the surface of the spring

source to be measured. Four measures will be taken around the spring, one measure directly above the position of the lure (before lure is placed and after it is removed), and three equal-distant spaced measures around the central measure at a radius of 10 cm.

Margin spring-type habitats will be delineated around a linear plane interpreted as perpendicular to the main concentration of spring-flow associated with the placement of the lure. A standardized device such as a bucket cannot be used in these types of habitats because they are based at or near the water surface and/or due to their 3-D structure. For these habitats, sample areas that are < 10 cm X 10 cm a single min and max flow will be measured, separately, by physically holding the probe in the spring flow until stable readings can be taken. Larger margin habitats will be subdivided into triangles so that Heron's formula can be used to find the area. Flow measures will be taken within each triangle.

A field survey will be conducted to examine the variation of this measuring strategy where at least six springs (three of each spring-type) will be measured with this protocol ca. five times each, over a single day as a means of assessing our precision.

Sampling level covariates

Julian day lure is retrieved (reflects the calendar day)
Cumulative river Q measured from USGS gauge station (average over lure placement period)
Cumulative precipitations measures (taken from closest gauge stations)
Sub-population (as delineated above)

Covariates for each lure (see datasheet)

<u>Recorded during lure set and retrieval</u>
Temperature ^{o}C
DO (mg/L)
Conductivity (µS/cm)
pH
Water depth (cm)
Lure depth within spring (cm) – The depth of the lure within the substrate
Percent substrate coverage

<u>Recorded during lure retrieval only</u>
Biofilm color and percentage coverage categorization (compare with unconditioned cotton sample)
Lure condition
Organic material present – Note the types of organic materials at the spring surface
Number of days deployed

Beetle counts and removal considerations

Upon retrieval, lures will be inspected with a stereoscope in the field. All individuals will be identified and counted according to maturity level. Larvae will be qualitatively identified as small, medium or large. All individuals will be returned back to the spring from which they were collected. The US Fish and Wildlife Service has requested four specimens per lure for an upcoming genomics assessment. It is unknown how many beetles will be attracted per lure. In the event that a large number of individuals (larvae and/or adult) are collected from a lure, four individuals can likely be removed without an anticipated influence on future sampling events. In these cases, a nuisance parameter will be created to account for percentage of individuals removed from the previous sampling event. For lures that only

attract two or three individuals, removing 100% of the individuals is not considered appropriate at this time.

Sample schedule

The sampling schedule includes four sampling events, following the spring and fall EAHCP biomonitoring schedule which minimizes the frequency of habitat disturbance. . The field sampling for this schedule would be initiated in fall 2022 and would be concluded in spring 2024. Each sampling event will reflect similar protocols for the current EAHCP biological monitoring program. Lures will be set for ca. one month to allow for biofilms to develop and attract beetles before retrieval.

Statistical analysis

N-mixture models

The request for proposal for this study implicated that the survey data should consider analysis with N-mixture models. We have extensively explored the utility of using the N-mixture model developed by Royle (2004), speaking with the author of the model and other statisticians. However, as described in the sampling design, life-history aspects of CSRB complicate the assumptions, mainly that the population is not closed between sampling events. We have also considered the use of an open N-mixture model by Dail and Madsen (2011), which is a generalized form of the Royle (2004) model that assumes population status between repeated sampling events is open according to a Markov process, where abundance at site *i* at sampling event *t* only depends on sampling event *t*-1. However, true sample replication is probably not achievable to satisfy the underlying assumptions. Open N-mixture models are also likely an unsuitable approach for insect populations that are subject to high levels of over-dispersion (J.A. Royle, personal communication). This modeling approach was previously used by Diaz et al. (2020) to address similar questions for *Heterelmis cf. glabra* within spring systems of the Devils River basin. Even though their candidate model appeared to perform well (AICc w = 0.84), their population estimates did not seem realistic for an insect. In as much, we will experiment with the N-mixture models; however, we are also offering an alternative analysis which is detailed below.

General linear mixed model overview

The proposed experimental design anticipates that the data to be collected will be highly structured, containing non-independent observations at multiple hierarchal levels (**Fig. 1**). Based on the presence of more complex data structure, a generalized linear mixed effects model (GLMM) framework will be used to quantify spatiotemporal patterns in population performance of CSRB. GLMMs are an extension of generalized linear models that includes a combination of fixed and random effects. Fixed effects are predictor variables that are hypothesized to be ecologically meaningful in relation to the response variable. In contrast, random effects represent a grouping variable, such as levels within a hierarchy that are repeatedly sampled from a larger level. GLMMs are flexible methods for modeling non-normal data and the incorporation of random effects helps control for non-independence within the data. Moreover, explicitly accounting for within/among group structure and variation provides more reliable inferences about the fixed effects that better generalizes to the entire population (i.e., partial pooling) (Bolker et al. 2009; Kéry & Royle 2015; Harrison et al. 2018). Provided below outlines the general protocol of statistical procedures that will be used to fit, validate, and evaluate GLMMs to quantify population trends of CSRB and assess the efficacy of this approach (Zuur & Ieno 2016; Harrison et al. 2018).

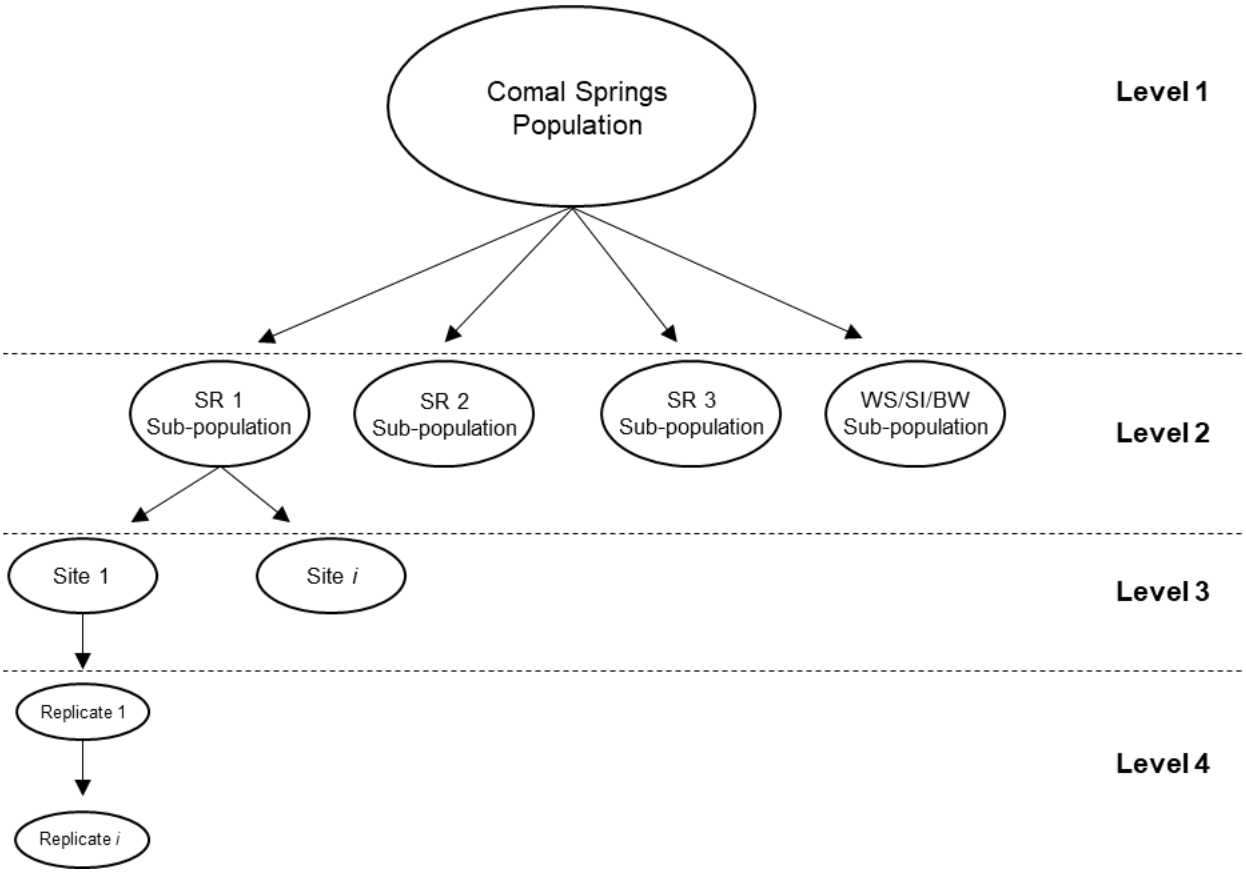


Fig. 1. Example of the hierarchal structure for the CSRB data to be collected. Levels one and two characterizes the metapopulation structure of CSRB as described in Lucas et al. (2016), which include four sub-populations. Levels three and four represents the nested survey process (example provided via one sub-population), where fixed sites are repeatedly sampled.

