Appendix M | **2024 EAHCP Committee, Subcommittee and Work Group Meeting Materials**

Appendix M1 | **Implementing Committee**

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, February 1, 2024 **10:00 AM** **Pauline Espinosa Community Hall & Microsoft Teams**

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 Program Annoucements
- Spring Community Updates

4. Approval of Minutes

4.1 December 14, 2023

5. Reports

5.1 **Receive report from Scott Storment, EAHCP Program Manager, on the EAHCP Biological Goals and Objectives Memorandum.**

5.2 **Receive report from Lucas Bare, ICF Project Manager, on temperature and rainfall scenarios to be used in modeling for the EAHCP permit renewal process.**

6. Individual Consideration

6.1 **Consider staff recommendation to appoint a chairperson for the 2024 EAHCP Budget Work Group.**

6.2 **Consider staff recommendation to approve the amendments to the 2024 City of San Marcos/Texas State University Work Plan and Funding Application.**

6.3 Consider staff recommendation to approve the amendments to the 2024 City of New Braunfels Work Plan and Funding Application.

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

Thursday, February 1, 2024 **10:00 AM Pauline Espinosa Community Hall & Microsoft Teams**

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

Tom Taggart called the meeting to order at 11:12AM. Committee members present: Roland Ruiz, Greg Malatek, Donovan Burton, Robert Mace and Jana Gray.

2. Public Comment

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

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Program Annoucements
- Spring Community Updates

Chad Furl provided a hydrologic update and J17 forecast. Scott Storment provided the November 2023 EAHCP Budget Report, an updated on the 2023 EAHCP Annual Report and reminded the Implementing Committee that the first meeting of the Conservation Measures Subcommittee will be held on February 22, 2024, at the Edwards Aquifer Authority. Greg Malatek and Mark Enders gave a spring community update on the City of New Braunfels and the City of San Marcos, respectively.

4. Approval of Minutes

4.1 December 14, 2023

A motion was made by Donovan Burton, seconded by Robert Mace, to approve the meeting minutes from the December 14, 2023, Implementing Committee meeting. There were no objections.

5. Reports

5.1 Receive report from Scott Storment, EAHCP Program Manager, on the EAHCP Biological Goals and Objectives Memorandum.

Scott Storment, EAHCP Program Manager, provided an update on the revised Biological Goals and Objectives (BGO) Memorandum process. A Science Committee meeting was added to the 2024 EAHCP Committee meetings calendar to discuss the BGO Memorandum. The Committees will have an opportunity to review the revised BGO Memorandum and response attachment March 7 – 21.

5.2 Receive report from Lucas Bare, ICF Project Manager, on temperature and rainfall scenarios to be used in modeling for the EAHCP permit renewal process.

Daniel Bishop, ICF, and Lucas Bare, ICF, provided a presentation on the temperature and precipitation projections in the Edwards Aquifer Region. This date will be used throughout the ITP renewal process.

6. Individual Consideration

6.1 Consider staff recommendation to appoint a chairperson for the 2024 EAHCP Budget Work Group.

Robert Mace was nominated and appointed to be the Chairperson for the 2024 EAHCP Budget Work Group. There were no objections from the Implementing Committee.

6.2 Consider staff recommendation to approve the amendments to the 2024 City of San Marcos/Texas State University Work Plan and Funding Application.

A motion was made by Donovan Burton, seconded by Tom Taggart, to approve the amendments to the 2024 City of San Marcos/Texas State University Work Plan and Funding Application.

6.3 Consider staff recommendation to approve the amendments to the 2024 City of New Braunfels Work Plan and Funding Application.

A motion was made by Robert Mace, seconded by Tom Taggart, to approve the amendments to the 2024 City of New Braunfels Work Plan and Funding Application.

7. Future Meetings

The next meeting of the Implementing Committee will be held on March 28, 2024, at the Edwards Aquifer Authority and online via Microsoft Teams.

8. Questions from the Public

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

9. Adjourn

There being no further business to discuss, the meeting adjourned at 1:09 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).

~~Greg Malatek~~ Amy Nites

Secretary, EAHCP Implementing Committee

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, March 28, 2024 | **10:00 AM** | **EAA Board Room & Microsoft Teams**

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 Program Announcements
- Spring Community Updates

4. Approval of Minutes

4.1

February 1, 2024 Meeting Minutes

5. Reports

5.1 **Receive report from Kristina Tolman, Senior HCP Coordinator, on the Net Disturbance and Incidental Take in the San Marcos and Comal Spring systems.**

6. Individual Consideration

6.1 **Consider staff recommendation to approve the 2023 Edwards Aquifer Habitat Conservation Plan Annual Report submittal to the U.S. Fish and Wildlife Service.**

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

Thursday, March 28, 2024 | **10:00 AM** | **EAA Board Room & Microsoft Teams**

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

Tom Taggart called the meeting to order at 10:01AM. Committee members present: Roland Ruiz, Amy Niles, Donovan Burton, Robert Mace and Jonathan Stinson.Tom Taggart called the meeting to order at 10:01AM. Committee members present: Roland Ruiz, Amy Niles, Donovan Burton, Robert Mace and Jonathan Stinson.

2. Public Comment

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

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Program Announcements
- Spring Community Updates

Chad Furl provided a hydrologic update and J17 forecast. Scott Storment provided the December 2023 and January 2024 EAHCP Budget Reports and an update on the Permit Renewal Process. Olivia Lopez provided a recap of the Conservation Measures Subcommittee Meeting #1, information on the National HCP Coalition annual meeting and the Steward Newsletter. Phillip Quast and Mark Enders gave a spring community update on the City of New Braunfels and the City of San Marcos, respectively.

4. Approval of Minutes

4.1

February 1, 2024 Meeting Minutes

A motion was made by Robert Mace, seconded by Donovan Burton, to approve the meeting minutes from the February 1, 2024, Implementing Committee meeting. There were no objections.

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).

Greg Malatek
Secretary, EAHCP Implementing Committee

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, April 11, 2024 | **10:00 AM** | **EAA Board Room & Microsoft Teams**

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 Program Announcements

4. Approval of Minutes

4.1
- March 28, 2024

5. Reports

5.1 **Receive report from Dr. Chad Furl, EAHCP Chief Science Officer, on the Science Committee's Memo on the Biological Goals and Objectives Memorandum.**

6. Individual Consideration

6.1 **Consider staff recommendation to accept the EAHCP Biological Goals and Objectives Memorandum for use in the Incidental Take Permit Amendment Application process with the U.S. Fish and Wildlife Service.**

6.2 **Consider staff recommendation to approve an amendment to the Edwards Aquifer Authority EAHCP 2024 Funding Application and Work Plan.**

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

Thursday, April 11, 2024 | **10:00 AM** | **EAA Board Room & Microsoft Teams**

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

Tom Taggart called the meeting to order at 10:11 AM. Committee members present: Roland Ruiz, Greg Malatek, Donovan Burton, Robert Mace and Jonathan Stinson.

2. Public Comment

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

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Program Announcements

Paul Bertetti provided a hydrologic update to the Implementing Committee. Olivia Ybarra Lopez provided a permit renewal update and a recap of the Conservation Measures Subcommittee meeting.

4. Approval of Minutes

4.1

- March 28, 2024

A motion was made by Robert Mace, seconded by Roland Ruiz, to approve the meeting minutes from the March 28, 2024, Implementing Committee meeting. There were no objections.

5. Reports

5.1 **Receive report from Dr. Chad Furl, EAHCP Chief Science Officer, on the Science Committee's Memo on the Biological Goals and Objectives Memorandum.**

Dr. Chad Furl provided an overview of the Science Committee's Memo on the Biological Goals and Objectives Memorandum and a timeline of the Memorandum process for the ITP Permit Renewal.

6. Individual Consideration

6.1 **Consider staff recommendation to accept the EAHCP Biological Goals and Objectives Memorandum for use in the Incidental Take Permit Amendment Application process with the U.S. Fish and Wildlife Service.**

A motion was made by Roland Ruiz, seconded by Robert Mace, to accept the EAHCP Biological Goals and Objectives Memorandum for use in the Incidental Take Permit Amendment Application process with the U.S. Fish and Wildlife Service There were no objections.

6.2 **Consider staff recommendation to approve an amendment to the Edwards Aquifer Authority EAHCP 2024 Funding Application and Work Plan.**

A motion was made by Roland Ruiz, seconded by Donovan Burton, to postpone the staff recommendation to approve the amendments to the 2024 Edwards Aquifer Authority Work Plan and Funding Application to the May 23, 2024, Implementing Committee meeting.

7. Future Meetings

The next Implementing Committee meeting will be held on July 25, 2024, at the Edwards Aquifer Authority and online via Microsoft Teams.

8. Questions from the Public

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

9. Adjourn

There being no further business to discuss, the meeting adjourned at 11:39 AM.

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).

Greg Malatek
Secretary, EAHCP Implementing Committee

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, May 23, 2024 **10:00 AM** **Pauline Espinosa Community Hall & Microsoft Teams**

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 Program Announcements
- Spring Community Updates

4. Approval of Minutes

4.1

- April 11, 2024 - Implementing Committee Meeting Minutes

5. Reports

5.1 **Receive report from EAA staff regarding Edwards Aquifer 2023 Critical Period Management, permitted groundwater authorization, reported use, and possible over-pumping.**

5.2 **Receive report from Mark Enders, City of San Marcos Habitat Conservation Plan Manager, on updates to the City of San Marcos' Conservation and Drought Contingency Ordinance.**

5.3 **Receive report from Lucas Bare, ICF project manager, on updates to the ITP permit renewal process.**

6. Individual Consideration

6.1 **Consider staff recommendation to approve an amendment to the Edwards Aquifer Authority EAHCP 2024 Funding Application and Work Plan.**

6.2 **Consider staff recommendation to approve the 2025 Edwards Aquifer Authority Work Plan.**

6.3 **Consider staff recommendation to approve the 2025 City of San Marcos/Texas State University Work Plan.**

6.4 **Consider staff recommendation to approve the 2025 City of New Braunfels Work Plan.**

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

Thursday, May 23, 2024 **10:00 AM Pauline Espinosa Community Hall & Microsoft Teams**

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

Tom Taggart called the meeting to order at 10:05 AM. Committee members present: Roland Ruiz, Greg Malatek, Patrick Shriver, Robert Mace, and Jonathan Stinson.

2. Public Comment

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

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Program Announcements
- Spring Community Updates

Chad Furl provided a hydrologic update to the Implementing Committee. Olivia Lopez provided a recap of the Conservation Measures Subcommittee meeting and an overview of the next Steward Newsletter. Phillip Quast provided a spring community update on the Comal Springs and Mark Enders provided an update on the San Marcos Springs.

4. Approval of Minutes

4.1

- April 11, 2024 - Implementing Committee Meeting Minutes

A motion was made by Robert Mace, seconded by Roland Ruiz, to approve the meeting minutes from the April 11, 2024, Implementing Committee meeting. There were no objections.

5. Reports

7. Future Meetings

The next Implementing Committee meeting will be held on July 25, 2024, at the Edwards Aquifer Authority and online via Microsoft Teams.

8. Questions from the Public

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

9. Adjourn

There being no further business to discuss, the meeting was adjourned at 1:25 P.M.

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).

Amy Niles

Greg Malatek Amy Niles
Secretary, Implementing Committee

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, July 25, 2024 | **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 Program Announcements
- Spring Community Update
  - City of New Braunfels
  - City of San Marcos

4. Approval of Minutes

4.1

- **May 23, 2024**

5. Individual Consideration

5.1 **Consider staff recommendation to accept the Springflow Simulation for Initial Preliminary Take Assessment for use in the Incidental Take Permit Amendment Application process with 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

Thursday, July 25, 2024 | **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

Tom Taggart called the meeting to order at 11:18 AM. Committee members present: Roland Ruiz, Amy Niles, Patrick Shriver, and Jonathan Stinson.

2. Public Comment

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

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Program Announcements
- Spring Community Update
  - City of New Braunfels
  - City of San Marcos

Chad Furl provided a hydrologic update and recognized the USFWS Team of The Year Award. Damon Childs presented the EAHCP Budget Reports for April, May, and June 2024 and updated the Committee on the upcoming Budget Work Group Meeting. Olivia Lopez introduced the EAHCP Intern, Sarah Garcia, and reminded Committee members about the National HCP Coalition Annual Meeting. Philip Quast provided a spring community update on the Comal Springs and Mark Enders provided a spring community update on the San Marcos Springs.

4. Approval of Minutes

4.1

- **May 23, 2024**

The Implementing Committee did not have a quorum to approve the meeting minutes from the May 23, 2024.

5. Individual Consideration

5.1 Consider staff recommendation to accept the Springflow Simulation for Initial Preliminary Take Assessment for use in the Incidental Take Permit Amendment Application process with the U.S. Fish and Wildlife Service.

Lucas Bare, ICF, presented the Springflow simulations for the initial take assessment. The Implementing Committee did not have a quorum to accept the take assessment.

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 was adjourned at 1:04 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).

Greg Malatek
Amy Niles
Secretary, Implementing Committee

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, September 19, 2024 | **10:00 AM** | **EAA & Microsoft Teams**

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 Program Announcements
- Spring Communities Update

4. Approval of Minutes

4.1

- Implementing Committee May 23 and July 25, 2024 meeting minutes.

5. Individual Consideration

5.1 **Consider staff recommendation to accept the Springflow Simulation for Initial Preliminary Take Assessment for use in the Incidental Take Permit Amendment Application process with the U.S. Fish and Wildlife Service.**

6. Future Meetings and Items for Consideration

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

Thursday, September 19, 2024 | **10:00 AM** | **EAA & Microsoft Teams**

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

Tom Taggart called the meeting to order at 10:02 AM. Committee members present: Roland Ruiz, Amy Niles, Donovan Burton, and Nathan Pence.

2. Public Comment

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

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Program Announcements
- Spring Communities Update

Chad Furl provided a hydrologic update on the Edwards Aquifer and spring systems. Damon Childs recapped the 2024 Budget Work Group Meeting and shared the July EAHCP Budget Report. Kristina Tolman updated the Committee on the Conservation Measures Subcommittee, the Science Committee Vacancy Work Group, the EAHCP Calendar, and the USFWS draft Recovery Plan. Phillip Quast provided a spring community update on the Comal Springs and Mark Enders provided an update on the San Marcos Springs.

4. Approval of Minutes

4.1

- Implementing Committee May 23 and July 25, 2024 meeting minutes.

A motion was made by Roland Ruiz, seconded by Tom Taggart, to approve the meeting minutes from the May 23 and July 25, 2024, Implementing Committee meetings. Robert Mace abstained from voting on the approval of the July 25, 2024, Implementing Committee meeting minutes due to his absence at that meeting. There were no objections.

5. Individual Consideration

5.1 **Consider staff recommendation to accept the Springflow Simulation for Initial Preliminary Take Assessment for use in the Incidental Take Permit Amendment Application process with the U.S. Fish and Wildlife Service.**

A motion was made by Roland Ruiz, seconded by Amy Niles, to approve the directive to proceed for using the 1947-1976 springflow simulation as the basis for an initial take assessment in the permit renewal process. The Implementing Committee will review the Springflow Modeling Reports and the Conservation Measures Subcommittee Report with reevaluation of the directive to proceed. There were no objections.

6. Future Meetings and Items for Consideration

The next Implementing Committee meeting will be held on October 10, 2024, at the City of New Braunfels City Hall and online via Microsoft Teams. The next Implementing Committee meeting will be held on October 10, 2024, at the City of New Braunfels City Hall and online via Microsoft Teams.

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 was adjourned at 12:02 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).

Amy Niles

Greg Malatek Amy Niles
Secretary, Implementing Committee

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, October 10, 2024 **10:00 AM** **New Braunfels City Hall & Microsoft Teams**

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 Program Announcements
- Spring Communities Update
  - City of New Braunfels
  - City of San Marcos

4. Approval of Minutes

4.1

September 19, 2024 Implementing Committee Meeting Minutes

5. Reports

5.1 **Receive report from EAHCP staff on the Conservation Measures Subcommittee Report.**

6. Individual Consideration

6.1 **Receive a report for discussion and consider recommendations from the 2024 EAHCP Budget Work Group for possible submittal of the EAHCP Budget Work Group Report to the Edwards Aquifer Authority Board of Directors.**

6.2 **Consider staff recommendation to approve the Edwards Aquifer Authority's EAHCP 2025 Funding Application and Work Plan amendment.**

6.3 **Consider staff recommendation to approve the City of New Braunfels EAHCP 2025 Funding Application and Work Plan amendment.**

6.4 **Consider staff recommendation to approve the City of San Marcos EAHCP 2025 Funding Application and Work Plan amendment.**

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
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EdwardsAquifer.org

Meeting Minutes

EAHCP Implementing Committee

Thursday, October 10, 2024 | **10:00 AM** | **New Braunfels City Hall & Microsoft Teams**

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

Chairperson Mark Enders called the meeting to order at 10:08 AM. Members present: Roland Ruiz, Greg Malatek, Donovan Burton, Robert Mace, and Jonathan Stinson.

2. Public Comment

There were no citizens who requested to address the committee.

3. EAHCP Program Manager Announcements

3.1

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

Chad Furl provided a hydrologic update for the Comal Springs, San Marcos Springs, and index wells J17 and J27. Scott Storment provided program announcements on August 2024 budget report, EAHCP appreciation event, the USFWS draft recovery plan and the EAHCP Climate Change and Springflow Projection Reports. Phillip Quast provided a spring community update on the Comal spring system and Mark Enders provided an update on the San Marcos spring system.