General Linear Mixed Model Statistical Procedures

Step 1: Select appropriate population metrics and conduct exploratory data analysis

Interpretations of count data from GLMMs differ from N-mixture models, mainly because they don't explicitly model the underlying detection process that generated the observed counts (Royle 2004; O'Brien 2011). This integration of detection probability distinguishes estimates of population size provided by N-mixture models compared to hierarchical models like GLMMs, which instead estimate a population index (i.e., metric assumed to be correlated with the true population size) (O'Brien 2011). Therefore, 'relative abundance' will be used as a population index via lure counts, under the assumption that lure counts are expected to vary with population size, meaning that the direction of change in relative abundance will be used to infer trends in the population. Moreover, due to the cryptic nature of CSRB and potential observation variance (e.g., measurement error, random variability) associated with lure sampling, count data collected at a given time may be zero-inflated or highly skewed, which could make it difficult to provide reliable estimates of relative abundance via statistical inference (MacKenzie et al. 2006). Therefore, presence/absence will be used as an additional metric to quantify population trends.

Patterns in the dataset will be explored to describe/understand response and predictor variables within the data with summary statistics and data visualization. Data exploration may also help identify potentially meaningful trends and group structures. Predictor-variable relationships with the response

variable will be explored using summary statistics (e.g., central tendency, variation, zero counts, skewness, kurtosis) and visual tools as appropriate for continuous (e.g., scatterplots with loess trend lines, histograms) and categorical (e.g., boxplots) predictors. Variation within predictors and covariation among predictors will also be explored (Bolker 2008; Wickham & Grolemund 2016).

Step 2: Present the statistical models

Estimates of CSRB presence/absence will be fit with a binomial error distribution (link function = logit): $Y \sim \text{Binomial}(\eta, \Phi)$, where η and Φ denote the number of trials and probability of presence, respectively. Relative abundance will be estimated using count data and may be fit with a Poisson error distribution (link function = log): $Y \sim \text{Poisson}(\lambda)$, where λ represents mean counts and assumes λ equals the variance σ^2. If the assumption for the Poisson distribution does not adequately represent the count data (i.e., overdispersion; $\sigma^2 > \lambda$), a negative binomial distribution (link function = log) will be used: $Y \sim \text{NegBinom}(\lambda, \kappa)$, where the second parameter κ controls the dispersion of the distribution by allowing σ^2 to exceed λ (Bolker 2008; Zuur et al. 2009). Models will be encoded to account for underlying structure within the data via nested and crossed random effects. Specifically, repeated measures are nested in sites and sites are nested in each sub-population, which are crossed with spring-type. Random intercept models (Eq. 1) will be fit and compared with random intercept and slope models (Eq. 2) for each population metric. Using notation similar to the R package 'lme4', both GLMMs can be described as:

Eq. 1 $$Y_{hijk} \sim X_{hijk} + (1 \mid \text{sub-population}_i) + (1 \mid \text{sub-population}_i\text{:site}_j) + (1 \mid \text{spring-type}_h)$$

Eq. 2 $$Y_{ihijk} \sim X_{hijk} + (1 + X_{hijk} \mid \text{sub-population}_i) + (1 + X_{hijk} \mid \text{sub-population}_i\text{:site}_j) + (1 + X_{hijk} \mid \text{spring-type}_h)$$

where Y_{hijk} is the *k*th repeated measure in site *j* within sub-population *i* and spring-type *h*, and X_{ijk} is the chosen fixed effects that may include, but are not limited to, the covariates listed previously. Interactions between fixed effects that are identified as important may also be included. For the random effects component, sub-population$_i$ (Eq 3.) is a random intercept that allows for variation between the four sub-populations, sub-population$_i$:site$_j$ (Eq. 4) is a second random intercept, allowing for variation between sites *j* of the same sub-population *i*, and spring-type$_h$ (Eq. 5) is a third random intercept that allows variation between upwelling and margin spring habitats. Random intercepts are assumed to be normally distributed and defined as:

Eq. 3 $$\text{sub-population}_i \sim \text{Normal}(0, \sigma^2_{\text{sub-population}i})$$

Eq. 4 $$\text{sub-population}_i\text{:site}_j \sim \text{Normal}(0, \sigma^2_{\text{sub-population}i\text{:site}j})$$

Eq. 5 $$\text{spring-type}_h \sim \text{Normal}(0, \sigma^2_{\text{spring-type}h})$$

with a mean of zero and variance σ^2, which determines the level of variation between these groupings. The random slopes component shown by Eq. 2 also allows for the effect size of fixed effects X (i.e., regression coefficients) to vary among groups (Zurr et al. 2009).

If the count data contains more zeros than expected from a Poisson or negative binomial distribution, a zero-inflated GLMM may be used instead. Zero-inflated models are fit using a mixture distribution with two parts that are modeled from the same data, which includes the probability of presence and mean counts when present (Zurr et al. 2009; Harrison 2014; Brooks et al. 2017). Since zero-inflated models

estimate probability of presence and mean counts in tandem, separate analyses of presence/absence and relative abundance would not be required.

Step 3: Pre-process data for model fitting

Insights from data exploration will be used to facilitate data pre-processing prior to fitting each model (Kuhn & Johnson 2013). Predictors that exhibit near-zero variance or are highly correlated ($r > 0.7$) will be removed from the dataset. Data transformation may be required if models do not converge or if assumptions are violated, which may include centering/scaling or other techniques (e.g., square root, log).

Step 4: Fit and validate the model

Each model will be fit using the R package 'lme4', or 'glmmTMB' if using a zero-inflated model is warranted. Model fit will be validated by assessing the diagnostics of the model to check whether basic distributional and structural assumptions of the model have been violated. Model diagnostics that may be checked include:

1. Overdispersion
2. Inspection of residuals
    a. Pearson residuals vs. fitted values
    b. Pearson residuals vs. predictor variables (fixed effects)
    c. Pearson residuals vs. fitted values per grouping level of the random intercept
    d. Spatiotemporal independence of Pearson residuals
3. Stability of variance components and significance of random effects
4. Goodness-of-fit (e.g., R^2)

Model fit will be assessed by checking diagnostics from the global model directly. Simulation procedures (e.g., Monte Carlo, parametric bootstrapping) will also be used to check model diagnostics, as well as examine sampling error (i.e., natural variability) of parameter estimates and uncertainty (e.g., bias, variance) of estimates for the response variable. To do this, a large number of datasets are randomly generated from a fitted model. Each simulated dataset is then used to refit the model, all of which are used to produce sampling distributions for model parameters and chosen fit statistics. Lastly, simulation results are compared to the global model to identify whether assumptions are met and if the chosen statistical model is a reasonable representation of the system (Harrison 2014; Kéry & Royle 2015).

Step 5: Model selection and evaluation

A two-step procedure will be used to select the most parsimonious model and evaluate its predictive performance. Model selection will first be used to identify which covariates best explain CSRB presence/absence and relative abundance and choose the best model for data inference. All candidate models will be ranked using Akaike Information Criteria corrected for small sample size (AICc). Differences in AICc scores will be used to calculate each candidate models weight (w) and the model with the lowest AICc score and highest w will be considered the best supported (Burnham & Anderson 2002). Models within two AICc scores will be considered equally supported, unless variables in the top model are a subset of the competing models (i.e., uninformative parameters; Arnold 2010). Model averaging may be used if selecting a single final model is not warranted.

Using the final model selected, predictive performance of each model will be further evaluated to examine how they generalize to new data. Resampling procedures (e.g., k-fold cross-validation,

bootstrapping) will be used to simulate new data and estimate out-of-sample predictive error. For each resampling iteration, a subset of the data is used to train the model, and the remaining data is used to independently examine model accuracy, which in total estimates mean generalization error (Hastie et al. 2009). Predictive performance for each model could be assessed with any of the following metrics:

1. Presence/absence model
    a. Area under the receiving operating curve (AUC)
    b. Sensitivity
    c. Specificity
    d. True skill statistic
2. Relative abundance model
    a. Correlation
    b. Root mean squared error
    c. Mean absolute error
    d. R^2

Step 6: Model interpretation

Summary statistics will be presented for each model fit with the full dataset, which will include estimated variance for random effects and estimated coefficients for the fixed effects included in the final model selected. Generalization error will also be summarized based on mean (± error) out-of-sample predictive performance. Relative importance (0-1) of each fixed effect will be calculated based on AIC_c *w*. Partial dependence plots will also be built to compare the strength of response-fixed effect relationships and display spatiotemporal population trends throughout the study duration.

These results will help facilitate a critical post-study review and recommendations for future research. For example, identifying specific data points with the largest predictive error may elucidate what components of the model failed to distinguish signal from noise and suggest how future work can improve predictive accuracy. Partial dependence plots may also show whether the environmental covariates used are ecologically rationale and identify covariates that have strong functional relationships with CSRB occurrence or abundance. Ultimately, we will compare the results of the GLMM to those of the N-mixture model.

Other considerations

Lure efficacy considerations

Although the GLMM does not require lure-efficacy data, understanding lure efficacy could be useful for estimating the population size at Comal Springs. *Efficacy* (*E*) can be interpreted from a recent luring study (BIO-WEST 2021); even though there were adverse conditions for each of the trials, results indicated that 0 – 80 % of the beetles would reside on cotton, with an average of ca. 20 %. This information could be used as a means of estimating the number of beetles in the vicinity of a lure and therefore, one adult observed on a lure during a check could be interpreted as four others in the vicinity (total of five adults). However, this cannot be done for larvae as it is expected that their movements are less than that of adults.

Additionally, we plan to place 5 lures (separated by the length of a lure) at select locations where large numbers of *H. comalensis* are expected to be found. After ca. 30 days of conditioning, the number of beetles will be counted among those lures. The beetles will be replaced and a single lure will be placed in the middle of where the set of five was and the lure will be inspected ca. one week later as a means of

developing field-based *E* that may also be useful for larvae. We plan to do this for at least 3 separate spring locations that are not part of the study sample sites. However, this is not a major focus of the study since the results may not be useful (i.e., in the event that no beetles are retrieved from the single lure).

Beetles per unit area

A simplistic approach to estimating the population size of *H. comalensis* is to take the fraction of the overall area sampled and extrapolate the number of beetles sampled to the total area of spring activity (corrected by lure efficacy) where *a* is the proportion of spring area sampled by the entire set of lures per sampling event with a given *E*, the surficial population *N* can be estimated based on the total number of sampled individuals *n*:

$$N = \frac{n}{a \times E}$$

If for instance a survey in a single sampling event finds 1,000 adults among 80 lures that represent 20% of the surficial spring area (*a*) and *E* is considered 20% effective, the total estimate of adults at the near surface would be 25,000. The coefficients *a* and *E* can be adjusted at later times as better information becomes available.

Biofilm considerations

The quality of the biofilms that form on the poly-cotton lures are thought to be an important factor with regard to the attraction of the beetles to the lures. Preliminary work by Dr. Camila Carlos-Shanley indicated that the biofilms found on these lures can be highly variable in terms of bacteria taxa and relative abundances of those taxa (personal communication). Having a diverse community of bacteria per lure elicits many metric measures that can be delineated as covariates of riffle beetle presence and abundance. The extraction of such data would require the expense of genomic sequencing for each lure and the time for a technician/student to perform the bioinformatics. However, the lures can be kept in 95% EtOH and stored for a few years. We would like to offer the service of saving these biofilms if there is an interest in pursuing this type of data acquisition in the future. It is also noted that a better understanding of the microbial community affiliated with *H. comalensis* could also help focus habitat restoration efforts.

Literature Cited

BIO-WEST. 2021. Comal Springs riffle beetle luring analysis. Final report. Prepared for the Edwards Aquifer Authority.

BIO-WEST. 2017. Comal Springs riffle beetle (*Heterelmis comalensis*): life history and captive propagation techniques. Final report. Prepared for the Edwards Aquifer Authority.

Bolker, B.M. 2008. Ecological Models and Data in R. Princeton University Press, Princeton, NJ.

Bolker B.M., M.E. Brooks, C.J. Clark, S.W. Geange, J.R. Poulsen, M.H.H. Stevens M.H.H., and J.S.S. White. 2009. Generalized linear mixed models: a practical guide for ecology and evolution. Trends in Ecology & Evolution 24:127–135.

Brooks, N.E., K. Kristensen, K.J. van Benthem, A. Margnusson, C.W. Berg, A. Nielsen, H.J. Skaug, M. Mächler, and B.M. Bolker. Modeling zero-inflated count data with glmmTMB. bioRxiv DOI:10.1101/132753.

Burnham K.P., and D.R. Anderson. 2002. Model Selection and Multimodel Inference: A Practical Information-Theoretic Approach. Second Edition. Springer-Verlag, New York, NY.

Dail, D., and L. Madsen. 2011. Models for estimating abundance from repeated counts of an open metapopulation. *Biometrics*. 67:577-587.

Dail, D., and L. Madsen. 2012. Estimating open population site occupancy from presence-absence data lacking the robust design. Biometrics 69:146-156.

Diaz, P.H., J.R. Gibson, C. W. Norris, and C. L. Thompson. Abundance and distribution of *Heterelmis cf. glabra* (Coleoptera: Elmidae) within Dolan Falls Preserve and the Devils River State Natural Area, Texas, USA. doi: https://doi.org/10.1101/2020.02.10.941641

Fries, J.N. 2003. Possible reproduction of the Comal Springs riffle beetle, *Heterelmis comalensis* (Coleoptera: Elmidae), in captivity. Entomological News 114: 7–9.

Harrison, X.A. 2014. Using observation-level random effects to model overdispersion in count data in ecology and evolution. PeerJ 2: DOI: 10.7717/peerj.616

Harrison, X.A., L. Donalson, M.E. Correa-Cano, et al. 2018. A brief introduction to mixed effects modelling and multi-model inference in ecology. PeerJ 6: DOI: 10.7717/peerj.4794

Hastie, H., R. Tibshirani, and J. Friedman. 2009. The Elements of Statistical Learning: Data Mining, Inference, and Prediction. 2nd edition. Springer, New York, NY.

Kéry, M., and J.A. Royle. 2015. Applied Hiearcvhichal Modeling in Ecology: Analysis of distribution, abundance, and species richness in R and BUGS. Volume 1, Academic Press, Cambridge, MA.

Kosnicki, E. 2022. Fecundity of first generation captive reared *Heterelmis comalensis* Bosse, Tuff, and Brown 1988 (Coleoptera: Elmidae). Journal of Insect Science (accepted for publication).

Kuhn, M., and K. Johnson. 2013. Applied Predictive Modeling. Springer, New York, NY.
Lucas, L.K., Z. Gompert, J.R. Gibson, K.L. Bell, C.A. Buerkle, and C.C. Nice. 2016. Pervasive gene flow across critical habitat for four narrowly endemic, sympatric taxa. Freshwater Biology 61:993-946.