4. Approval of Minutes

4.1

September 19, 2024 Implementing Committee Meeting Minutes

Robert Mace rejected the approval of the September 19, 2024, Implementing Committee meeting minutes.

5. Reports

5.1 **Receive report from EAHCP staff on the Conservation Measures Subcommittee Report.**

Kristina Tolman, Senior EAHCP Coordinator, provided an overview of the Conservation Measures Subcommittee Report and Subcommittee process. The Subcommittee report was submitted to the ICF Permit Renewal Contractor in October 2024 to review for the Conservation Strategy Memorandum.

6. Individual Consideration

6.1 **Receive a report for discussion and consider recommendations from the 2024 EAHCP Budget Work Group for possible submittal of the EAHCP Budget Work Group Report to the Edwards Aquifer Authority Board of Directors.**

A motion was made by Donovan Burton, seconded by Robert Mace, to submit the Budget Work Group Report to the Edwards Aquifer Authority Board of Directors. There were no objections.

6.2 **Consider staff recommendation to approve the Edwards Aquifer Authority's EAHCP 2025 Funding Application and Work Plan amendment.**

A motion was made by Robert Mace, seconded by Donovan Burton, to approve the Edwards Aquifer Authority's EAHCP 2025 Funding Application and Work Plan amendments. There were no objections. A motion was made by Robert Mace, seconded by Donovan Burton, to approve the Edwards Aquifer Authority's EAHCP 2025 Funding Application and Work Plan amendments. There were no objections.

6.3 **Consider staff recommendation to approve the City of New Braunfels EAHCP 2025 Funding Application and Work Plan amendment.**

A motion was made by Robert Mace, seconded by Mark Enders, to approve the City of New Braunfels EAHCP 2025 Funding Application and Work Plan amendments. There were no objections. A motion was made by Robert Mace, seconded by Mark Enders, to approve the City of New Braunfels EAHCP 2025 Funding Application and Work Plan amendments. There were no objections.

6.4 **Consider staff recommendation to approve the City of San Marcos EAHCP 2025 Funding Application and Work Plan amendment.**

A motion was made by Donovan Burton, seconded by Robert Mace, to approve the City of San Marcos EAHCP 2025 Funding Application and Work Plan amendments. There were no objectionsA motion was made by Donovan Burton, seconded by Robert Mace, to approve the City of San Marcos EAHCP 2025 Funding Application and Work Plan amendments. There were no objections

7. Future Meetings

The next meeting of the Implementing Committee will be held on December 19, 2024, at the Edwards Aquifer Authority.

8. Questions from the Public

Dianne Wassenich addressed the Implementing Committee with a request that the "Comments for Consideration" in the Conservation Measures Subcommittee Report be addressed throughout the permit Renewal process, stressed the need for continuity for the next EAHCP, thanked the Edwards Aquifer Authority for continued financial support of the EAHCP, and asked for clarity on cost spikes from program triggers when funding springflow programs and the overall budget in light of drought conditions.

9. Adjourn

There being no further business to discuss, the meeting adjourned at 12:46 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).

Amy Niles

Greg Malatek, City of New Braunfels
Secretary, Board of Directors

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Implementing Committee

Thursday, December 19, 2024 | **10:00 AM** | **EAA Board Room and Microsoft Teams**

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
- EAHPC Program Announcements
- Spring Communities Update

4. Approval of Minutes

4.1

Approval of the Implementing Committee meeting minutes from September 19 and October 10, 2024.

5. Reports

5.1 **Receive a report from the permit renewal contractor, ICF, on the Permit Renewal progress and next steps related to developing the Conservation Measures Memorandum and Incidental Take Assessment Memorandum.**

6. Individual Consideration

6.1 **Consider staff recommendation to approve amendments to Edwards Aquifer Authority 2025 Work Plan.**

6.2 **Consider staff recommendation to approve the 2025 Implementing Committee Officers.**

7. Future Meetings

7.1

2025 EAHCP Committee Meeting Calendar

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

Thursday, December 19, 2024 | **10:00 AM** | **EAA Board Room and Microsoft Teams**

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

Chairperson Mark Enders called the meeting to order at 11:32 AM. Committee members present: Roland Ruiz, Amy Niles, Donovan Burton, Robert Mace, and Jonathan Stinson.

2. Public Comment

There were no citizens who requested to address the Committee.

3. EAHCP Program Manager Announcements

3.1

- Hydrologic Update
- EAHCP Program Announcements
- Spring Communities Update

Attachments: 09-2024 EAHCP Expense Report

10-2024 EAHCP Expense Report

Paul Bertetti, EAA Senior Director of Aquifer Science Research & Modeling, provided the hydrologic update. Damon Childs, EAHCP Senior Contract Administrator, provided the EAHCP budget reports for September and October 2024, announced 2025 RFPs, and updated the committee on the USFWS Section 6 Grant coordination with TPWD. Phillip Quast and Mark Enders provided a spring community update on the Comal and San Marcos springs, respectively.

4. Approval of Minutes

4.1

Approval of the Implementing Committee meeting minutes from September 19 and October 10, 2024.

Attachments: EAHCP_ImplementingCommittee_Sept.19.2024_REVISED_MeetingMinutes_Pending Approval
EAHCP_ImplementingCommittee_October 10._2024_MeetingMinutes_Pending Approval

A motion was made by Robert Mace, seconded by Donovan Burton, to approve the September 19 and October 10, 2024, Implementing Committee meeting minutes. There were no objections.

5. Reports

5.1 Receive a report from the permit renewal contractor, ICF, on the Permit Renewal progress and next steps related to developing the Conservation Measures Memorandum and Incidental Take Assessment Memorandum.

6. Individual Consideration

6.1 Consider staff recommendation to approve amendments to Edwards Aquifer Authority 2025 Work Plan.

Attachments: 2025 EAA Work Plan - Amendment# 2 (Dec 2024) - HIGHLIGHTED (final)

A motion was made by Donovan Burton, seconded by Robert Mace, to approve the Edwards Aquifer Authority's EAHCP 2025 Work Plan amendments. There were no objections.

6.2 Consider staff recommendation to approve the 2025 Implementing Committee Officers.

Attachments: Implementing Committee Officer Succession Plan (1)

KSELP-1147548-v1-EAHCPP_parliamentary_rule_of_conduct_for_the_Implementing_Committee

KSELP-1147549-v1-EAHCPP_implementing_committee_operational_rules_procedures

A motion was made by Robert Mace, seconded by Mark Enders, to approve the 2025 Implementing Committee Officers in accordance with the succession plan. There were no objections.

7. Future Meetings

7.1

2025 EAHCP Committee Meeting Calendar

Attachments: 2025 EAHCP Committee Meeting Calendar

8. Questions from the Public

There were no citizens who requested to address the committee.

9. Adjourn

There being no further business to discuss, the meeting adjourned at 12:26 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).

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Donovan Burton
Secretary, Implementing Committee

Appendix M2 | **Budget Work Group**

Edwards Aquifer Habitat Conservation Plan

Report of the 2024 Budget Work Group

To: Edwards Aquifer Habitat Conservation Plan Implementing Committee

From: Edwards Aquifer Habitat Conservation Plan Budget Work Group

Date: August 28, 2024

Overview:

On August 28, 2024, an annual meeting of the Edwards Aquifer Habitat Conservation Plan (EAHCP) Budget Work Group was held to receive a report from Edwards Aquifer Authority (EAA) staff pertaining to the EAA's Financial 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 as they arise and are referred by the Implementing Committee".

Members of this Work Group include:

- Robert Mace, EAHCP Implementing Committee (IC) Member (Texas State University – Chair)
- Myron Hess, EAHCP Stakeholder member (Living Waters Project)
- Marc Friberg, EAA designee
- Benjamin Benzaquen, San Antonio Water System designee
- Adam Yablonski, Member-at-Large, Medina County Farm Bureau

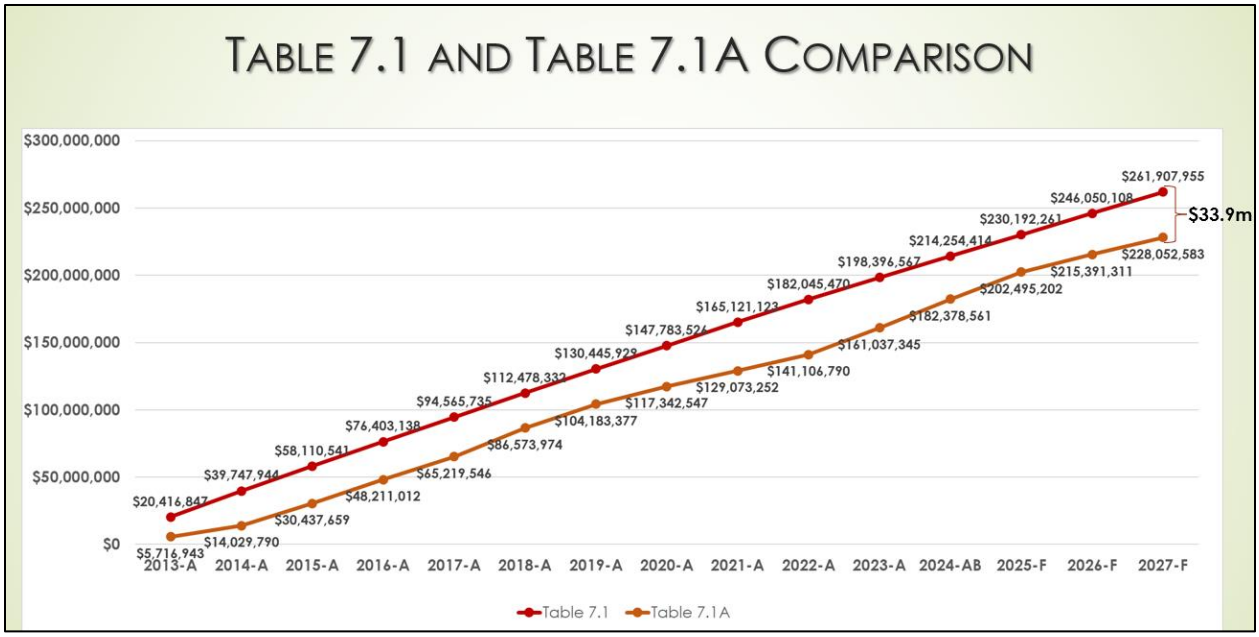
Work Group Discussions:

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

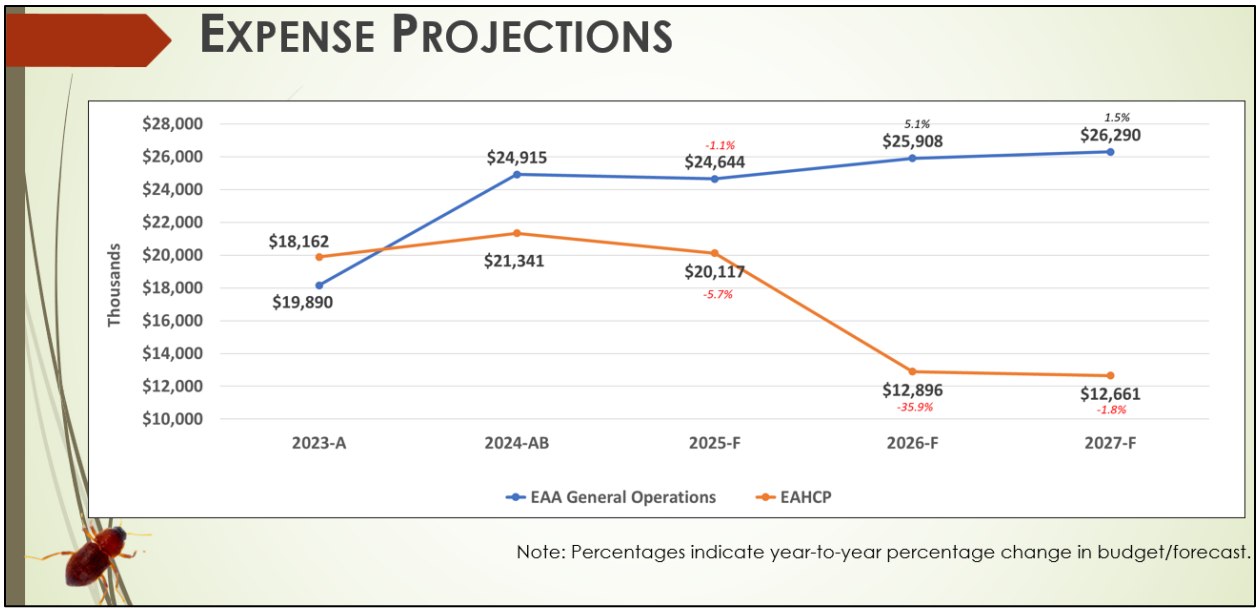
- Receive presentation and consider possible action associated with the EAHCP ITP Forecast

Financial Forecast (2025-2027):

EAA staff presented a projected Financial Forecast for the EAA, including both the EAA General Operations and Habitat Conservation Program budgets. A detailed illustration was given of how the 7.1 Budget compares to actual expenses (Table 7.1A) thus far and as projected through 2027. Excluding costs for additional triggering events of VISPO after 2025 or any triggering of ASR recovery before 2027, the current projections show the EAHCP will be about $33.9 million under budget by the end of that timeframe.

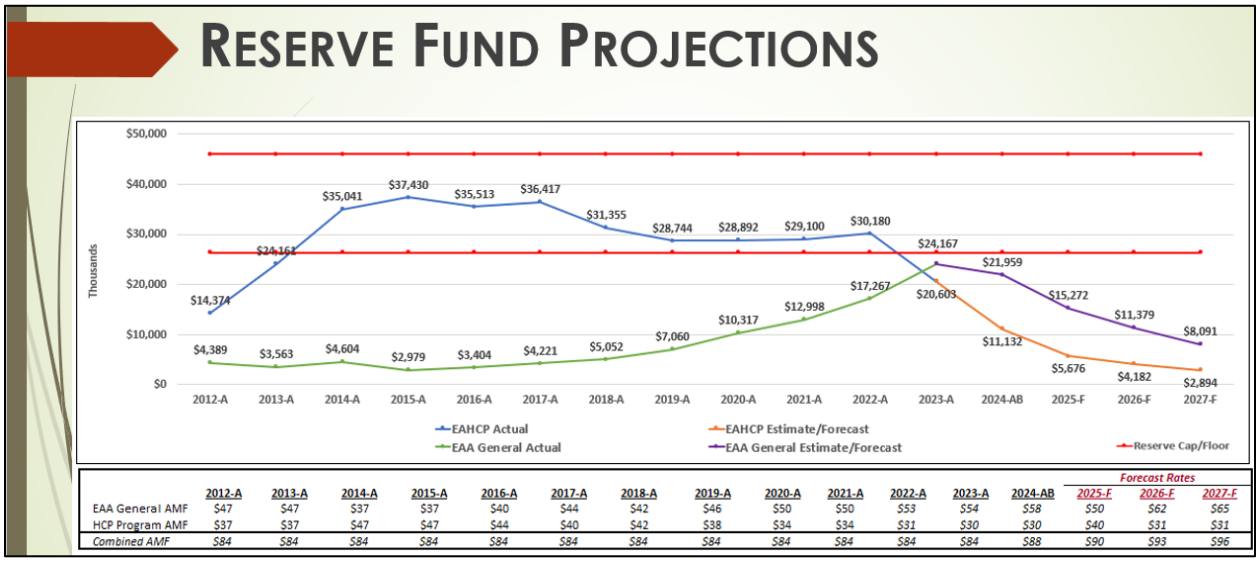


A comparative look at the combined EAA/EAHCP expense projections through 2027 was provided. The EAA operating budget is projected to incur small increases each year whereas the EAHCP budget is projected to see a slight decline in 2025 but then see a sharp decrease by over $7 million in 2026 and then remain level going into 2027 as it reaches the end of the current Incidental Take Permit (ITP). This decline in EAHCP budget is largely predicated on an expected decrease in programmatic expenses but, as noted above, it does not include any additional VISPO trigger occurrences after 2024 (for forbearance in 2025) or any ASR recovery expenses.



EAA staff provided additional information regarding current trigger probabilities for both VISPO and ASR. Based just on an analysis of historical data through 2023, the

probability of reaching the VISPO trigger in any specific year would be about 8%. More specifically, using those data, for the period of 2024-2028, the chances of a VISPO trigger are 37.2% for 1 or more years, 6.7% for 2 or more years, and 0.6% for 3 or more years. However, given aquifer conditions at the time of the meeting, the chances of a VISPO trigger for 2024, with forbearance in 2025, were characterized at 62%. The cost of a VISPO trigger for forbearance in 2025 is already included in the 2025 proposed budget at an approximate value of $6.9 million, to be paid from the EAHCP Reserve. Any additional VISPO forbearance events would carry comparable costs. There is no chance of triggering ASR forbearance or recovery in 2025, as it is mathematically impossible for the 10-year rolling recharge average to drop below the trigger value of 500,000 acre-feet. However, the chance of a triggering event in the year 2026, for ASR forbearance in 2027, is about 39.7% and the chance of it triggering in 2027, for forbearance in 2028, is about 68%. Because of the way ASR forbearance contracts are structured, triggering of ASR forbearance does not result in additional costs. However, if ASR recovery were to take place in 2027 or 2028, additional costs would be incurred.