MacKenzie, D.I., J.D. Nichols, J.A. Royle, K.H. Pollock, L.L. Bailey, and J.E. Hines. 2006. Occupancy estimation and modeling: inferring patterns and dynamics of species occurrence. Elsevier-Academic Press, San Diego, California.

O'Brien, T.G. 2011. Abundance, Density and Relative Abundance: A Conceptual Framework. Pages 71-96 *in* A.F. O'Connell, J.D. Nichols, and K.U. Karanth, editors. Camera Traps in Animal Ecology: Methods and Analyses. Springer, New York, NY.

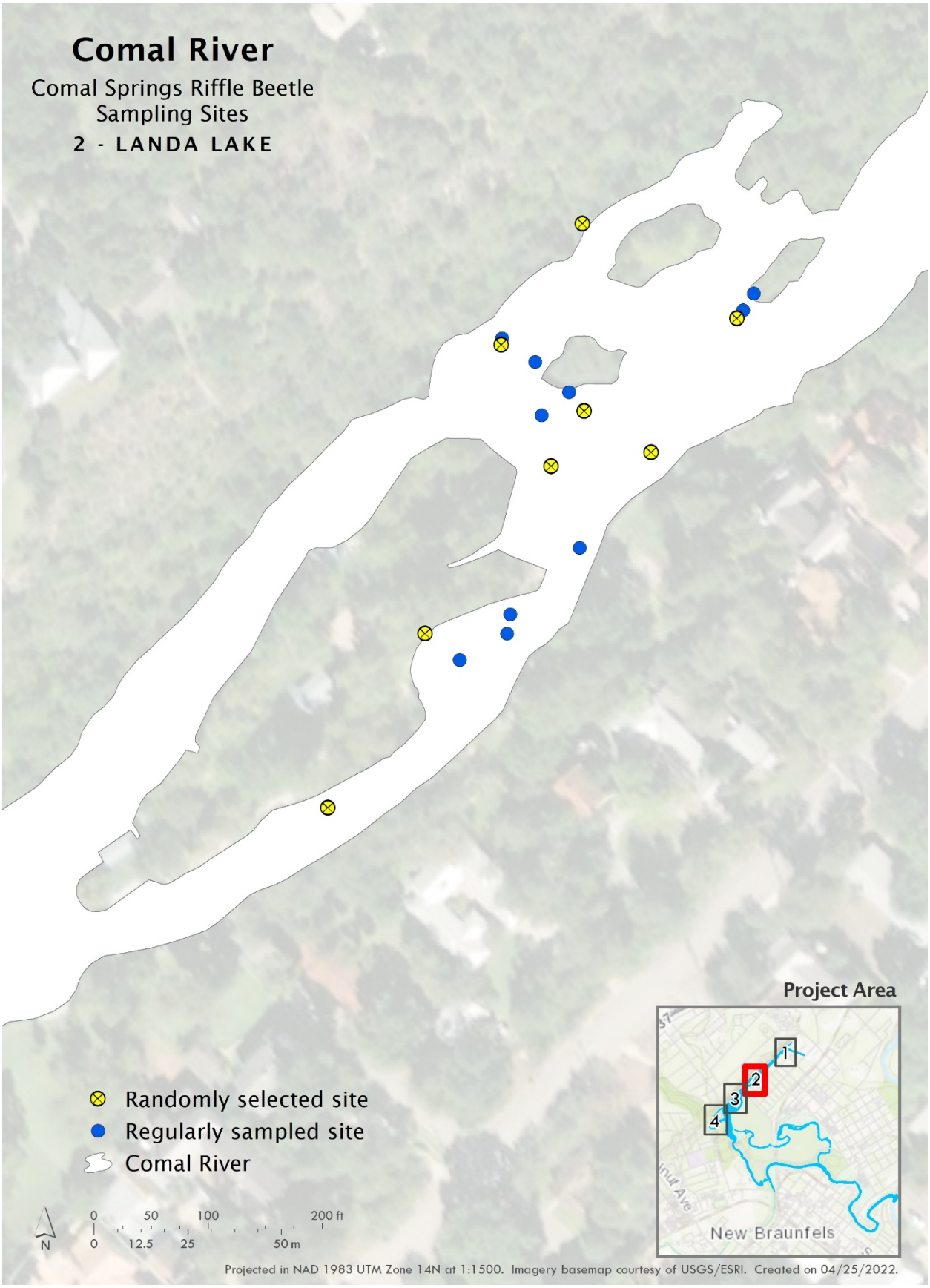
Royle, J.A. 2004. *N*-mixture models for estimating population size from spatially replicated counts. Biometrics 60:108-115.

Wickham, H., and G. Grolemund. 2016. R for Data Science. O'Reilly, Sebastopol, CA.

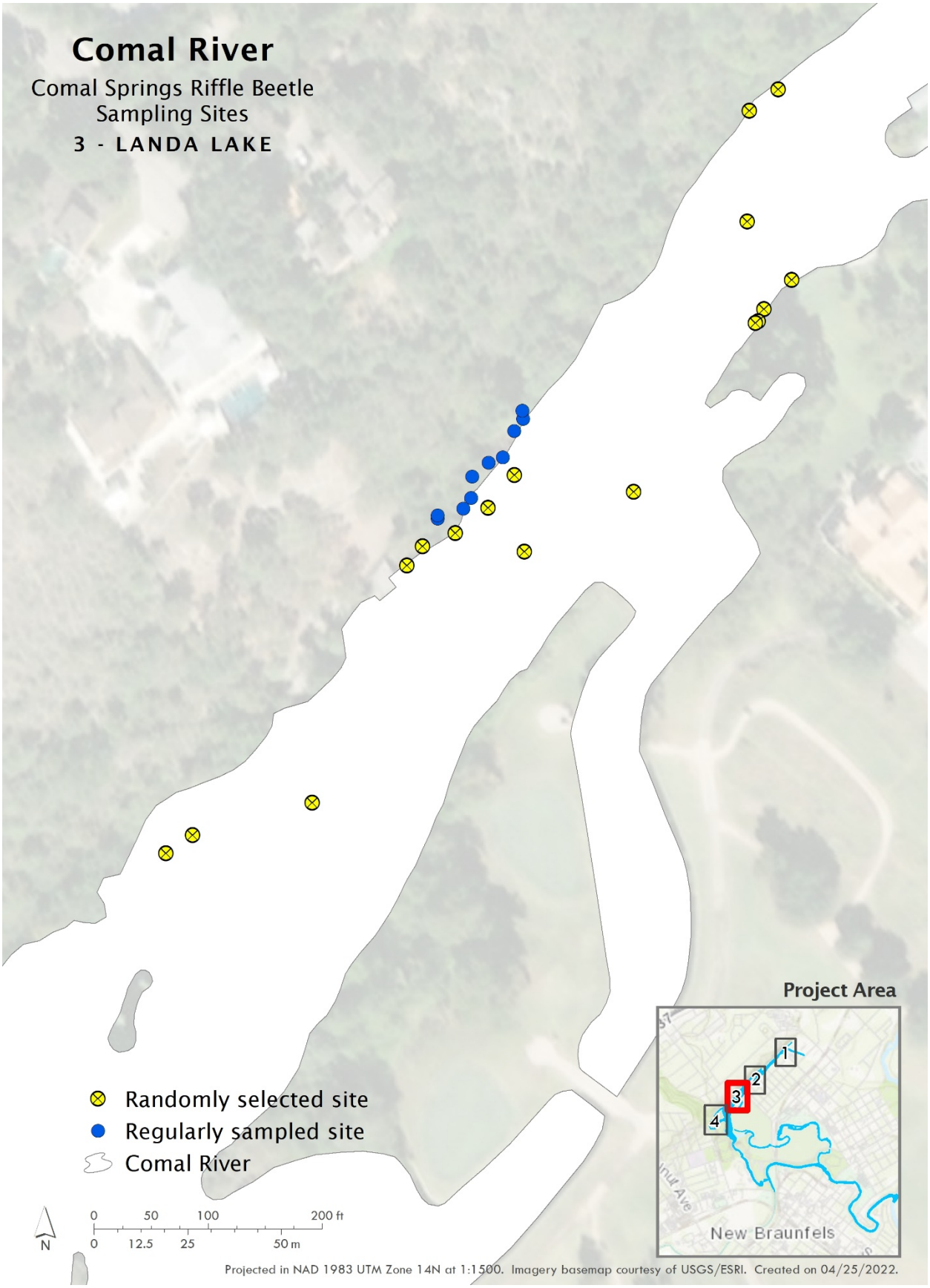
Zurr, A.F., E.N. Ieno, N.J. Walker, A.A. Saveliev, and G.M. Smith. 2009. Mixed Effects Models and Extensions in Ecology with R. Springer, New York, NY.

Zuur, A.F., and E.N. Ieno. 2016. A protocol for conducting and presenting results of regression-type analyses. Methods in Ecology and Evolution 7:636-645.

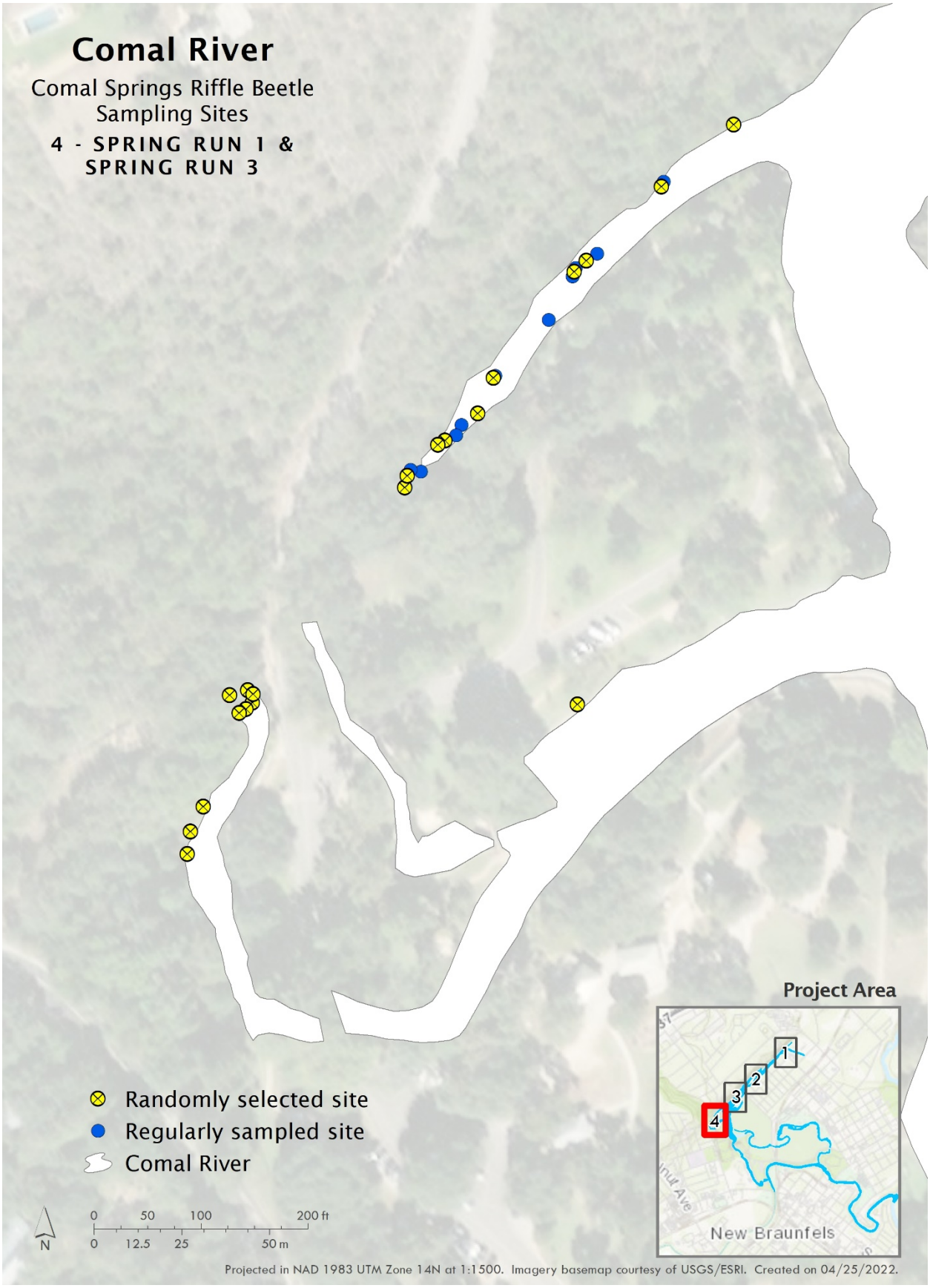
Map 1a. Map of Comal Springs and randomly selected sites for sampling *Heterelmis comalensis*.



Map 1b. Map of Comal Springs and randomly selected sites for sampling *Heterelmis comalensis*.



Map 1c. Map of Comal Springs and randomly selected sites for sampling *Heterelmis comalensis*.



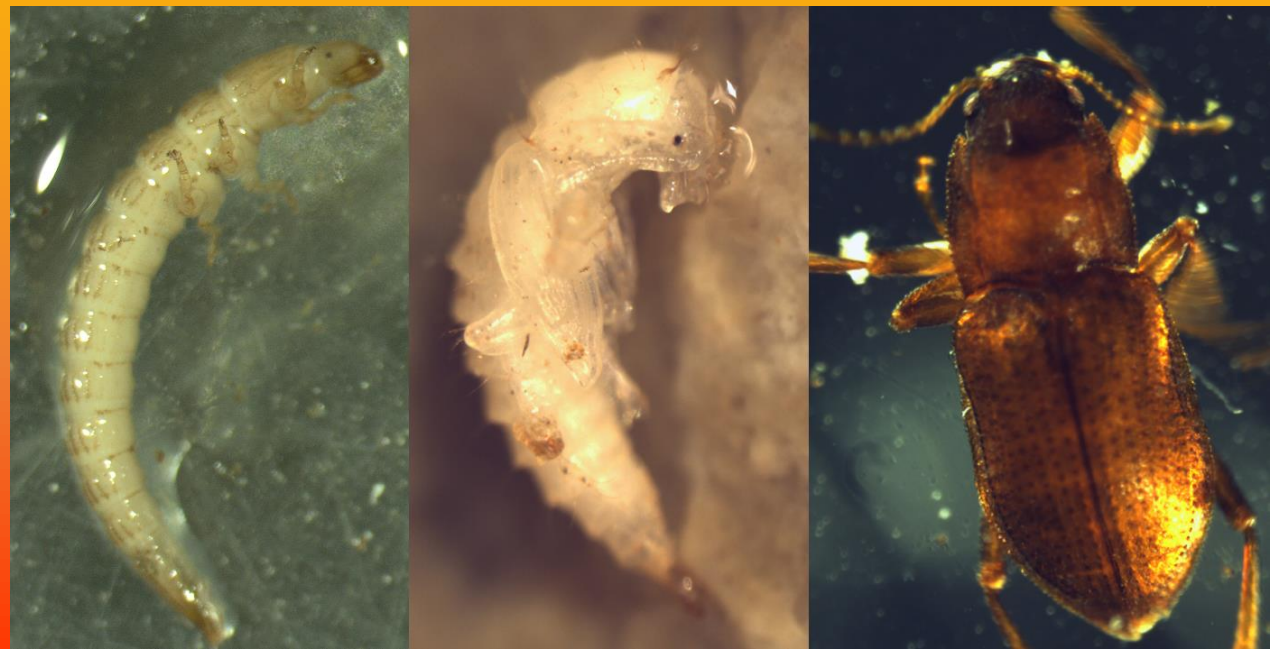
Map 1d. Map of Comal Springs and randomly selected sites for sampling *Heterelmis comalensis*.