	2012-A	2013-A	2014-A	2015-A	2016-A	2017-A	2018-A	2019-A	2020-A	2021-A	2022-A	2023-A	2024-AB	Forecast Rates 2025-F	2026-F	2027-F
EAA General AMF	$47	$47	$37	$37	$40	$44	$42	$46	$50	$50	$53	$54	$58	$50	$62	$65
HCP Program AMF	$37	$37	$47	$47	$44	$40	$42	$38	$34	$34	$31	$30	$30	$40	$31	$31
Combined AMF	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$88*	*$90*	*$93*	*$96*

A concise look into the Reserve Fund Projections was provided for the Workgroup, fostering much discussion of the combined EAA Aquifer Management Fee (AMF) rate and Reserve Forecast. The prevailing sentiment over the years has remained that the Work Group should be vigilant in continuously evaluating the declining AMF portion allocated to HCP vs. EAA operations and any correlating, negative effect on the reserve balance. The year 2024 was the first year in EAHCP history that saw an increase in the combined AMF rate, going from $84 to $88 per acre-foot. This trend will continue in 2025 as the EAA has proposed a $2 *overall* increase to the AMF rate for 2024, going to $90. The combined AMF rate is projected to rise to $93 in 2026 and $96 in 2027. These increases are in response to current inflationary costs and maintaining a combination of fund reserves capable of absorbing future potential VISPO trigger events.

While the HCP Program AMF rate portion is projected to increase to $40 in 2025, the forecast shows a comparable decline back to $31 in 2026 and 2027. This is due to the fact that HCP Program expenses are projected to decrease from current levels as we near the end of the current ITP. With this decrease in programmatic costs, and with the

assumptions noted above regarding forbearance events, the Reserve Fund balance is projected to drop to just below $3 million at the end of 2027. As always, the EAA staff intends to continue to evaluate program expenses and how they affect the reserve fund each year.

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 2025.
- The work group acknowledged that there will be a proposed $2 overall AMF rate increase in 2025 accompanied by a one-year increase in the HCP Program allocation. It was also understood that the *projected* AMF rates shown for 2026-2027 are not to be interpreted as the actual proposed rate.
- The work group understands that even with the EAHCP Budget Reserve Fund decreasing over the final years of the current ITP, any future potential trigger-based expenditures will be addressed through the toggling of AMF Rates and/or the usage of the EAA General Reserve fund.
- The Budget Work Group will continue to convene as early in the budget process as reasonable each year

Recommendations:

The Work Group makes no finalized recommendation for the EAHCP Implementing Committee to forward to the EAA Board , but rather, the Work Group refers the items listed below to the Implementing Committee for discussion, consideration, and action in formulating a recommendation to the EAA Board regarding the 2025 budget. The Work Group recommends the Implementing Committee consider and discuss the following issues related to funding:

1. Allocation of reserve funds at the end of the current ITP in 2027

The topic of the fate of any surplus program funds that may remain at the expiration of the ITP was often raised during the discussion. At the core of the matter, the concern that looms large is what is the ethically and fiscally responsible manner to handle this? Should any EAHCP Budget Reserve funds remaining be re-purposed for programs associated with the new HCP or should these funds be refunded to all permit holders as those options are set out in Section 6.5 of the FMA? The FMA language related to carryover approval of reserve balances or the default return of funds to the permit holders poses the question of what approach is preferred and, if carryover of funds is desired, what amount should be needed. The default FMA requirement of a refund of remaining reserves is in keeping with the original AMF increase EAA board action on entering the program. If the severe drought climate that we are currently in continues to persist, should a robust reserve amount be made available on the onset of a new ITP

to cover any steep, unexpected costs that arise? For example, because all existing forbearance agreements expire at the end of the current HCP, there may be substantial startup costs associated with getting new forbearance agreements in place. If current recharge trends continue, at that point forbearance triggers are likely to be met or close to being met and the cost of agreements is likely to reflect that reality. The availability of a substantial reserve might help defer the need for a large increase in the AMF in that situation. This is a fluid conversation that the Work Group would like the EAA Board to remain engaged on.

2. The potential of the management of program costs using a single, shared EAA reserve fund

This proposed notion was discussed and merits careful consideration. Under this scenario, a simpler budgetary process would exist that, arguably, would provide greater agility in responding to variable financial costs. As it stands, the EAHCP Program Reserve is restricted to usage for program expenses only whereas the EAA General Reserve is unrestricted and can be used towards both general and EAHCP expenses. The Implementing Committee should consider potential advantages and disadvantages of this arrangement. One of the advantages originally considered in developing the current approach of building a large, dedicated program Reserve is the certainty of availability of funding for periodic large expenses associated with VISPO forbearance and ASR recovery without corresponding large changes in the AMF. As discussed below, depending on market acceptance, it may be possible to design all future forbearance agreements to avoid incurring such varying costs.

3. Consideration for the prospect of disconnecting cost hikes from program-triggers when funding all springflow protection programs in the next ITP

Because Springflow Protection measures that trigger periodically are both the most costly and the most unpredictable expenditures for the current EAHCP, this has resulted in substantial fluctuations in annual program costs. Moving away from a financial formula that connects significant cost increases to program triggers would eliminate the need to compensate for such costly hits to the EAHCP budget in any given year. This approach would also help flatten costs and provide a landscape for more accurate budget forecasting and the establishment of a smaller Reserve floor. Although not tested in the VISPO market, this type of approach has been successfully implemented for ASR-related forbearance agreements, which, unlike VISPO forbearance agreements, are designed to trigger only upon a recurrence of conditions similar to the drought-of-record.

4. Considerations for start-up costs for the renewed EAHCP

Because all existing forbearance agreements expire at the end of the current HCP, there may be substantial startup costs associated with getting new forbearance agreements in place, particularly if current recharge trends continue. If, at that point, forbearance

triggers are met or are likely to be met soon, the cost of new agreements is likely to reflect that reality. The availability of a substantial Reserve might help defer the need for a large increase in the AMF under those conditions.

APPENDIX A
SLIDE PRESENTATIONS

EAHCP Budget Work Group

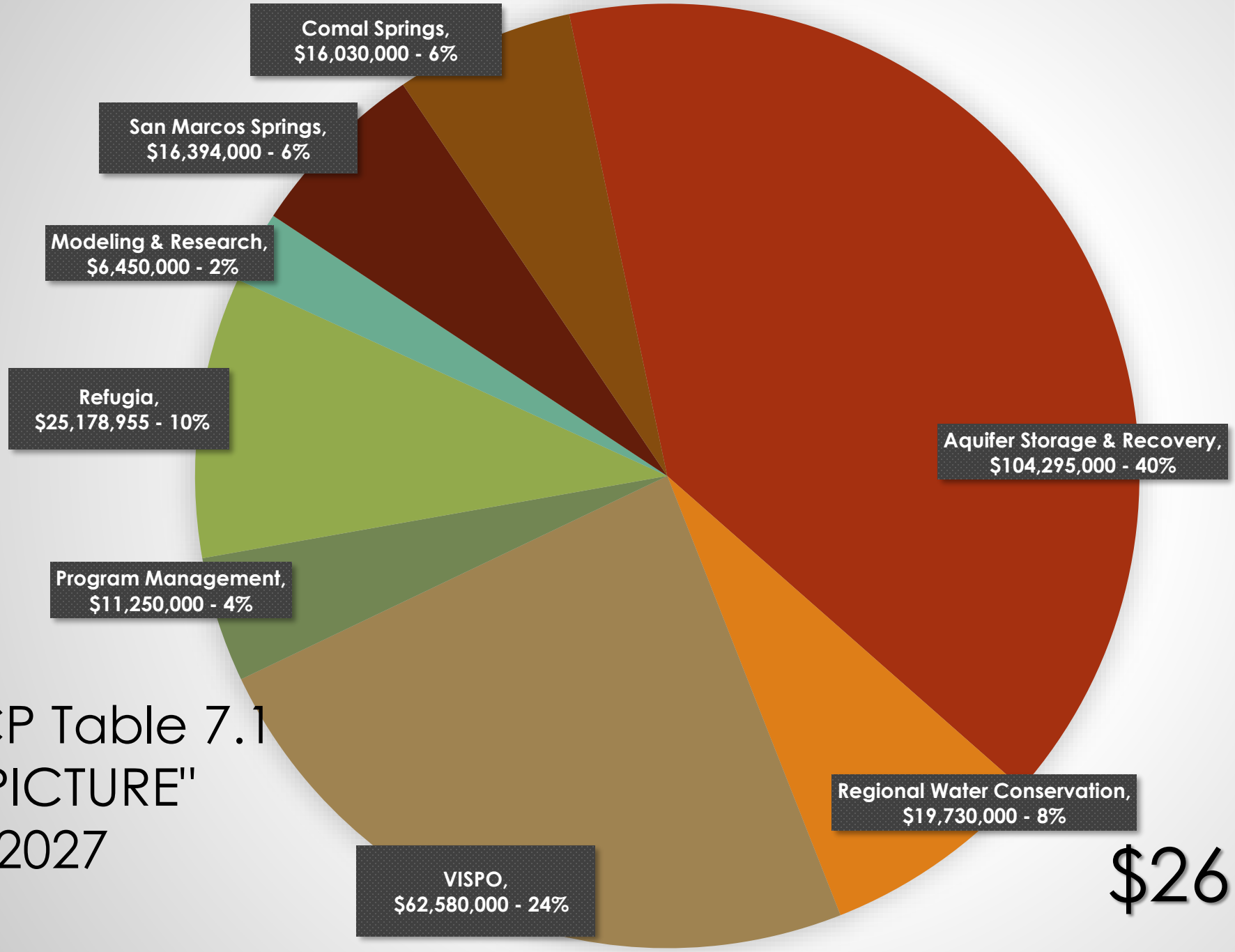
August 28, 2024

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.

EAHCP 7.1A Analysis and Forecast



EAHCP Table 7.1 "BIG PICTURE" 2013-2027

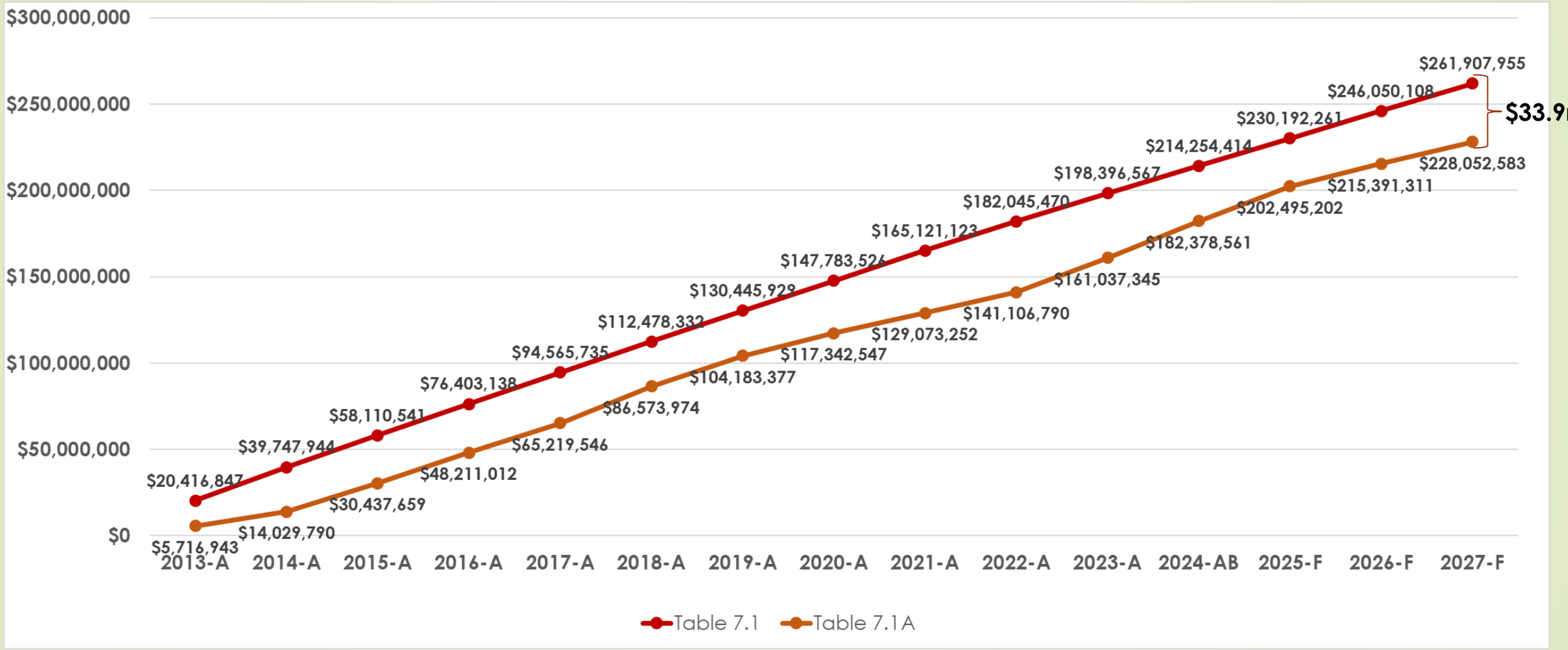
$261,907,955

7.1 Adjusted

"Table 7.1A"

Tracks actuals for closed years and forecasted periods through the end of the ITP.

Table 7.1 and Table 7.1A Comparison



PROGRAM TOTALS | TABLE 7.1 AND TABLE 7.1A COMPARISON

EAHCP Measure	Table 7.1 Totals	Table 7.1A Projected Totals	▲ Between Table 7.1 to 7.1A
Program Administration	$11,250,000	$15,763,643	($4,513,643)
ASR - Leasing/Forbearance	71,385,000	71,109,121	275,879
ASR - O & M	32,910,000	4,709,262	28,200,738
Regional Water Conservation	19,730,000	19,414,103	315,897
VISPO	62,580,000	57,988,894	4,591,106
San Marcos Springs	16,394,000	17,907,765	(1,513,765)
Comal Springs	16,030,000	16,152,214	(122,214)
Modeling & Research	6,450,000	5,879,057	570,943
Refugia	25,178,955	19,128,524	6,050,431
Total	**$261,907,955**	**$228,052,583**	**$33,855,372**

Entity	Table 7.1 Totals	Table 7.1A Projected Totals	▲ Between Table 7.1 to 7.1A
Edwards Aquifer Authority	$238,483,955	$204,639,278	$33,844,677
City of San Marcos - Texas State University	11,894,000	12,703,490	(809,490)
City of New Braunfels	11,530,000	10,709,816	820,184
Total	**$261,907,955**	**$228,052,583**	**$33,855,372**

TABLE 7.1 AND TABLE 7.1A COMPARISON

EDWARDS AQUIFER AUTHORITY

EAHCP Measure	Table 7.1 Totals	Table 7.1A Projected Totals	▲ Between Table 7.1 to 7.1A
ASR - Leasing/Forbearance	$71,385,000	$71,109,121	$275,879
ASR - O & M	32,910,000	4,709,262	28,200,738
Regional Municipal Water Conservation	19,730,000	19,414,103	315,897
VISPO	62,580,000	57,988,894	4,591,106
Biological Monitoring	6,000,000	7,978,492	(1,978,492)
Water Quality Monitoring	3,000,000	2,668,182	331,818
Ecological Modeling	1,150,000	1,117,758	32,242
Applied Research (Research & Facility)	4,750,000	3,402,786	1,347,214
Refugia	25,178,955	19,128,524	6,050,431
Program Management	11,250,000	15,763,643	(4,513,643)
Science Review Panel	550,000	1,358,513	(808,513)
Total	**$238,483,955**	**$204,639,278**	**$33,844,677**