Comal Springs Riffle Beetle Population Assessment

27 May, 2022

Biological Considerations

- ***Heterelmis comalensis*, the Comal Springs riffle beetle (CSRB)**
- **Larvae take 9 – 11 months to reach maturity**
- **Wild caught and captively reared adults seldomly live for a year**
- **Breeding is continuous and likely occurs among different cohorts**



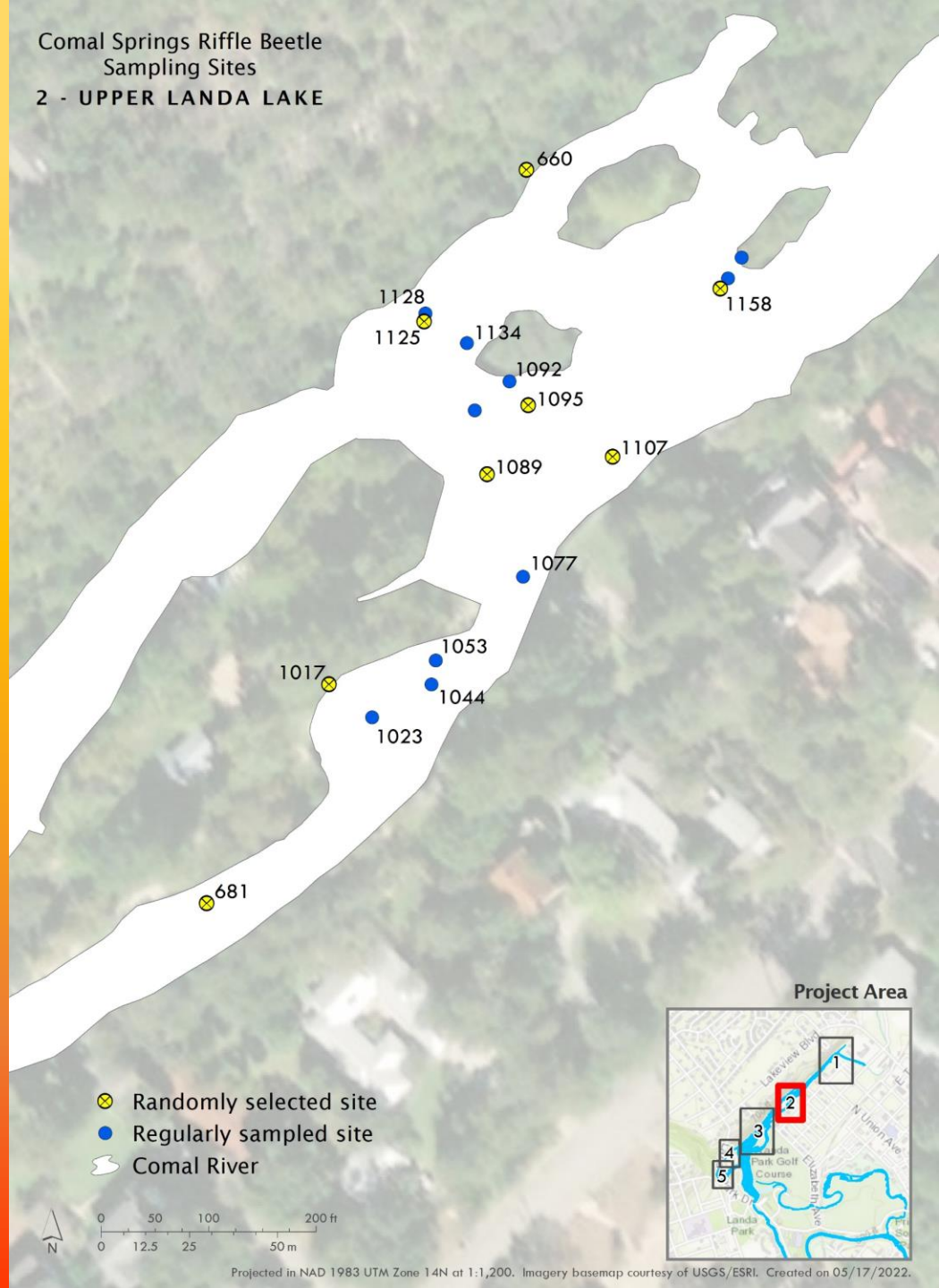
Study Design

- **Divided into four areas, based off subpopulations of Lucas et al. (2016) + headwaters - TPWD map & supplements (Norris and Gibson)**
- **Randomly selected 50 springs**
- **Include 30 HCP biomonitoring sites**
  - **19% of mapped spring locations**
- **Spring Run 4 + Spring Run 5 + Comal headwaters + Blieder's Creek: 8 sites**

Study Design

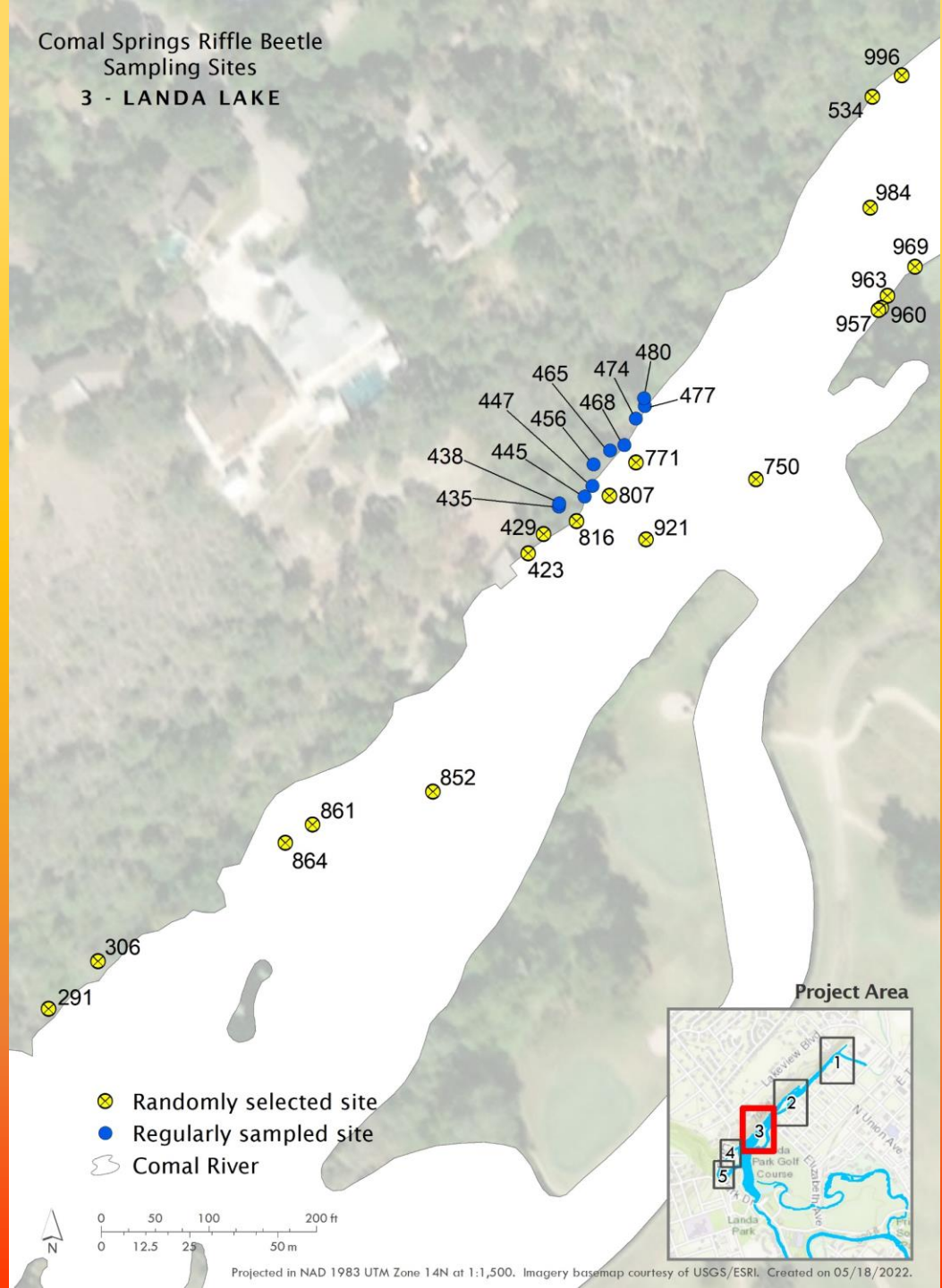
- **Western shoreline + Spring Island: 42 (including 20 biomonitoring sites)**

- **Some spring sites have almost no flow at this time**



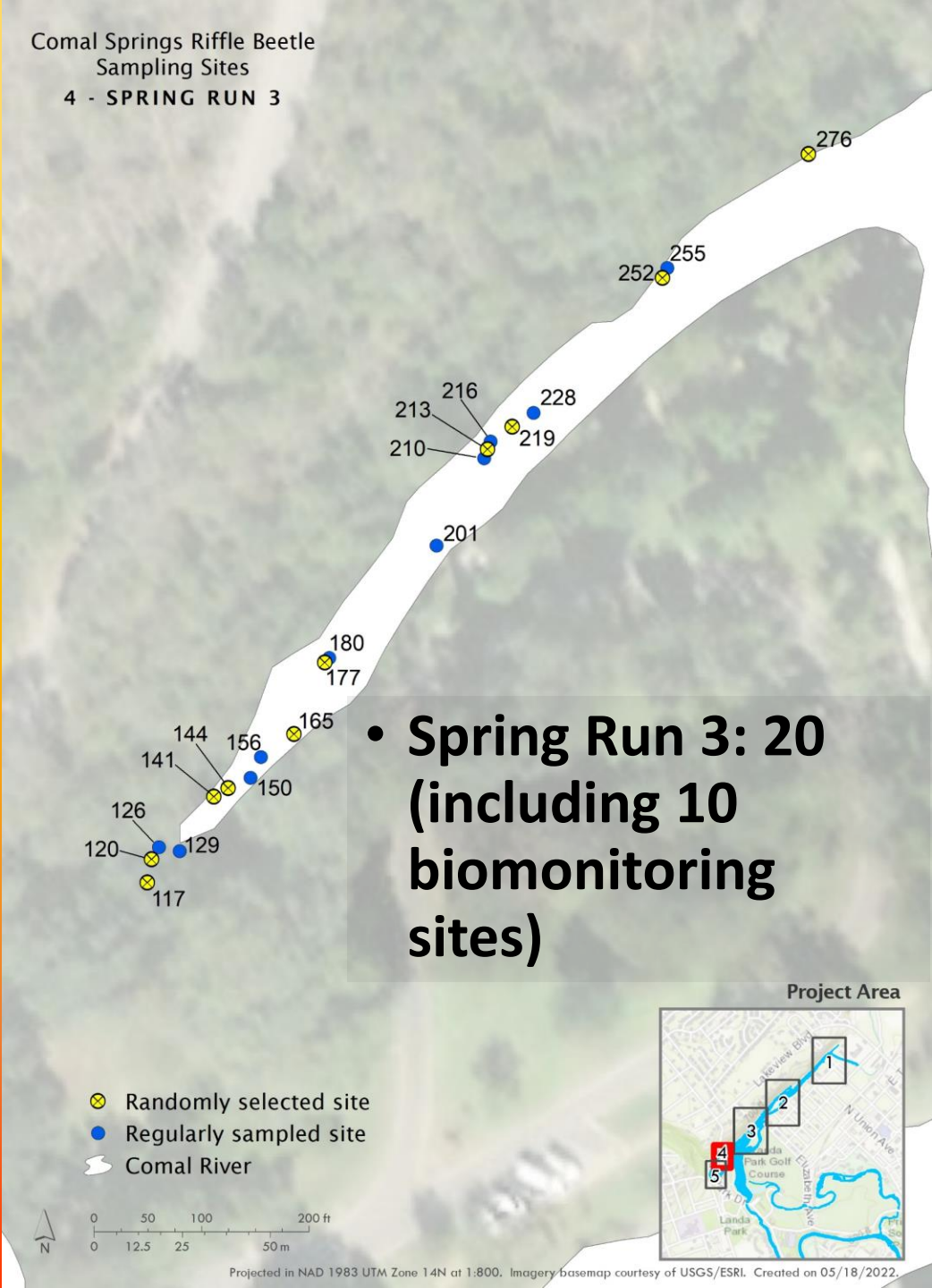
Study Design

- **Western shoreline + Spring Island: 42 (including 20 biomonitoring sites)**
- **Spring type divided into upwellings and margin habitats**



Study Design

- **Spring Run 1: 10 sites**



- **Spring Run 3: 20 (including 10 biomonitoring sites)**

Covariates

Spring-level covariates

- Temperature, DO, Conductivity, days deployed, biofilm category, Wentworth substrate, spring type
- Flow index
  - Areas < 10 x 10 cm find left-center-right flow of that area
  - Complex areas > 10 x 10 cm will use Heron's formula, find flow at center of each triangle

Sampling-event-level covariates

- Cumulative precipitation, subpopulation, Julian Days

Lure efficacy

Previous study

- **Found ca. 20 % of adults would reside on poly-cotton lures in laboratory settings**
- **High variability**

Current study

- **Place five lures at select locations where CSRB is expected to be found but not part of the study**
- **Count and replace beetles after 30 days and replace one lure in same area**
- **Return to lure site after a few days and count beetles on the same lure**
- **100 % efficacy = same number of beetles found on one lure as all five**

Analysis

N-mixture models

- Issues with model assumptions (immigration/emigration, life-history)
- True sample replication is unlikely
- Open N-mixture model likely unsuitable for insect populations that display over dispersion
- We can provide exploratory analysis with open N-mixture models

General linear mixed models (GLMM)

- Non-independent, structured data at hierarchal levels
- Quantify spatiotemporal patterns
- Fixed effects and random effects

Analysis

GLMM procedures

1. **Selection of population metrics and Exploratory analysis**
   - **Population metrics – presence/absence, relative abundance**
   - **Exploratory analysis – summary statistics, data visualization**
     - **What type of variation occurs within variables?**
     - **What type of covariation occurs between variables?**

2. **Present statistical models**
   - **Choose error distribution**
   - **Select fixed effects**
   - **Select random effects**
     - **Random intercepts model**
     - **Random intercepts and slopes model**

3. **Pre-process data**
   - **Remove highly correlated and near-zero variance predictors variables, transformations (if needed)**