TABLE 7.1 AND TABLE 7.1A COMPARISON

CITY OF SAN MARCOS/TEXAS STATE UNIVERSITY

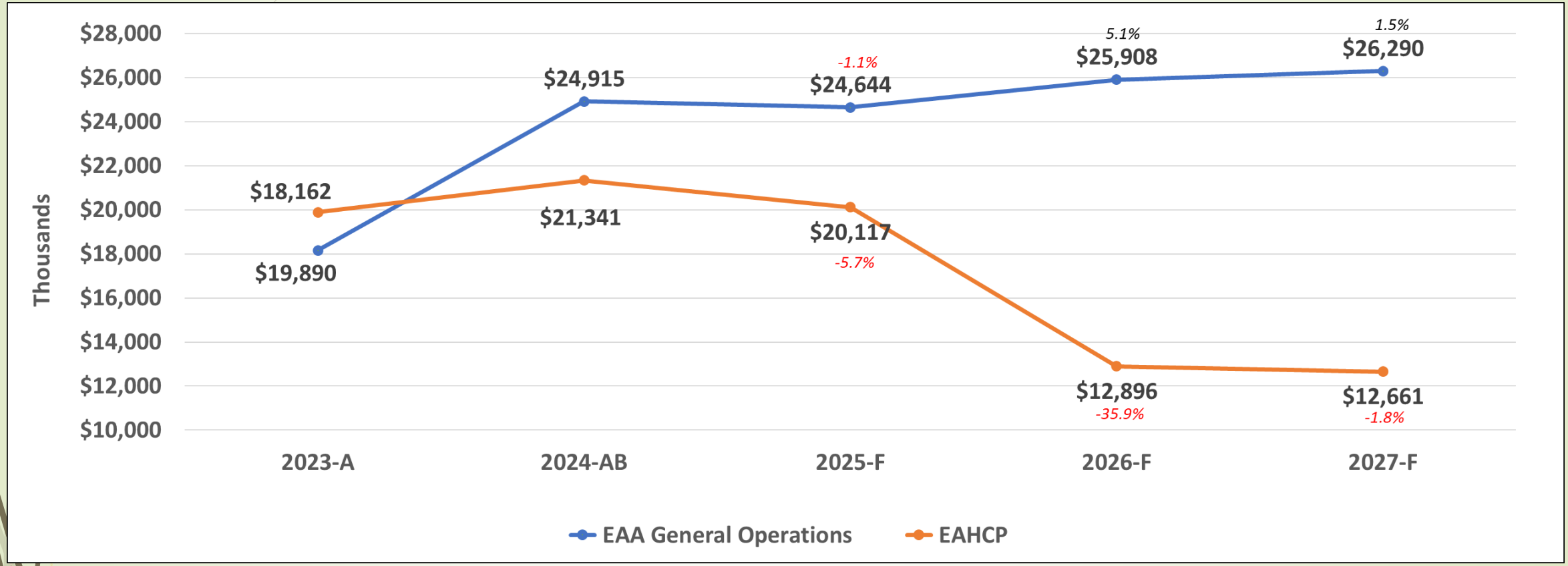
EAHCP Measure	Table 7.1 Totals	Table 7.1A Projected Totals	▲ Between Table 7.1 to 7.1A
TX Wild Rice Enhancement/Restoration	$1,850,000	$1,220,665	$629,335
Sediment Removal	850,000	744,292	105,708
Non-Native Plant Species Control	1,375,000	3,033,824	(1,658,824)
Litter Control/Floating Vegetation	1,200,000	695,927	504,073
Non-Native Animal Species Control	525,000	379,868	145,132
Bank Stabilization/Perm Access Points	780,000	1,153,492	(373,492)
Restoration - Riparian Zones	380,000	651,836	(271,836)
Management - Key Public Rec Areas	784,000	854,487	(70,487)
LID/BMP Management	3,600,000	3,441,325	158,675
Household Hazardous Waste Program	450,000	412,426	37,574
Sessom Creek Sand Bar	100,000	100,000	0
Education	0	15,349	(15,349)
Total	**$11,894,000**	**12,703,490**	**($809,490)**

Table 7.1 and Table 7.1A Comparison

City of New Braunfels

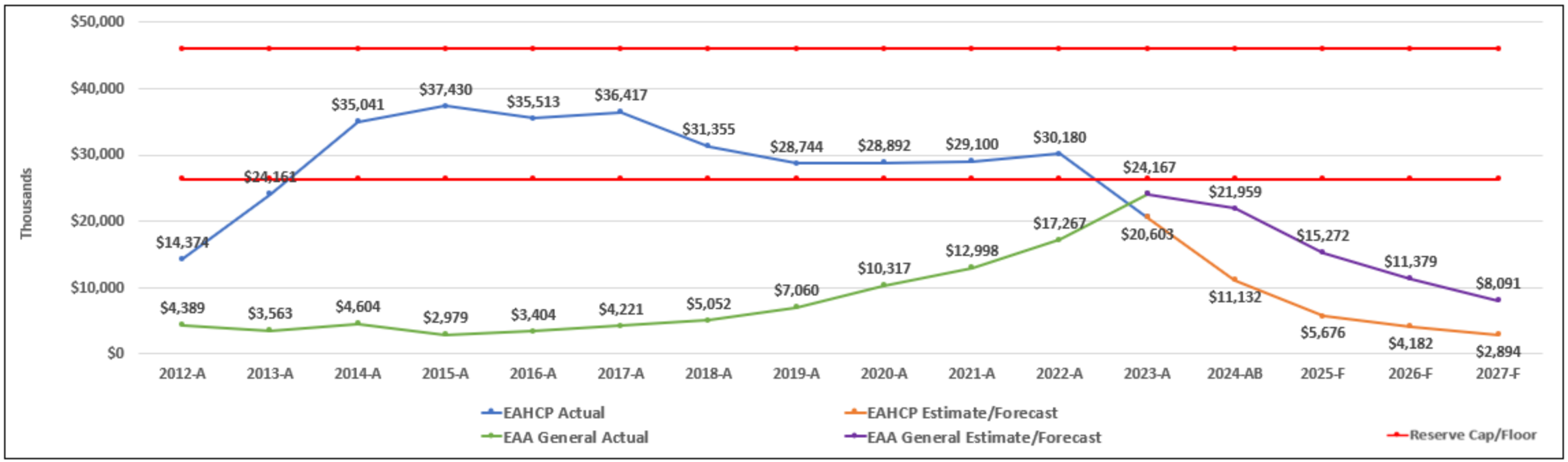
EAHCP Measure	Table 7.1 Totals	Table 7.1A Projected Totals	▲ Between Table 7.1 to 7.1A
Old Channel Restoration	$2,000,000	$1,707,938	$292,062
Flow Split Management	270,000	352,878	(82,878)
Aquatic Vegetation Restoration	1,245,000	1,471,477	(226,477)
Non-Native Animal Species Control	1,245,000	939,722	305,278
Decaying Vegetation Removal	960,000	390,437	569,563
Riparian Impr - Riffle Beetle	525,000	467,513	57,487
Gill Parasite Control	1,325,000	749,777	575,223
Restoration - Riparian Zones	1,600,000	2,092,656	(492,656)
LID/BMP Management	1,900,000	1,675,678	224,322
Household Hazardous Waste Program	450,000	521,014	(71,014)
Litter Control/Floating Vegetation	0	337,376	(337,376)
Prohibition - Hazardous Materials Route	10,000	0	10,000
Education	0	3,349	(3,349)
Total	**$11,530,000**	**$10,709,816**	**$820,184**

Expense Projections



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

Reserve Fund Projections



	2012-A	2013-A	2014-A	2015-A	2016-A	2017-A	2018-A	2019-A	2020-A	2021-A	2022-A	2023-A	2024-AB	Forecast Rates 2025-F	2026-F	2027-F
EAA General AMF	$47	$47	$37	$37	$40	$44	$42	$46	$50	$50	*$53*	*$54*	*$58*	*$50*	*$62*	*$65*
HCP Program AMF	$37	$37	$47	$47	$44	$40	$42	$38	$34	$34	*$31*	*$30*	*$30*	*$40*	*$31*	*$31*
Combined AMF	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$84*	*$88*	*$90*	*$93*	*$96*

EAHCP Drought Probabilities: VISPO & ASR Forbearance

VISPO Forbearance

- **VISPO Trigger: "**If*, on October 1st of a year, the J-17 Index well water level is at or below 635 feet msl, the General Manager of the EAA shall issue a notice of a Forbearance Year. A Forbearance Year commences on January 1st of the year following the year in which the General Manager issued a notice of a Forbearance Year."*

  - Considering historical data through 2023, the probability of reaching the VISPO trigger would be about 8% and for the 4 years from 2024 - 2028, the chances of VISPO triggering are:
    - 1 or more VISPO trigger years = 37.2 percent
    - 2 or more = 6.7 percent
    - 3 or more = 0.6 percent

  - As of July 1, 2024, water levels in J-17 were low (less than 640 ft msl). This condition on July 1 has occurred 13 times over the 89 years on record, and in 8 of those years, the October 1 water level at J-17 was at or below the VISPO trigger of 635 ft msl.
    - The probability of reaching the VISPO trigger in 2024, for forbearance in 2025, is likely to be closer to 62% using those criteria.

EAHCP Drought Probabilities: VISPO & ASR Forbearance

ASR Forbearance

- **ASR Trigger:** "If, *on June 1st of a year, the Ten-year Rolling Average of the Estimated Annual Recharge to the Aquifer is equal to or less than 500,000 AF/annum, the General Manager of the EAA shall issue a notice of a Forbearance Year. A Forbearance Year commences on January 1st of the year following the year in which the General Manager issued a notice of a Forbearance Year*."

  - The 10-year rolling average recharge calculated on June 1, 2024, based on recharge estimates for years 2014–2023, was 549,700 acre-feet, indicating that 2025 will ***not*** be a Forbearance year.
  - There is zero chance of ASR triggering in 2025, for forbearance in 2026, even if recharge were zero for 2024, the 10-year average would still be above 500,000 acre-feet.
  - The chance of triggering in the year 2026, for forbearance in 2027, is about 39.7%.
  - The chances of triggering in 2027, for forbearance in 2028, is about 68%.

Questions?

APPENDIX B
MEETING AGENDA

2024 EAHCP Budget Work Group

Meeting Agenda
Wednesday, August 28, 2024
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 ITP Forecast**
4. **Public comment**
5. **Future meetings**
6. **Adjourn**

APPENDIX C
MEETING MINUTES

2024 EAHCP Budget Work Group

Meeting Minutes
Wednesday, August 28, 2024

Members of this Work Group include Robert Mace (Chair – Texas State University), Marc Friberg (Edwards Aquifer Authority), Adam Yablonski (Medina County Farm Bureau), Myron Hess (Texas Living Waters Project), and Benjamin Benzaquen (SAWS).

1. **Confirm attendance.**
   Robert Mace called the meeting to order at 10:02 a.m. All Work Group members were present except for Adam Yablonski.

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

3. **Receive presentation and consider possible action associated with the EAA's Financial Forecast (2025-2027)**

   After reading the charge of the Work Group, Robert inquired on what is the ultimate action item of the committee. Marc and Damon clarified that the ultimate objective and action item of the Work Group is to provide a comprehensive report of the committee's findings that will be provided in the form of public comment to the EAA Board each year for the Board to consider as they contemplate the approval of the proposed budget for the next fiscal year.

   EAA Controller Shelly Hendrix presented the EAA's financial forecast that was presented to the EAA Board on 8-13-24. That forecast provided an overview of how the EAHCP budget is allocated amongst its various programs and expense categories. It should be noted that the forecast is predicated on assumptions about rate considerations & reserves. A comparative look at the projections between Table 7.1 and Table 7.1A indicates expected expenditures at $33.9 million below Table 7.1 values through 2027 at a total of $228 million. These forecast updates are based on estimates to the end of the Incidental Take Permit (ITP) and 2025 proposed EAHCP budget. It was noted that the proposed 2025 Budget already includes assumed suspension payments for a likely VISPO trigger, although that formal determination is made on Oct 1st each year. Robert asked how much a VISPO trigger typically costs, which Shelly replied is approximately $7 million. Marc added that incurring any ASR Operation & Maintenance (O&M) costs would be virtually mathematically impossible until 2026 because of the calculation of the 10-year average recharge value. The O&M costs are essentially the energy costs for SAWS to pump the water from ASR.

The combined EAA General Operations/EAHCP expense projections through 2027 were provided. The annual expenses for EAA General Operations are projected to hold steady at around ~$24-26 million whereas the EAHCP expenses are forecasted at just over $20 million in 2025 but projected to decline to under $13 million for the final years of the current ITP in 2026-2027. This decline is attributed to an expected reduction in programmatic expenses as we approach the end of the permit. It should be noted that these projections do not include VISPO triggers for 2026-2027 or triggering of ASR recovery.

The EAHCP Budget Reserve Fund projections were presented to the Workgroup, The combined AMF rate is proposed to increase from $88 to $90 in 2025. While 2024 saw the first rate increase in the history of the EAHCP, there will be projected, stair-step increases to the combined AMF each year until the end of the current ITP. It should be noted that the HCP Program AMF portion is forecasted to decrease in the final years of the ITP. Ben asked if EAHCP program needs are supposedly going down, why are AMF rates projected to increase over the same time frame. Shelly responded it is done to manage inflationary costs and keep our general fund reserve at a manageable point and there is the potential for additional VISPO triggers.

Robert asked what we do with the reserve funds after 2027 when the ITP expires. Marc replied that it is not determined within the HCP how those funds will be handled upon the expiration of the ITP. Marc further stated that if all parties agreed, there is the opportunity to refund any unspent reserves back to each of the Permittees. However, that approach does not consider the fact that we would still have ongoing conservation measures to fund in 2028. Marc also stated that in the next ITP, he would prefer to have conservation measures the cost of which do not vary based on triggers but rather that are designed to flatten costs and allow us to forecast more accurately and determine what an appropriate reserve amount should be without those large trigger costs. Robert posed the question of the possibility of the current ITP being extended another two years and how would we pay for another VISPO trigger with only an approximate $3 million left in our projected reserve balance at that point. Marc replied that it would be paid through an appropriate AMF rate increase to accommodate this but also noted that an extension scenario is currently not being contemplated. Scott verified that the funding mechanisms that will go into place for the next ITP are set to be discussed over the next year or so.

Mark Enders from the City of San Marcos inquired if the projected reserve fund amount for 2025 (~$5.6 million) accounts for a VISPO trigger, which Shelly confirmed that it does. Robert expressed concern that with the reserve funds being depleted as we transition into the next ITP, will there be a scenario in which we do not have the funds available to pay for a VISPO trigger and the Threatened/Endangered species ultimate suffer from this. Marc clarified that

the program reserves do not control implementation of VISPO, which is implemented through a contract between the EAA and individual permit holders. Since it is a contractual obligation, the EAA Board would decide if funds for a VISPO trigger would be paid through the EAA General reserve fund or through an AMF rate increase. Scott added that from our conversations with USFWS, they are not particularly inclined to grant an ITP extension and the expectation is to have a new ITP in place by 2028. Robert raised the question that if a bad drought occurs during the ITP transition phase, will there be any potential funding issues to preserve springflows. Marc assuaged those concerns by likening this to the start of the current ITP in which there was a substantial drought and no reserve funding to draw from, which the EAHCP navigated through. Marc also noted that the bigger issue of how funding will be handled as a new HCP gets going without ongoing VISPO contracts has to be addressed, regardless of whether VISPO forbearance is triggered. Myron added that previous discussions of EAHCP Budget Work Group have focused on the implications of management of the program reserve as it relates to aquifer management fees with consideration of the potential of starting a new ITP during severe drought conditions.

The Drought Probabilities for VISPO and ASR Forbearance were provided to the Work Group. For VISPO, considering historical data through 2023, there is an 8% chance that there will be a VISPO trigger each year from 2024-2028. In this same timeframe, the probabilities also reflect a 37.2% chance for 1 or more triggers, a 6.7% change for 2 or more triggers, and a 0.6% chance for 3 or more triggers. It was noted that as of July 1, 2024, water levels in J-17 were low (less than 640 ft msl). This same scenario on July 1 has occurred 13 times over the 89 years on record, and in 8 of those years, the October 1 water level at J-17 was at or below the VISPO trigger of 635 ft msl. Thus, the probability of reaching the VISPO trigger in 2024, for forbearance in 2025, is likely to be closer to 62% using those criteria.

For ASR Forbearance, it has been determined that there is a 0% chance for ASR triggering in 2025 for forbearance in 2026. Subsequently, there is a 39.7% chance of triggering in 2026, and a 68% chance of triggering in 2027. Robert inquired what is the cost of an ASR trigger and Marc replied that there is no cost for the forbearance component since it is already pre-paid under those contracts. The only cost associated with an ASR trigger event is the SAWS O&M withdrawal costs. That cost can vary depending on how much water SAWS decides to bring back from ASR storage versus relying on other supplies.

Shelly gave a reminder that the EAA General Reserve Fund is unrestricted and can be used to pay for any necessary EAHCP-related expenses when needed whereas the EAHCP Reserve Fund is restricted to only paying for EAHCP program expenses. Marc advised that it would be ideal that prior to the next ITP, there is some thoughtful discussion about not placing unnecessary restrictions on an EAHCP reserve and consider the benefits of managing all

costs under a single, shared budget with the EAA. Myron posed the question of how does the Budget Work Group want to write their Final Report to illustrate these implications that we have discussed to the Implementing Committee. Robert agreed that with the current ITP winding down, it is important to convey assurance that the EAA is capable of absorbing these trigger-based events that expend a lot of money from the budget. He also noted that it would be worthwhile to mention any plans for the ITP transition phase and that all necessary steps will be taken to safeguard our protected species. Marc gave a final clarification that the projected $2.9 million reserve amount in 2027 is not the EAHCP budget that will be used going into the next ITP in 2028.

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

5. **Future meetings**
   No date was set for any additional Work Group meetings in 2024.

6. **Adjourn** – 10:42 a.m.

Appendix M3 | **Conservation Measures Subcommittee**

Conservation Measures Subcommittee

Report

2024

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Report

To:	EAHCP Implementing Committee and Permit Renewal Contractor – ICF
From:	EAHCP Conservation Measures Subcommittee
Date:	October 4, 2024
Re:	EAHCP Conservation Measures Subcommittee Report – 2024

Introduction

The Edwards Aquifer Habitat Conservation Plan (EAHCP) is currently renewing its Incidental Take Permit (ITP) with the U.S. Fish and Wildlife Service (USFWS). This process, referred to as the permit renewal, involves evaluating the existing components of the EAHCP conservation strategy and recommending new approaches and potential modifications to the conservation measures comprising the strategy. A key aspect of Habitat Conservation Plans (HCPs), as outlined in the joint 2016 U.S. Fish and Wildlife Service and National Marine Fisheries Service "Habitat Conservation Planning and Incidental Take Permit Processing Handbook" (HCP Handbook), is the development of conservation measures. These measures describe the specific actions that Permittees will implement to achieve biological objectives and support the overall goals of the HCP consistent with applicable state and federal requirements.