Examples of random intercepts and random intercepts/slopes models

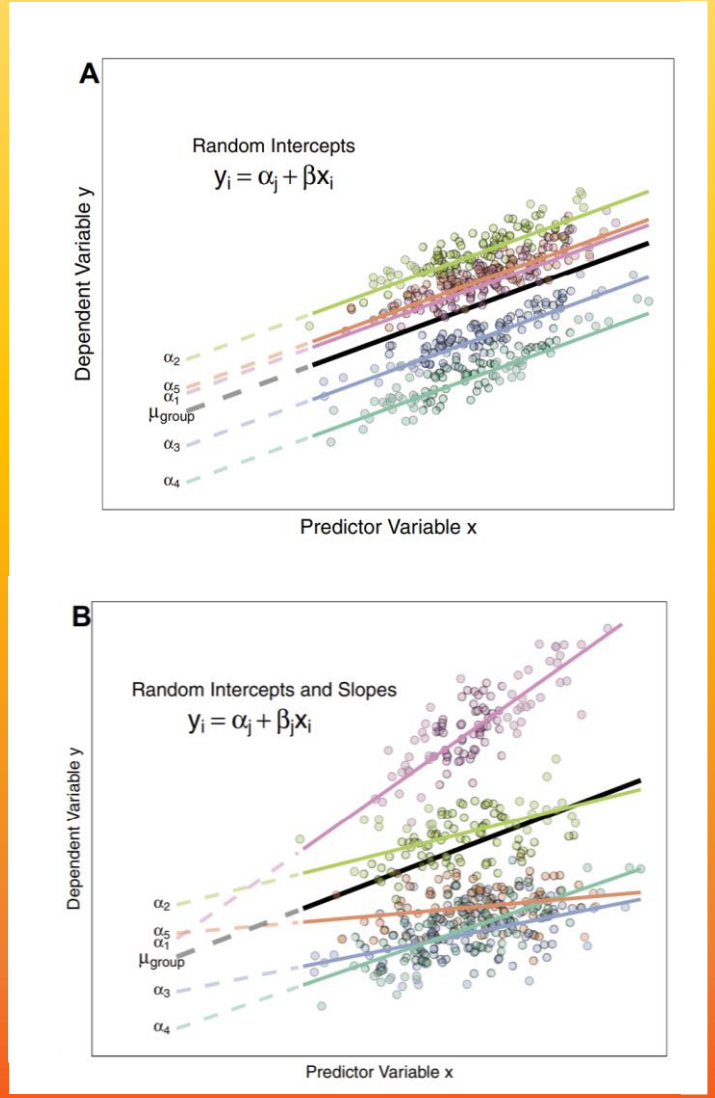


Figure 1; Harrison et al. 2018

Analysis

GLMM procedures

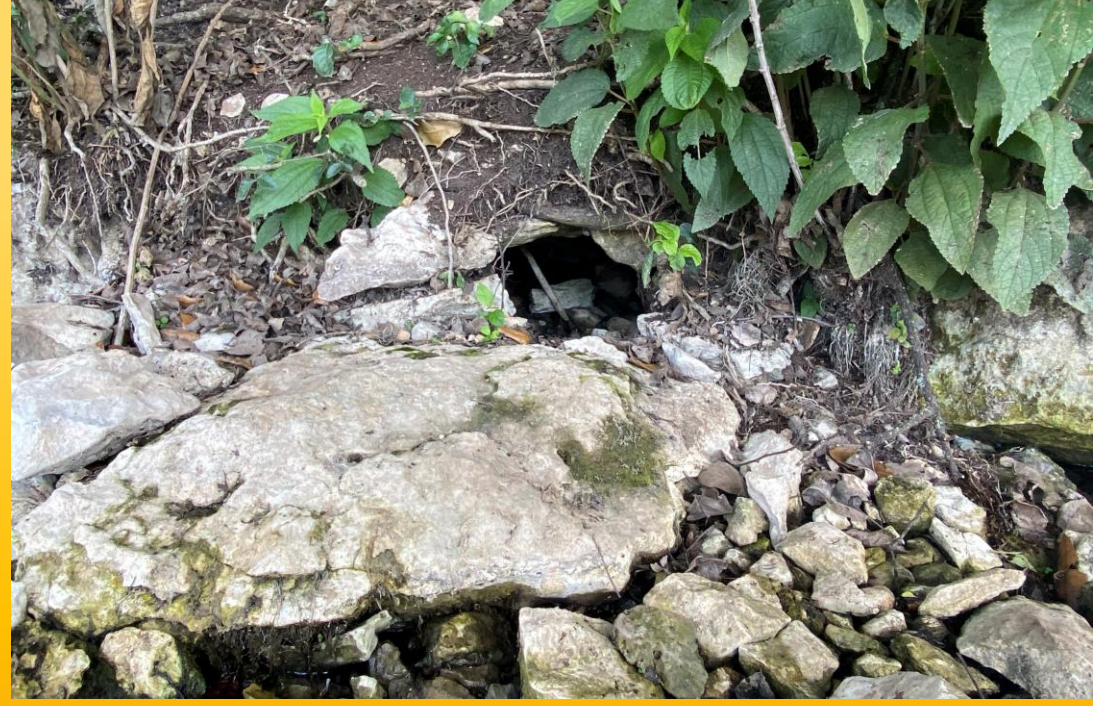
4. **Fit and validate model**
   - **Model diagnostics checks**
   - **Model uncertainty checks**

5. **Model selection and evaluation**
   - **Select parsimonious model**
   - **Evaluate out-of-sample predictive performance**

6. **Model interpretation**
   - **Predictive performance**
   - **Predictor relative importance**
   - **Parameter estimates**
   - **Partial dependence plots**

Sample schedule

- **Schedule A:**
  - **Four sampling events over 11-month period**
  - **September 2022; concluded in August 2023**
- **Schedule B:**
  - **Four sampling events based on biomonitoring schedule**
  - **September 2022; concluded May 2024**
- **What about drought conditions?**



Comal Springs Riffle Beetle Population Assessment

Questions?

Appendix M8 | **Research Work Group Meeting Materials**

Charge of the Research Work Group

EAHCP Adaptive Management Science Committee

Overview

The Edwards Aquifer Habitat Conservation Plan (EAHCP) calls for research to be conducted by the Edwards Aquifer Authority under two separate programs: (1) the *Applied Research Program* (HCP §6.3.4), enhances understanding of the Comal and San Marcos aquatic ecosystems, supports the development of the EAHCP Ecological Model, and provides scientific information to program management concerning success in meeting EAHCP's Biological Goals and Objectives; and (2) the *Refugia Program* (HCP §5.1.1), provides for research activities, as necessary, to develop practical knowledge for housing adequate populations of Covered Species and to expand knowledge of their biology, life histories, and reintroduction.

This document lays out the background, creation, charge, and administration of a Work Group created to provide scientific review and input concerning research under the Applied Research and Refugia programs.

Background

Applied Research Program*:* Initially, the Applied Research Program conducted studies prescribed in the EAHCP to fill critical gaps in data. As this data was acquired, additional research questions were identified by the EAHCP Adaptive Management Science Committee ("Science Committee"), and by the National Academy of Sciences, to constitute future research. These recommendations underwent a comprehensive review in 2015 by the Applied Research Work Group, which produced the *EAHCP 2016-2019 Applied Research Project Schedule*. The schedule provides guidelines for future research; however, the program's dynamic nature, including new progress made since 2015, merits continued scientific review and input.

Refugia Program*:* In 2017, a contract for the EAHCP Refugia facility was executed with the U.S. Fish & Wildlife Service with dedicated funds for a comprehensive Refugia research program. Although the basics of this program are defined by contract, as questions arise related to the development and methodology of research projects, and due to research's dynamic nature, continued scientific review and input is merited.

Creation

To provide a focused deliberative body with the appropriate subject matter expertise for continued scientific review and input on questions related to the EAHCP Applied Research and Refugia research programs, the HCP Program Manager and the Implementing Committee jointly determined to create a Science Committee Work Group ("Research Work Group") comprised of members drawn from the Science Committee (FMA §7.9.3.b) for this purpose.

Charge

The Work Group's charge consists of: (1) suggesting specific Applied Research projects to be conducted during 2018 and 2019 as part of the Applied Research Program; and (2) suggesting refinements to the methodology proposed for Refugia research projects.

Administration

The Work Group will begin in 2017. The Work Group will meet on an as-needed basis as determined by the HCP Program Manager and the Science Committee Chair and Vice-Chair. Final recommendations resulting from a given meeting, or meetings, of the Work Group will be presented for discussion and possible endorsement of the Science Committee at the next full committee meeting scheduled. The Work Group will be constituted of the following individuals: Chad Norris, Tom Arsuffi, Floyd Weckerly, and Conrad Lamon. The Work Group will operate by consensus, and will heed of the scope designated in the EAHCP for the Measures under consideration. It is anticipated this Work Group will exist for the duration of the ITP. However, there is a recognition that the group will need to adapt and be flexible as new issues are identified. Therefore, this charge and membership is to be revisited annually, and, if needed, may be modified with Science Committee endorsement.