Conservation Measures Subcommittee Overview:

The purpose of the Conservation Measures Subcommittee (Subcommittee) was to review, discuss, and develop recommendations for conservation measures that should be considered for inclusion in the next EAHCP. The Subcommittee's recommendations are intended to help guide EAHCP staff and the permit renewal consultant, ICF, through the permit renewal process. The Subcommittee charge was approved by the EAHCP Implementing Committee on December 14, 2023 (Appendix A). From March through October 2024, nine Subcommittee meetings (Appendix B – *Subcommittee Timeline*) were conducted in-person with a virtual Microsoft Teams option for remote participation. Meeting recordings were posted on the EAHCP website and on the EAHCP Vimeo account. Meeting agendas are in captured in Appendix C.

Members of the Conservation Measures Subcommittee:

- **Subcommittee Chair:** San Antonio Water System: Represented by Linda Bevis
- Texas State University: Represented by Kimberly Meitzen

- City of San Marcos: Represented by Mark Enders
- City of New Braunfels: Represented by Phillip Quast
- Edwards Aquifer Authority: Represented by Marc Friberg
- Guadalupe-Blanco River Authority: Represented by Daniel Large
- EAHCP Stakeholder Committee Member (Bexar County Interest): Kerim Jacaman
- EAHCP Stakeholder Committee Member (Recreational Interest): Melani Howard
- EAHCP Stakeholder Committee Member (Agricultural Interest): Adam Yablonski
- EAHCP Stakeholder Committee Member (Environmental Interest): Myron Hess

The Subcommittee recognizes that the recommendations presented in this report will continue to be evaluated and refined throughout the permit renewal process. This process will involve collaboration between the Permittees, EAHCP staff, and the permit renewal consultant (ICF), with input from USFWS and all EAHCP Committee members. The Subcommittee fully supports this collaborative, transparent, and iterative approach to ensure that all interests are appropriately considered, the diverse expertise of participating scientists and stakeholders is leveraged, and decisions are grounded in the best available science.

The Subcommittee's review of the current conservation measures was not intended to determine whether the proposed modifications are sufficient to fully offset the take resulting from covered activities or meet the EAHCP's recovery goals. Rather than directly addressing adequacy, the recommendations in this report focus on improving efficiency, feasibility, and basic effectiveness, while promoting a more comprehensive and streamlined approach. This focus reflects the available information and the collective expertise of the Subcommittee members.

Under Section 10 of the ESA, the criteria for issuing an ITP require applicants to demonstrate that the proposed measures "minimize and mitigate take to the maximum extent practicable." Assessing the adequacy of the Subcommittee's recommended measures, relative to this regulatory requirement and the EAHCP's additional recovery considerations, is beyond the capacity of the Subcommittee and will have to be considered during subsequent steps of the process.

Furthermore, the Subcommittee notes that the Aquifer Storage and Recovery (ASR) measure involves extensive coordination between the Edwards Aquifer Authority (EAA) and San Antonio Water System (SAWS) that must be defined through the negotiation and

renewal of one or more contracts. The Subcommittee recognizes that its recommendations regarding the ASR are one of many considerations for these negotiations.

Conservation Measures Subcommittee Recommendations:

The EAHCP's current conservation measures are detailed in HCP Chapter 5 "Minimization and Mitigation Measures; Measures Specifically Intended to Contribute to Recovery." These measures were originally organized based on the entity responsible for their implementation. However, because multiple entities are involved in various conservation efforts, this structure led to redundant and inconsistent language throughout the chapter. This redundancy and inconsistency can create confusion, making it more difficult for stakeholders to clearly understand the responsibilities of the Permittees and for decision-makers to ensure alignment across all conservation activities.

To address these issues, the Subcommittee recommends reorganizing the revised conservation measures into the following five categories: Springflow Protection (Figure 1), Comal Springs System (Figure 2), San Marcos Springs System (Figure 3), Refugia, and Measures that Contribute to Recovery (Figure 4). These new categories will better reflect the focus of each group of measures, align more closely with the overall conservation strategy, and be more concise, providing a more cohesive presentation of the measures for achieving the Biological Goals and Objectives.

Springflow Protection Measures are activities implemented to minimize flow impacts to the Covered Species associated with permitted groundwater pumping from the Edwards Aquifer. Proposed *Springflow Protection Measures* are intended to be implemented by the Edwards Aquifer Authority (EAA) and San Antonio Water System (SAWS); however, all Permittees are encouraged, throughout the permit term, to evaluate additional or alternative potential springflow protection options for implementation east of Cibolo Creek, closer to the springs. Pumping closer to the springs may have a more direct impact to springflow.

The *Comal and San Marcos springs systems* habitat conservation measures, also known as *Habitat Protection Measures*, are activities implemented within the spring runs, lakes, rivers, and adjacent riparian zones of the springs systems to minimize the impacts from Covered Activities and enhance the habitat of the Covered Species. These measures are intended to be implemented by the City of New Braunfels (CONB) in the Comal Springs System and by the City of San Marcos (COSM) and Texas State University (TXST) in the San

Marcos Springs System, with the participation of the EAA and, especially for state scientific area (SSA) implementation, support from the Texas Parks and Wildlife Department (TPWD).

The *Refugia Measure* describes the off-site refugia that house, research, and maintain populations of the Covered Species to support re-establishment in the wild if wild populations are extirpated due to catastrophic events such as a chemical spill or exceptional drought. This conservation measure is managed by EAA and implemented under contract by USFWS.

Measures that Contribute to Recovery are measures that go beyond minimum mitigation requirements to contribute to the likelihood of downlisting (reclassification of endangered to threatened) or delisting of the listed Covered Species. Compared to the other mitigation measures, benefits from these measures may be more difficult to quantify because benefits to the Covered Species are likely to be more indirect, harder to measure, and more uncertain in their implementation due to funding or other constraints. Consistent with state legislative directives and the status of the EAHCP as a Recovery Implementation Program, these measures align with the recovery actions included by USFWS in the recently released *Draft Recovery Plan for the Southern Edwards Aquifer Springs and Associated Aquatic Ecosystems* (USFWS, 2024) and with Goal 7 of the *Revised Recommended Biological Goals and Objectives for the Permit Renewal Memorandum* (BIO-WEST and ICF, 2024).

This report, organized according to the proposed new structure described above, summarizes the modifications to conservation measures recommended by the Subcommittee. Each existing measure that corresponds to a recommended modified measure is listed after the description of the recommended modified measure for reference. In addition to the recommended re-organization and modifications to conservation measures, the report includes specific comments for further consideration for various conservation measures, a glossary of the key terms used throughout this report, and a detailed table of the native and non-native species addressed in the recommended measures identified by common and scientific name. The Subcommittee recommends that the *Comments for Consideration* included in this report be fully integrated into the process of finalizing the conservation strategy for the ITP renewal, recognizing that further evaluation, analysis, and coordination will be necessary for assessing the manner and extent that these comments are reflected in specific conservation measures.

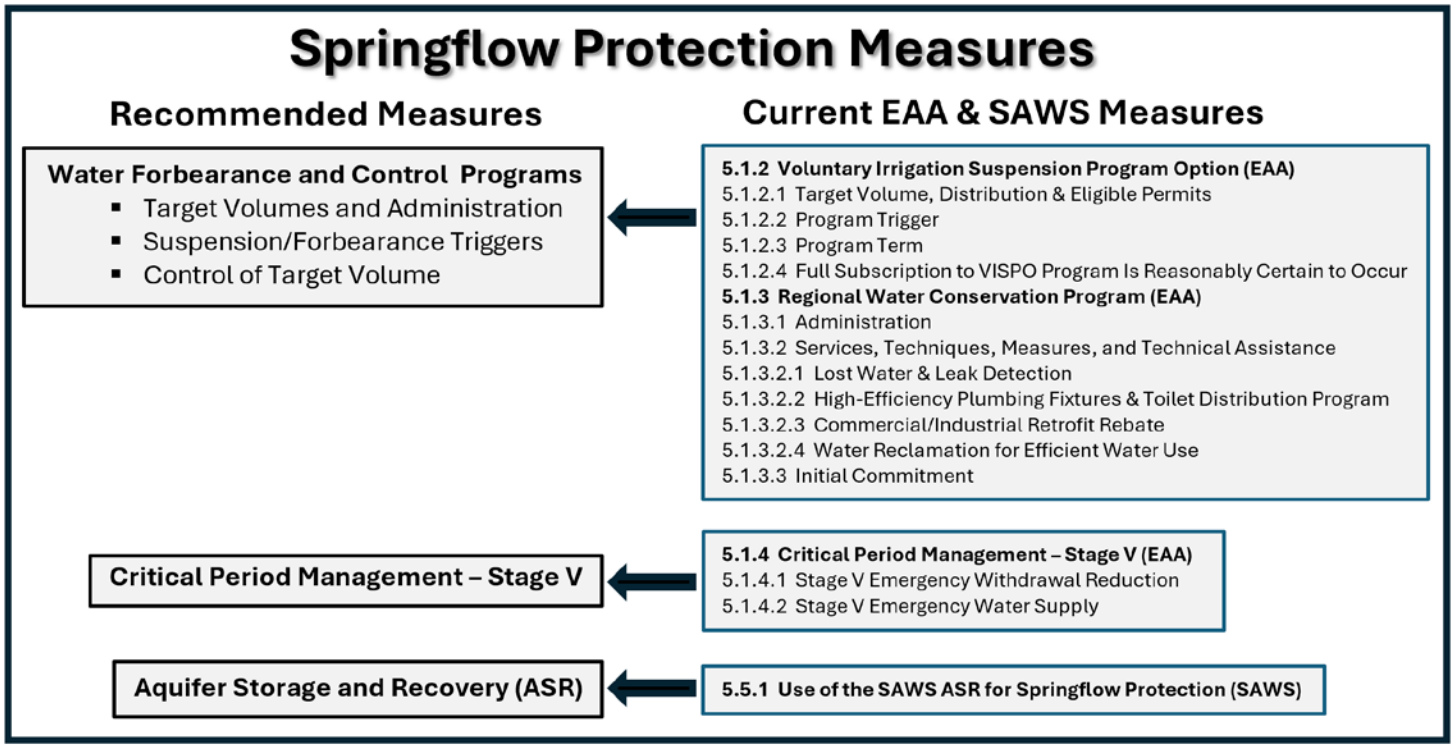

Figure 1. Structure of current and recommended Springflow Protection Measures.

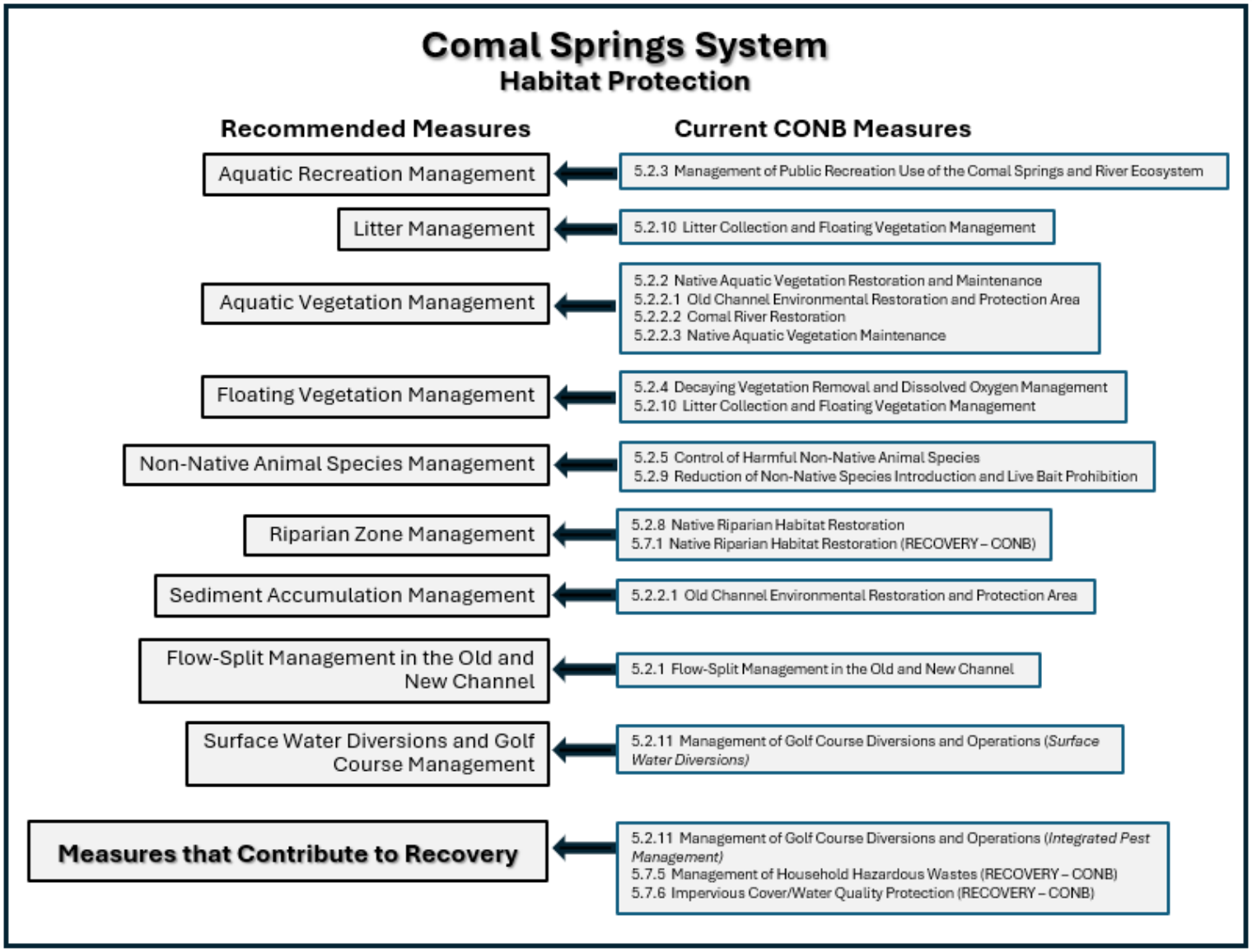

Figure 2. Structure of current and recommended Comal Springs System Habitat Protection Measures.

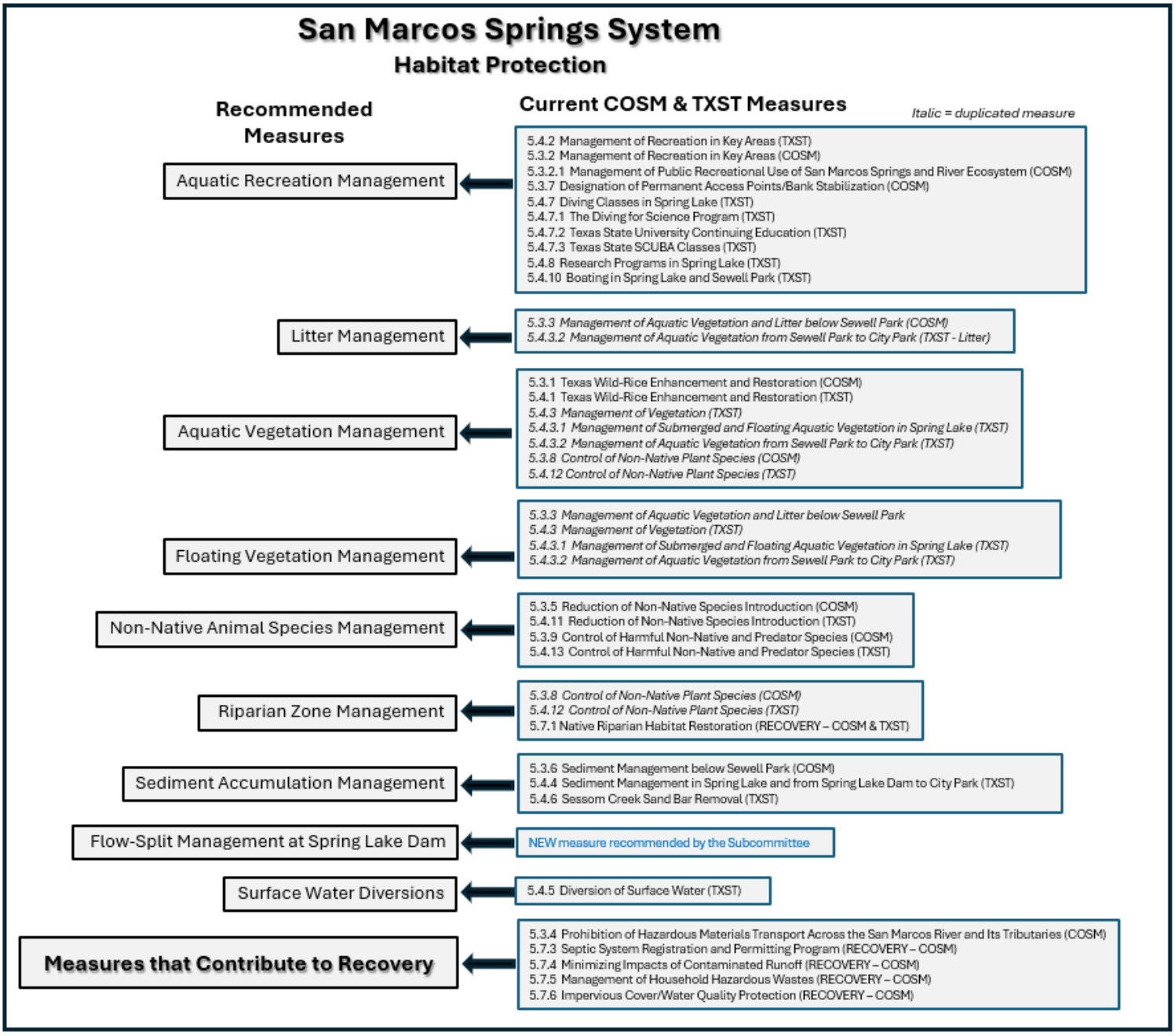

Figure 3. Structure of current and recommended San Marcos Springs System Habitat Protection Measures.

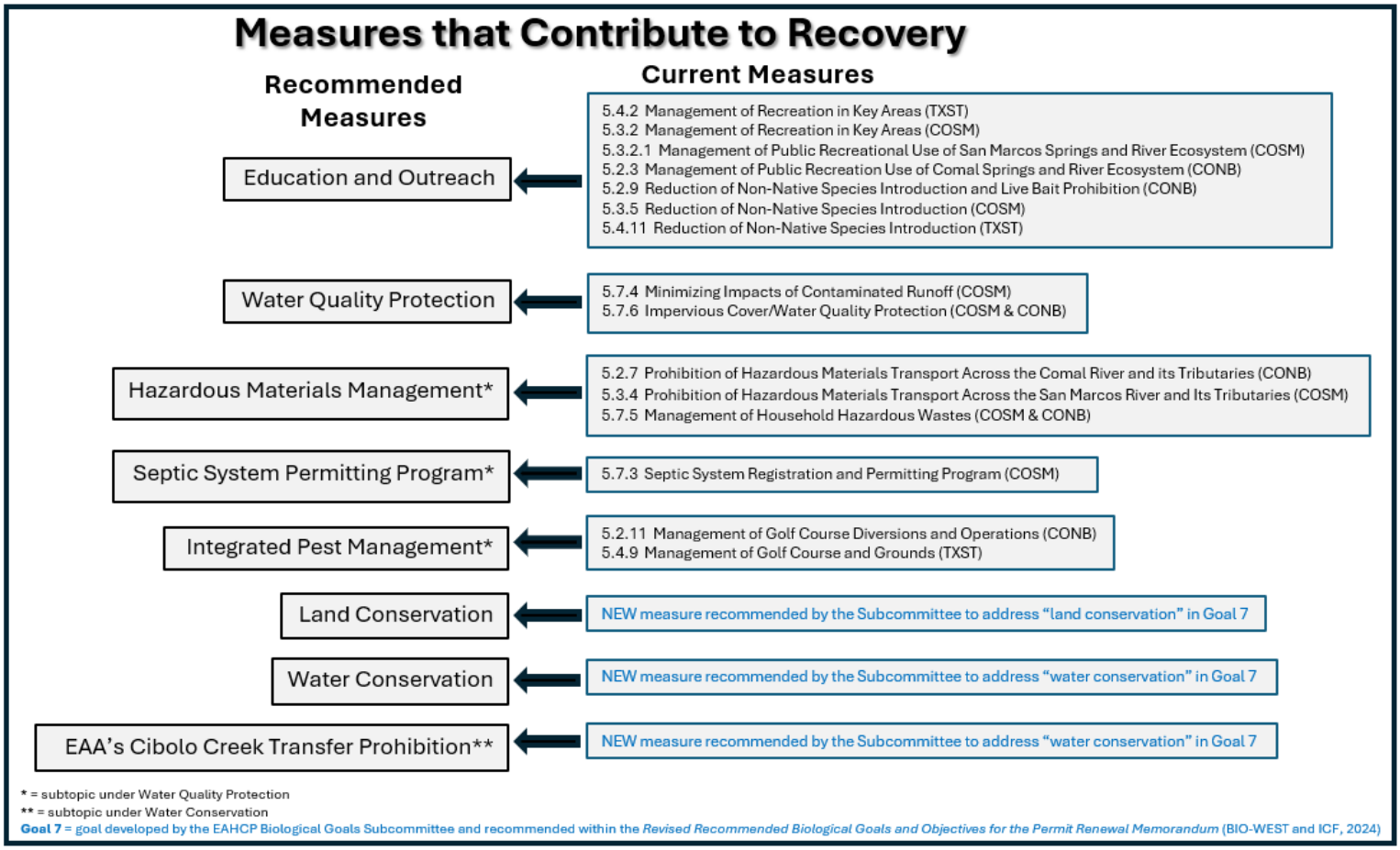

Figure 4. Structure of current and recommended Measures that Contribute to Recovery.

Springflow Protection Measures

The current Springflow Protection Measures include the Voluntary Irrigation Suspension Program Option (VISPO), Aquifer Storage and Recovery (ASR), Critical Period Management (CPM) – Stage V, and the Regional Water Conservation Program (RWCP). While VISPO and ASR have been effective under the current implementation of the EAHCP, there is a growing need for administrative flexibility to ensure these programs can adapt to the increasingly competitive and evolving Edwards Aquifer groundwater market, that is likely to change over the permit term. This administrative flexibility is intended to reduce the administrative challenges that were encountered during the initial term of the EAHCP, particularly in implementing the VISPO, ASR, and RWCP.

RWCP requirements were fulfilled in 2020 and no additional water conservation efforts have been implemented through the RWCP since that time. The Subcommittee recommends a reconceptualization of the RWCP primarily as a component of the proposed Water Forbearance and Control Programs. Accordingly, the 10,000 ac-ft of water conservation achieved through the current RWCP and previously designated for allocation to flow protection has been added below to the volumetric goal for the Water Forbearance and Control programs.

Water Forbearance and Control Programs

The EAA will administer a combination of programs to control sufficient water rights to ensure pumping from the Edwards Aquifer is reduced in adequate amounts, and at appropriate times, to achieve minimum springflow objectives for the Comal and San Marcos springs as set forth in the *Revised Recommended Biological Goals and Objectives for the Permit Renewal* memorandum (BIO-WEST and ICF, 2024). These programs are intended to minimize incidental take from low springflows resulting from groundwater withdrawals primarily by suspending, or forbearing, the withdrawal of specified volumes of Edwards Aquifer water during drought conditions.

Target Volumes and Administration

The total volumetric goal for the water forbearance and control programs is 101,795 acre-feet/year (ac-ft/yr.). Holders of irrigation, industrial, and municipal permits in Atascosa, Bexar, Comal, Hays, Medina, and Uvalde counties will be approached for enrollment in various control programs and/or lease agreements. Within that total annual volume, control of at least 10,000 ac-ft will be pursued to the maximum extent practicable in Atascosa, Bexar, Comal, and Hays counties because these counties are closest to the springs where temporary suspension of pumping is likely to be the most effective.

All strategies utilized by the EAA for control of the rights will be pooled together and implemented to meet forbearance and control requirements as specified triggers occur. Strategies implemented to control rights will include, but not be limited to:

- Long-term leases of groundwater withdrawal rights;
- Purchases of groundwater withdrawal rights;
- Forbearance agreements for groundwater withdrawal rights;
- Placement of groundwater withdrawal rights in the EAA's Groundwater Trust; and
- Acquisition of groundwater conservation easements.

Suspension/Forbearance Triggers

Suspension Increment One

Suspension of pumping of 41,795 ac-ft of Edwards Aquifer Groundwater Withdrawal Rights will occur during the calendar year following a year during when the Bexar County Index Well (J-17) is at or below 635 feet-mean sea level (ft-MSL) on the annual trigger date of October 1. This date provides affected permit holders ample time to make decisions to mitigate impacts resulting from the loss of the ability to access the suspended groundwater rights. Announcing implementation of the program after that date will result in a complete suspension of the associated withdrawals for the following calendar year beginning on January 1.

Suspension Increment Two

Suspension of pumping of 50,000 ac-ft of Edwards Aquifer Groundwater Withdrawal Rights will be triggered in any year when the most currently available 10-year moving annual average of Edwards Aquifer recharge is at or below 500,000 ac-ft/yr, as determined by the EAA. Announcing the triggering of the program will result in a complete suspension of the associated withdrawals the following calendar year beginning on January 1.

Supplementary Suspension Increment Three

Suspension of pumping of the additional 10,000 ac-ft/yr will occur in any year during which either Suspension Increment One or Suspension Increment Two is implemented.

Control of Target Volume

The EAA has consistently controlled over 90,000 ac-ft of groundwater rights through leases and forbearance agreements under the predecessor components of this program for the past ten years. This experience in the Edwards Aquifer water market, coupled with the added flexibility of multiple vehicles for control provided by this modified measure, indicates a reasonable likelihood of achieving control of the full target volume of Edwards Aquifer Groundwater Withdrawal Rights once funding is available and contracting begins.

Original EAHCP Conservation Measure:

- Section 5.1.2: Voluntary Irrigation Suspension Program Option
- Section 5.1.3: Regional Water Conservation Program

Comments for Consideration:

- It would be beneficial to explore long-term options for controlling more than the proposed minimum of 10,000 ac-ft/yr east of Cibolo Creek, closer to the Comal and San Marcos springs systems.
- For Suspension Increment Two, consider adding triggers for minimum springflows of 30 cfs for Comal and/or 45 cfs for San Marcos, over a 30-day duration.
- The Suspension Increment Two forbearance trigger should be further evaluated and may need to be more "sensitive" to triggering. The trigger should be based on achieving the minimum flows for Comal and San Marcos as set forth in the Biological Objectives for the "low-end" MODFLOW projection model runs. Applicable trigger adjustments could be in the form of a lesser rolling average period (i.e. 5- or 7-yr rolling recharge average), a higher recharge value (i.e. trigger when the 10-yr rolling average decreases below 550,000 or 600,000 ac-ft/yr) and/or a springflow trigger.
- Ongoing scientific evaluations during the permit term should consider relevant, new information that may improve springflow protection such as refined climate modeling and improved understanding of Edwards Aquifer recharge characteristics, inter-formational recharge (e.g., Trinity Aquifer levels and inter-formational connections), and/or surface water recharge (e.g., Medina Lake water levels and surface water flow changes).
- Routine adaptive management evaluations, or "check-ins", should occur during the 30-year ITP at either defined temporal intervals (e.g., every 10 years) and/or after extreme droughts if the Biological Objectives are not met, as outlined in the *Revised Recommended Biological Goals and Objectives for the Permit Renewal Memorandum* (BIO-WEST and ICF, 2024). These evaluations could assess the effectiveness of forbearance programs and their triggers, updating them based on climate change impacts, recharge, pumping, aquifer levels, and springflow.
- Adaptive management ought to be reserved for specific response to environmental changes, helping to ensure the long-term success of conservation efforts within the HCP and should not be included in the conservation measures section of the HCP.
- The target volume of 101,795 ac-ft/yr for water forbearance and control programs should continue to be evaluated during the 30-year ITP through future MODFLOW modeling to determine if the target volume meets the minimum and long-term

springflow objectives for Comal and San Marcos springs, with adjustments made as needed based on additional modeling runs.

Critical Period Management – Stage V

The EAA will continue to implement a Stage V reduction of 44 percent below authorized pumping levels applicable in both the San Antonio and Uvalde pools. Stage V reductions for the San Antonio pool will be triggered when (1) the 10-day rolling average of the J-17 index well levels is below 625 ft-MSL, or (2) springflows at Comal Springs are less than 45 cubic feet per second (cfs) as calculated as a ten-day rolling average, or less than 40 cfs as calculated as a three-day rolling average. Stage V reductions for the Uvalde pool will be triggered at any time when the 10-day rolling average for the J-27 Index Well water level is below 840 ft MSL. It is possible that some of the smaller municipal water providers who are entirely dependent on the Edwards Aquifer may not have sufficient water supplies to meet public health and safety needs when subject to Stage V critical period reductions. In such cases, municipal water providers will not be denied the use of groundwater from the Edwards Aquifer to meet public health and safety needs, but if they do not achieve the mandated reductions, they will incur substantial fines and penalties as determined by the EAA, pursuant to its enforcement rules and policies.

Original EAHCP Conservation Measure:

- Section 5.1.4: Critical Period Management – Stage V

Comments for Consideration:

- In the current version of the EAHCP, Stage V cutbacks greater than 44% are discussed in the transition to Phase II. Something similar could be included for the renewed EAHCP through adaptive management evaluations.

Aquifer Storage and Recovery (ASR)

The SAWS ASR can be used to help maintain springflow in the Comal and San Marcos springs by offsetting Edwards Aquifer demand during a drought-of-record conditions as described below. The SAWS ASR facility will be used for storage and delivery of groundwater leased by the EAA. When triggers are reached, as described below, SAWS may use water stored in the ASR to serve as a baseload supply in its service area nearest to the springs. As described below, an amount equivalent to the water recovered from the ASR may be used to offset SAWS's Edwards Aquifer demand.

The trigger condition for implementation of ASR springflow protection in accordance with the EAHCP will be an aquifer level of 630 ft MSL or less at the J-17 index well during a repeat

of drought conditions similar to the drought of record as indicated by a ten-year rolling average of Edwards recharge of 500,000 ac-ft or less, as determined by the EAA. When the trigger condition is met, the ASR or other non-Edwards supplies capable of utilizing shared infrastructure will be activated by SAWS to deliver up to 60 million gallons per day to the SAWS distribution system. When the trigger condition, as described above, is met, pumping of selected SAWS wells, including those on the northeast side of SAWS water distribution system—i.e., those nearer the springs–will be reduced in an amount that on a monthly basis equals the amount of water returned from the ASR or other non-Edwards supplies capable of utilizing shared infrastructure. The total reduction will be limited to the extent of the Edwards Aquifer water provided by the EAA for storage in the ASR. SAWS will use up to 100 percent of the conveyance capacity of existing SAWS ASR facilities to recover water made available by EAA to offset SAWS's Edwards Aquifer demand.

In recovering water from the ASR and/or offsetting pumping in response to the trigger condition being met, SAWS will attempt, to the extent practicable or necessary, to mimic the pattern of delivery and recovery developed by HDR (HDR 2011). That pattern of delivery, however, was intended to represent how the water in the ASR would have been managed in response to the drought of record that occurred in the 1950s. Future droughts of similar duration and magnitude undoubtedly will differ in the timing and pattern of recharge in a given year. Thus, the actual pattern of delivery of water from the ASR or of offsetting pumping may differ from what HDR used in its modeling simulations depending on the actual course of the drought (see HDR 2011) to achieve the intended level of springflow protection. Decisions as to the actual pattern of delivery will be determined by SAWS in conjunction with the Regional Advisory Group described below.

The use of the SAWS ASR is predicated on an assumption, informed by the groundwater modeling undertaken by HDR, that the SAWS ASR will be utilized to deliver approximately 126,000 ac-ft of water to SAWS' distribution system during a decadal drought similar to the drought of record. It is further predicated on the assumption from HDR (2011) that the maximum amount of water that will be delivered in a given year is 46,300 ac-ft. SAWS retains the option to use other non-Edwards supplies in lieu of ASR recovery to achieve the same levels of springflow protection.

The management of the ASR to protect springflow involves some judgment and flexibility. SAWS will make decisions necessary to fulfill the ASR commitment consistent with the EAHCP. A Regional Advisory Group consisting of representatives from SAWS, the EAHCP program, the EAA, and key stakeholders including EAA irrigation permit holders, small municipal pumpers, the Spring cities (New Braunfels and San Marcos), environmental interests (inclusive of the Texas Parks and Wildlife Department), industrial pumpers, and

downstream interests, will provide advice to SAWS regarding the implementation of the program. If different from representation on the EAHCP Stakeholder Committee, each entity or group will designate its representative(s). The Regional Advisory Group will meet as needed, generally once annually, and more frequently as significant implementation decisions are under consideration, with SAWS organizing and facilitating the meetings.

With a 30-year permit term, the potential, although presumably slight, exists for experiencing more than one drought similar to the drought of record or of beginning the new term without full ASR storage available for offsetting pumping. Accordingly, it may be necessary to refill storage in the ASR emptied pursuant to this provision and the EAA will ensure that pumping rights controlled pursuant to the Water Forbearance and Control Programs are available to refill that storage as needed, consistent with forbearance, critical period management, and pumping reduction commitments.

Original EAHCP Conservation Measure:

- Section 5.5.1: Use of the SAWS ASR for Springflow Protection

Comments for Consideration:

- ASR implementation agreements between EAA and SAWS for the next EAHCP are ongoing, therefore, the ASR program administrative structure described above is subject to change.
- The annual USGS recharge estimations may not accurately account for changes in the inter-formational flows between the Trinity and the Edwards aquifers, more information is needed to better understand that relationship. Drought impacts and increases in Trinity Aquifer withdrawals may appreciably reduce recharge to the Edwards Aquifer through reduced subsurface contributions and reduced baseflow of creeks and rivers that provide recharge to the Edwards. Ongoing research about the Trinity and Edwards Aquifer inter-formational flows relationship is needed to evaluate the effect of climate change on the ten-year rolling recharge triggers.
- The adequacy of the ASR recovery/offset trigger should be re-evaluated during the 30-year ITP based on a defined temporal interval (e.g., every 10 or 15 years), to assess how observed effects of climate change and updated modeling efforts, if such updated modeling is needed to reflect significant advances in science, match the results of current modeling efforts, particularly as it relates to recharge, pumping, aquifer level, and springflow. The trigger should be adjusted, as appropriate, based on those evaluations.

Comal Springs System

The Comal Springs System, located in New Braunfels, Texas, encompasses Comal Springs and Spring Runs, Landa Lake, and the Old and New Channels of the Comal River. This system originates from the Edwards Aquifer, with four major springs and several spring runs, notably Spring Runs 1, 2, and 3, forming its headwaters. The headwater springs, including the spring runs and the subsurface area surrounding the springs, provide essential habitat for several endangered species, including the Comal Springs riffle beetle, Comal Springs dryopid beetle, and Peck's cave amphipod. The headwaters are impounded by a dam originally constructed in 1860, creating Landa Lake, that provides critical habitat for the fountain darter. Water from Landa Lake flows into two channels of the Comal River: the Old Channel and the New Channel. The New Channel, that was excavated in 1847 to divert water to a saw and grist mill, is a modified waterway that includes several dams and recreational areas. The Old Channel of the Comal River merges with the New Channel approximately 1.3 miles upstream of the confluence with the Guadalupe River. The Old Channel and the New Channel provide essential habitat for the fountain darter, that is also found in the Comal River downstream of the confluence of those two channels. As part of biological monitoring, trends in river discharge are evaluated using U.S. Geological Survey (USGS) mean daily flow data in the Comal River (gage #08169000). Springflow is also monitored by the USGS station in the New Channel (gage #08168932), and one USGS station in the Old Channel (gage #08168913).

In terms of the control and management of property and structures implicated in the Comal Springs System, the land along the upper portion of Landa Lake near the headwaters of the Comal Springs System falls under the jurisdiction of Comal County Water Recreation District No. 1 (CCWRD No. 1) a political subdivision of the State of Texas, established by the state legislature in 1937. CCWRD No. 1 is responsible for managing Spring Island, as well as all the smaller islands, bridges, and riverbeds within its jurisdiction. The City of New Braunfels owns and manages the parks and areas of Landa Lake outside the boundaries of CCWRD No. 1, extending downstream to the Landa Lake Dam. A substantial portion of the property bordering the Old and New Channels is privately owned although the Landa Park Golf Course, owned by the City of New Braunfels, borders a significant portion of the Old Channel.

Fountain darters are commonly found throughout the Comal Springs system. Species located closer to the spring orifices, particularly in and around Landa Lake and the Spring Runs, include the Peck's cave amphipod, Comal Springs dryopid beetle, Edwards Aquifer diving beetle, and Comal Springs riffle beetle.

Beyond its ecological importance, the Comal Springs System is a popular recreational area, attracting visitors for water recreation activities including swimming, fishing, tubing

and kayaking. Historically, the springs have been a vital water source for indigenous peoples and early settlers, contributing to the establishment of New Braunfels. Today, through ongoing implementation of the EAHCP, conservation efforts are in place to protect the threatened and endangered species, water quality, and ecosystem.

Habitat conservation measures will be implemented by the City of New Braunfels in the Comal Springs System, extending from the headwaters of the Comal Springs downstream of Blieders Creek to the confluence of the Old and New channels of the Comal River.

Aquatic Recreation Management

Aquatic recreation can have significant negative impacts on Covered Species habitats by increasing disturbance and degrading habitat quality in both aquatic and riparian systems. The implementation of appropriate recreational management measures is necessary to mitigate these impacts and protect Covered Species and their habitats.

Recreation in the Comal River is primarily centered on tubing specifically, at a recreational entry point along a small section of the New Channel of the Comal River, just before it merges with the Old Channel. Schlitterbahn Waterpark & Resort operates a popular tube chute ride that flows into the Old Channel of the Comal River. Future plans for Schlitterbahn rides and operations, as shared by Schlitterbahn management, do not include any activities in the Comal River. Additionally, within Landa Park, water from Spring Run 2 feeds into a small wading pool, offering limited recreational opportunities for park visitors.

While the City of New Braunfels prohibits recreation in Landa Lake at Landa Park, the Comal County Water Recreation District No. 1 (CCWRD No. 1) oversees Spring Island, along with the smaller islands, bridges, and riverbeds within its jurisdiction, including areas where recreation still occurs in the upper part of Landa Lake, upstream of Landa Park.

To minimize and mitigate the impacts of recreation, the City of New Braunfels will enforce City Ordinances and Policies in Chapter 86 – Parks and Recreation and Chapter 142 – Waterways. The City of New Braunfels will not reduce the levels of protections provided below, and will continue to manage recreational use of the Comal Springs System, by:

a. Providing educational resources, including maps of the river with public access points and signage about park rules, the Covered Species, their Critical Habitat, and efforts to protect the Covered Species.
b. Limiting recreation on Landa Lake in Landa Park to paddle boats.
c. Limiting recreational access to the Spring Runs in Landa Park solely to the Wading Pool in Spring Run 2.

d. Restricting access to the Old Channel; except for the continuation of current levels of Schlitterbahn operations within its present location.
e. Prohibiting the use of disposable containers on the Comal River.
f. Prohibiting the use of cast nets and non-native live bait for fishing.
g. Prohibiting the release of non-native aquatic animals in waterways.
h. Restricting access to the Mill Channel portion of the New Channel.

Original EAHCP Conservation Measure:

- Section 5.2.3 – Management of Public Recreation Use of the Comal Springs and River Ecosystem.

Comments for Consideration:

- The City of New Braunfels already implements recreation management by restricting public access to Landa Lake through Landa Park, the Old Channel, and portions of the New Channel of the Comal River so that recreation occurs outside of the habitat conservation efforts.
- There was discussion of the potential value of additional limitation on recreational access to portions of the New Channel during periods of extreme low flows. However, in the absence of specific information about the nature of the potential adverse impacts from recreation in those areas (e.g., water depth, co-occurrence of recreation and Covered Species, and likely recreational impact on aquatic vegetation) during extreme low flows, no recommendations were developed for additional recreational limitations in the New Channel.
- The questions about ownership and/or control of portions of lake bottom, river bottom, and frontage, particularly related to vegetation management, seem to require further consideration and, ideally, clarification through contractual arrangements.

Litter Management

Litter refers to any form of waste or discarded material that is improperly disposed of in the environment, particularly in public spaces such as parks and waterways. Litter has wide-ranging negative impacts on aquatic organisms and their habitat, including water pollution and habitat degradation and direct harm to the organism. Preventing litter and promoting sustainable waste management practices are essential for protecting the Covered Species.

The City of New Braunfels will be responsible for the collection and removal of litter throughout the Comal Springs System and surrounding park areas. Litter prevention efforts will include educating park and river users on the negative effects of litter on the

environment, including the Covered Species, and may include broader education efforts aimed at minimizing litter in areas throughout the Comal River watershed.

The City of New Braunfels will continue to implement its prohibition of disposable food and beverage containers on the Comal River.

Original EAHCP Conservation Measure:

- Section 5.2.10: Litter Collection and Floating Vegetation Management

Comments for Consideration:

- The City of New Braunfels disposable container ordinance includes prohibitions for the Comal and Guadalupe rivers within the city limits.

Aquatic Vegetation Management

Submerged aquatic vegetation is essential natural habitat for fountain darters, providing them with ecological resources and shelter necessary for healthy population resiliency. Aquatic recreation, exposure of wetted habitat during severe drought, competition from non-native aquatic vegetation, scouring from flood events, floating vegetation accumulations, and reduced diversity of native aquatic vegetation can negatively impact fountain darters and the submerged aquatic vegetation they utilize as habitat. The presence of diverse aquatic vegetation contributes to maintaining quality habitat crucial for the survival and resilience of the fountain darters and other aquatic organisms.

To mitigate the impacts of low-flow and recreation, the City of New Braunfels will implement aquatic vegetation management strategies within the Long-Term Biological Monitoring Reaches and Restoration Reaches of the Comal Springs System, shown in Figure 5 and to the extent possible, within other high priority areas of the Old and New Channels. Strategies include the monitoring, planting, and maintenance of native aquatic vegetation and removal of non-native aquatic vegetation in those reaches. Removal efforts will be accompanied by timely planting of native aquatic vegetation. Culling of submerged aquatic vegetation, undertaken with due care to minimize adverse impacts to Covered Species, may be implemented to aid in the reduction of floating vegetation.

Aquatic vegetation used for planting should be sourced and propagated within the Comal Springs System or, if necessary, may be obtained from sources that meet locality and disease-free criteria. Management and maintenance efforts will be designed and implemented to achieve areal coverage using simple (*Potamogeton*, *Sagittaria*, and *Vallisneria*) and complex (*Bryophyte*, *Cabomba*, and *Ludwigia*) aquatic vegetation as set forth in the fountain darter habitat biological objectives for the Comal Springs System.

With appropriate care to minimize adverse impacts to all Covered Species, aquatic vegetation that is removed in order to conduct covered activities such as pumping equipment maintenance, USGS gage measurement, or construction projects will be replanted at favorable locations within the Comal Springs System, as appropriate.

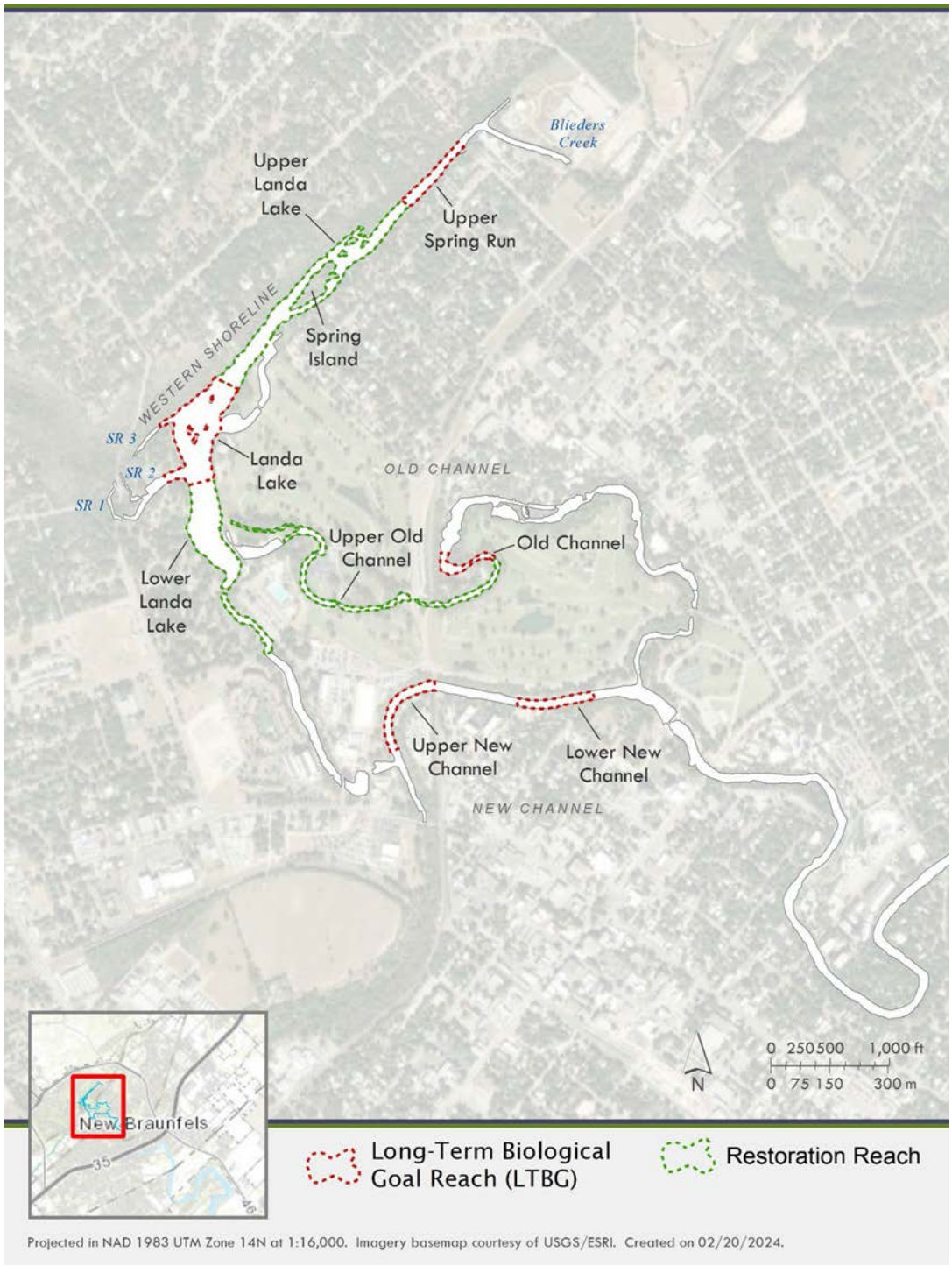

Figure 5. Comal Springs System Long-term Biological Goal/Restoration Reaches.

Original EAHCP Conservation Measures:

- Section 5.2.2: Native Aquatic Vegetation Restoration and Maintenance
- Section 5.2.2.1: Old Channel Environmental Restoration and Protection Area
- Section 5.2.2.2: Comal River Restoration
- Section 5.2.2.3: Native Aquatic Vegetation Maintenance

Comments for Consideration:

- Aquatic vegetation management should be considered for implementation downstream of the Old and New Channel confluence of the Comal River. Although this area is recognized as fountain darter habitat, previous efforts to implement aquatic vegetation strategies have been unsuccessful due to challenges such as sediment composition, limited public access to the Comal River, water depth, changes in velocities, and the impact of recreational activities. Conservation efforts may include small-scale aquatic vegetation management activities such as the removal of non-native vegetation to improve fountain darter habitat. Planting may also occur in this area if a large scouring event results in substantial denuding of vegetation.
- Aquatic vegetation management should be extended to portions of the Old and New Channels outside of the Long-term Biological Goal and Restoration reaches to the extent reasonably practicable. These areas provide important habitat for the fountain darter. The current EAHCP anticipates additional habitat being protected through aquatic vegetation management outside of those specific reaches, particularly downstream of the confluence of the Old and New Channels. That work has not occurred and areas upstream of the confluence may present greater opportunity to improve habitat conditions.
- Removal and planting methodologies of aquatic vegetation will be reevaluated when Comal springflow decreases below 130 cfs.
- The questions about ownership and/or control of portions of lake bottom, river bottom, and frontage, particularly related to vegetation management, seem to require further consideration and, ideally, clarification through contractual arrangements.

Floating Vegetation Management

Floating vegetation mats have been demonstrated to negatively impact submerged aquatic vegetation that serves as fountain darter habitat. The mats block sunlight, reduce water

velocity, and generally interfere with the health of aquatic vegetation. Reducing floating vegetation mats increases the resilience of submerged aquatic vegetation.

The City of New Braunfels will manage floating vegetation by dislodging accumulations of floating vegetation utilizing methods that result in only minimal disturbances to the Covered Species and their habitat throughout Landa Lake and the Old Channel of the Comal River. Litter and aquatic organisms will be removed from floating vegetation prior to dislodging it.

Original EAHCP Conservation Measure(s):

- Section 5.2.4: Decaying Vegetation Removal and Dissolved Oxygen Management
- Section 5.2.10: Litter Collection and Floating Vegetation Management

Comments for Consideration:

- Removal and dislodgement efforts during low flow conditions could potentially be harmful instead of beneficial due to fountain darter habitat impacts (i.e. disturbance of substrate and rooted aquatic vegetation) that can occur as a result of operating canoes, kayaks, barges or other vessels in relatively shallow water.

Non-Native Animal Species Management

Non-native species are organisms that do not naturally occur in a particular area and are often introduced by human activities. Non-native animal species can pose serious threats to the Covered Species through competition, predation, disease transmission, habitat alteration, and ecosystem disruption. Effective management strategies, such as prevention, eradication, and control of problematic non-native species, are essential for minimizing negative impacts to Covered Species.

Management of non-native animal species will include the removal of non-native armored catfish, sailfin catfish, tilapia, nutria, and other species that are deemed a threat, from the Comal Springs System. Parasite monitoring will occur under the EAHCP Biological Monitoring Program. The City of New Braunfels will be responsible for managing the removal of potentially harmful non-native animals through the use of spearfishing, spear guns, or other approved methods designed to facilitate efficient removal of target non-native animals while minimizing adverse impacts to Covered Species and the ecosystem. Non-native species introduction will be reduced by the City of New Braunfels through maintaining and enforcing its prohibitions on aquarium dumping, the release of non-native aquatic animals in waterways, and the use of non-native live bait species for fishing. The City of New Braunfels will provide and maintain educational resources and signage about the importance of preventing the introduction of non-native animals and controlling them

where they have been introduced. In addition, if monitoring indicates problematic levels of parasites, the City of New Braunfels, in collaboration with EAA staff, will develop and implement responsive measures.

Original EAHCP Conservation Measure(s):

- Section 5.2.5: Control of Harmful Non-Native Animal Species
- Section 5.2.9: Reduction of Non-Native Species Introduction and Live Bait Prohibition

Comments for Consideration:

- Consider citing the following City of New Braunfels Code of Ordinances: Sec. 142-6.- Control of Non-native Organism Introduction into Waterways and Sec. 142-4 – Methods of Fishing.

Riparian Zone Management

Vegetated riparian zones are essential for maintaining good water quality in the Comal Springs System because they stabilize the banks, prevent erosion, and filter runoff before it enters the aquatic system. Additionally, managing and maintaining vegetated riparian zones provides essential habitat and food sources for the Comal Springs riffle beetle and the Comal Springs dryopid beetle.

The City of New Braunfels will implement riparian restoration and maintenance strategies to increase the extent and health of the riparian zone within the Comal Springs System. Restoration efforts will include the removal of non-native riparian vegetation and the timely planting of native riparian vegetation. Deer-resistant and drought-tolerant native riparian vegetation will be prioritized for planting within the riparian habitat zones. Plantings will also consider use of native species that discourage potentially harmful public access or fences may be used for that purpose. Restoration efforts may also include more intensive bank stabilization and erosion control projects to reduce riparian degradation where necessary, but use of hardened structures will be minimized.

Original EAHCP Conservation Measure(s):

- Section 5.2.8: Native Riparian Habitat Restoration
- Section 5.7.1: Native Riparian Habitat Restoration

Comments for Consideration:

- The questions about ownership and/or control of portions of lake bottom, river bottom, and frontage, particularly related to vegetation management, seem to

require further consideration and, ideally, clarification through contractual arrangements.

Sediment Accumulation Management

Managing accumulations of excessive sediment is important to maintaining the health and functionality of aquatic ecosystems. Detrimental effects of excessive sediment accumulation for the Covered Species include increased turbidity, reduced water quality, Comal Springs riffle beetle habitat degradation, and reduced flow from spring orifices.

In addition to efforts designed to minimize sediment inputs (see Riparian Zone Management), measures such as dredging, suction, or fanning of sediment will be implemented to mitigate the impacts of sedimentation, as needed, and in a manner designed to minimize direct adverse impacts on the Covered Species.

Original EAHCP Conservation Measure:

- Section 5.2.2.1: Old Channel Environmental Restoration and Protection Area (the portion addressing removal of sediment island in Old Channel)

Comments for Consideration:

- None.

Flow-Split Management in the Old and New Channel

Flow-split management involves manually partitioning springflow from Landa Lake into the Old and New Channels of the Comal River. Flow-split management is intended to protect habitat for fountain darters in the Old Channel by reducing disturbance from elevated base flows and high-flow scouring events and by helping to ensure adequate flows during drought conditions. Flow-split management also contributes to maintaining water temperatures in the Old Channel necessary for the fountain darter life cycle.

The City of New Braunfels will adjust the amount of flow entering the Old Channel during low, average, and high flow conditions by adjusting the gates that control flow from Landa Lake into the Old Channel. In order to maintain the potential for proper flow-split management operations, the City will also ensure maintenance and repair of: a) the gates and culverts connecting Landa Lake and the Old Channel, and b) the dam on Landa Lake. In addition, the City will periodically assess and, as necessary, maintain a flow path adequate to convey water from Landa Lake to the Old Channel during low flow conditions.

The flow-split strategy will be based on USGS real-time flow gages in the Comal River (gage #08169000), Old Channel (gage #08168913), and New Channel (gage #08168932) as

illustrated in Table 1. When total Comal springflow is less than 50 cubic feet per second (cfs), priority in managing the flow-split will be placed on maintaining suitable conditions in the Old Channel.

Table 1. Flow-split management for Old and New channels of the Comal River.

FLOW-SPLIT MANAGEMENT FOR OLD AND NEW CHANNELS				
Total Comal Springflow (cfs) Gage #08169000	Old Channel (cfs) Gage #08168913		New Channel (cfs) Gage #08168932	
	Fall, Winter	Spring, Summer	Fall, Winter	Spring, Summer
350+	65	60	280+	290+
300	65	60	235	240
250	60	55	190	195
200	60	55	140	145
150	55		95	
100	50		50	
80	45		35	
70	40		30	
60	35		25	
50	35		-	
40	30		-	
30	20		-	

Original EAHCP Conservation Measure(s):

- Section 5.2.1: Flow-Split Management in the Old and New Channel

Comments for Consideration:

- Due to infrastructure on the New Channel, the flow-split management plan cannot reliably achieve flows that equal the previously specified combined values of the Old and New Channel at total flows less than 50 cfs.

Surface Water Diversions and Golf Course Management

The diversion of surface water from the Old Channel of the Comal River is diverted to irrigate the Landa Park Golf Course. Pursuant to TCEQ Certificates of Adjudication Nos. 18-3824, 18-3824A, 18-3824B, 18-3824C, and 18-3826, and 18-3826A, the City of New Braunfels is authorized to divert a combined total of 300 ac-ft/yr of water for irrigation use within a diversion segment along the Old Channel of the Comal River. The combined total instantaneous diversion rate authorized is 3 cfs.

Currently, two pumps capable of diverting at a combined rate of 1.32 cfs, are used for irrigation diversions. Historically, the City of New Braunfels has not utilized its full permitted surface water rights for irrigation. In accordance with surface water right authorizations, the City will use intake pumps equipped with a mesh screen of 0.25 inches or less and a maximum flow-through velocity of 0.5 cfs to minimize potential entrainment and impingement of aquatic organisms by surface water diversions from the Old Channel. The City of New Braunfels also will limit its combined diversion rate for those irrigation diversions to no greater than 1.32 cfs. Pursuant to the EAHCP, the City of New Braunfels has installed piping to facilitate use of reclaimed water for irrigation of the golf course as a mechanism for reducing diversions from the Old Channel.

Original EAHCP Conservation Measure:

- Section 5.2.11: Management of Golf Course Diversions and Operations

Comments for Consideration:

- The City's water rights already mandate that intake screens have a mesh size of 0.25 inches or less and a maximum flow-through velocity of 0.5 cfs to minimize impingement and entrainment of aquatic organisms. Additional commitments under consideration by the City include developing an alternate water supply, likely reclaimed water, that would allow for the suspension of diversions when flows in the Old Channel are at or below 30 cfs, consistent with an unrealized commitment in the current HCP. These additional commitments would represent specific minimization and mitigation measures designed to address incidental take associated with irrigation surface water diversions.

San Marcos Springs System

Approximately 17.5 miles northeast of the Comal Springs System, the San Marcos Springs System flows from the Edwards Aquifer in San Marcos, Texas. The San Marcos Springs System includes Spring Lake, the lower segment of Sessom Creek, and the Upper San Marcos River. Spring Lake has a surface area of approximately 20 acres and contains the major and most of the minor artesian springs that discharge into the San Marcos River.

In addition to Spring Lake, a few smaller springs occur in the lower segment of Sessom Creek, a major tributary of the San Marcos River that joins the river immediately downstream of Spring Lake Dam. Collectively, these artesian springs provide the baseflow for the Upper San Marcos River that extends 4.5 miles to its confluence with the Blanco River tributary. Downstream of that confluence, the Lower San Marcos River continues for 75.5 more miles, eventually flowing into the Guadalupe River a short distance upstream of Gonzales, Texas. The Upper San Marcos River within the EAHCP area is influenced by surface water runoff inputs from Sessom, Sink, Purgatory, and Willow Spring creeks, primarily during and immediately following storm events.

Spring Lake Dam, originally constructed around 1849, is located at the southwestern end of Spring Lake. The dam splits flow into two channels, the Western and Eastern spillways. The flows converge a short distance downstream of the dam and upstream of the Aquarena Springs Drive bridge. The USGS gage #08170500 is affixed to the river left side of the Aquarena Springs Drive bridge at Sewell Park. This gage is the primary gage for assessing the stage-discharge rating curve streamflow data used in calculating springflow reported for USGS gage #08170000. Texas State University owns and manages the property surrounding Spring Lake, Spring Lake Dam, and the San Marcos River between Spring Lake Dam and the downstream end of Sewell Park. The City of San Marcos owns and manages parkland immediately adjacent to the San Marcos River in the reach from the downstream end of Sewell Park to Stokes Park, located approximately 1 mile downstream of IH-35. Stokes Park is owned by the Texas Parks and Wildlife Department (TPWD) but is managed by the City of San Marcos (COSM) through an agreement between TPWD and COSM. COSM parkland comprises a substantial portion of the total riverfront property along the San Marcos River between the lower limit of Sewell Park and Stokes Park. Downstream of Stokes Park and to the city limit, the riparian land on river right is owned in part by Hays County, Texas Parks and Wildlife Department (A.E. Wood Fish Hatchery), and private property. On river left, the land immediately downstream of Stokes Park is privately owned and COSM owns the remainder to the COSM city limit. The riparian land between the city limit and the Blanco River confluence is privately owned. Any river access from private property is authorized only with permission from the landowner.

Covered Species within Spring Lake include the Texas blind salamander, San Marcos salamander, fountain darter, Texas wild-rice, and Comal Springs riffle beetle. Covered Species in the Upper San Marcos River below Spring Lake Dam include the San Marcos salamander, fountain darter, and Texas wild-rice. Comal Springs dryopid beetles and Texas blind salamanders have been documented in the springs within the lower segment of Sessom Creek, but their occurrence in Sessom Creek is rare. Similarly, Texas blind salamanders do not persist in Spring Lake but briefly appear there when expelled through a spring.

Habitat conservation measures will be implemented by the City of San Marcos and Texas State University in the San Marcos Springs System, including Spring Lake, the Upper San Marcos River, and lower segments of major tributaries.

Aquatic Recreation Management

Aquatic recreation can have significant negative impacts on the Covered Species, especially Texas wild-rice, fountain darter, and San Marcos salamanders, by increasing disturbance and degrading habitat quality. The implementation of appropriate recreational management measures is a critical component of minimizing adverse impacts to Covered Species and their habitats.

In 2012, the Texas Parks and Wildlife Commission designated the San Marcos River between Spring Lake Dam and the San Marcos Wastewater Treatment Plant as the San Marcos River State Scientific Area (31 TAC § 57.910). The San Marcos River State Scientific Area designation prohibits the uprooting or disturbance of Texas wild-rice and authorizes restrictions on access to areas of the river clearly marked by signage, booms, ropes, and buoys installed to protect flora and fauna. Texas Game Wardens are responsible for enforcing state regulations on public waters, including Spring Lake and the San Marcos River. Collaborative enforcement efforts, involving the Texas Parks and Wildlife Department, City of San Marcos, and Texas State University, will be pursued, particularly during future low-flow periods, to implement and enforce the protections afforded through the state scientific area designation.

Texas State University owns and manages the property surrounding Spring Lake and the San Marcos River downstream through Sewell Park. Access to the public waters of Spring Lake is restricted to university approved activities (COSM § 58.067). The Meadows Center for Water and the Environment is an affiliated institute of Texas State University that, among other duties, manages access within and around Spring Lake for research and recreational activities. University approved activities and the process for requesting access to Spring

Lake are defined in the Spring Lake Management Plan. Sewell Park is owned by Texas State University and is managed by TXST's Department of Campus Recreation.

The City of San Marcos owns and manages parkland immediately adjacent to the San Marcos River from the downstream end of Sewell Park to downstream of IH-35 at Stokes Park. City police, marshals, and park rangers are responsible for monitoring and enforcing city ordinances in the riverfront parks.

To minimize and mitigate the impacts of recreation, the City of San Marcos will enforce City Ordinances and Policies in Chapter 58 – Parks and Recreation in City parks and Texas State University will enforce University Policies and Procedures (UPPS) in university parks. COSM and Texas State University will coordinate with staff, park rangers, city and university police, EAHCP contractors, and Texas Game Wardens to minimize the impacts from recreational use of Spring Lake and the San Marcos River and will:

a. Provide educational resources and signage about park rules, including maps with Texas State University and City of San Marcos river access points and information about the Covered Species, their Critical Habitat, and efforts to protect them.
b. Install and maintain signage and protective barriers around sensitive habitat within the river and around adjacent riparian areas to restrict public access and minimize disturbance of aquatic flora and fauna in the San Marcos River State Scientific Area (31 TAC § 57.910). Those efforts will include evaluating effectiveness of existing protective barriers and need for additional barriers to be installed in sensitive habitat areas based on varied low-flow conditions and recreational use patterns.
c. Install and maintain riparian fencing within pertinent areas of riverfront parks to prevent riparian and aquatic habitat degradation and to direct river access to stabilized river access points.
d. Maintain designated river recreation access points within Texas State University and City of San Marcos parks to minimize habitat degradation in areas not immediately adjacent to the access points.
e. Restrict access to the public waters of Spring Lake to Texas State University approved activities in accordance with the Spring Lake Management Plan (COSM § 58.067 and the Spring Lake Management Plan).
f. Prohibit the removal, destruction, or disturbance of artifacts or cultural features without authorization from the Texas Historical Commission (COSM § 58.030 and Antiquities Code of Texas §§ 191.092-0.93, 191.171).
g. Prohibit the release or introduction of any fish, plant, or aquatic organisms without authorization from the City of San Marcos and Texas Parks and Wildlife Department (COSM § 58.037 and TPWC § 66.015).

h. Prohibit the removal or harm of plants and animals without authorization from the City of San Marcos and Texas Parks and Wildlife Department (COSM § 58.030, § 58.037, TXST UPPS No. 08.01.07, and 31 TAC Ch.57L).
i. Prohibit the possession or shooting of spears or spearguns on City-owned property without prior authorization from the City of San Marcos (COSM § 58.068, TPWC § 66.115)
j. Prohibit fishing in areas where fishing is prohibited by signage (COSM § 58.037 and UPPS No. 08.01.07).
k. Prohibit the use of smoking or vapor devices, alcohol, glass, Styrofoam, disposable beverage containers, and coolers larger than 30 quarts in park areas adjacent to the river (COSM § 58.026, § 58.034, § 58.042; UPPS No. 04.05.02, No. 08.01.07).
l. Prohibit the usage of tents, tarps, shade structures, umbrellas, portable tables and barbeque pits in park areas immediately adjacent to the river and within the river (COSM § 58.039 & UPPS No. 08.01.07).
m. Prohibit jumping or diving from bridges crossing the San Marcos River (COSM § 58.069, UPPS No. 08.01.07).
n. Control and reduce visitor access to pertinent riverfront parks, and river access through riverfront parks, during periods of extreme low flow (< 60 cfs) and/or when habitat has been demonstrated to be significantly degraded (i.e. significantly reduced aquatic vegetation coverage) and/or when a high density of river users is expected for given dates or events. Access control methods may include a combination of measures: gated fencing, paid parking, riverfront park access fees, etc. Implementation of the selected measures will be evaluated when flows approach 65 cfs.

Original EAHCP Conservation Measures:

- Section 5.3.2: Management of Recreation in Key Areas
- Section 5.3.2.1: Management of Public Recreational Use of San Marcos Springs and River Ecosystem
- Section 5.3.7: Designation of Permanent Access Points/Bank Stabilization
- Section 5.4.2: Management of Recreation in Key Areas
- Section 5.4.7: Diving Classes in Spring Lake
- Section 5.4.7.1: The Diving for Science Program
- Section 5.4.7.2: Texas State University Continuing Education
- Section 5.4.7.3: Texas State SCUBA Classes
- Section 5.4.8: Research Programs in Spring Lake
- Section 5.4.10: Boating in Spring Lake and Sewell Park

Comments for Consideration:

- Issues related to enforcement of city ordinances and university policies within the San Marcos River remain unresolved and need clarification. Evaluate potential enforcement structure and methodologies. Staff and members will assess the current enforcement options and the feasibility of an interlocal agreement between Texas Parks and Wildlife Department, City of San Marcos, and Texas State University to ensure reasonable enforcement levels, with a particular emphasis on periods of high recreational use and low flows.
- Prioritize the evaluation of potential control methods and triggers (listed above in item n) for reducing public access and the feasibility of locations or access points that would be restricted. If access were restricted, members discussed potential triggers that would either be flow-related (<60 cfs) and/or based on biological monitoring data such as reduced coverage of aquatic vegetation. To ensure availability of actionable monitoring data on a timely basis, the need for regular full system vegetation mapping beginning when flows drop to 65 cfs was noted. Members discussed that as flows decrease below 60 cfs, the potential for exceeding take thresholds increases and recommended that the City of San Marcos and Texas State University develop procedures for further controlling recreation access under those conditions.
- In helping to inform development of control methods listed above in item n, the City of San Marcos and Texas State University should consider analyzing a "carrying capacity" of river recreation that considers varying low-flow conditions, peak recreation periods (i.e. summer holidays) and habitat impacts. Include a further evaluation of number of visitors in City/Texas State University parks and within the river during peak recreational periods.
- Evaluate TPWD rules related to the introduction and removal of fish, plants, aquatic organisms (Chapter 57, Subchapter C) and identify the process for permitting the potential removal of Texas wild-rice.
- University policies related to recreational conduct are listed in the Sewell Park rules, that do not specifically include the riverbank areas between Aquarena Springs bridge and the Spring Lake Dam, and area around Spring Lake. Clarification of policies and coordination between university entities is needed to improve management of aquatic recreation.
- The current Spring Lake Management Plan was last amended in 2012, revisions are needed to reflect current practices and recommended protocols in Spring Lake. Staff and members will work with the Meadows Center for Water and the

Environment to revise and update the Spring Lake Management Plan. Once a revised plan is developed, it should be explicitly referenced in order to establish a baseline level of protections to be maintained in Spring Lake.

- Assessment of recreational impacts is required by the ITP for annual take assessments. Members have requested that routine assessments of available recreation management enforcement strategies are also considered by EAHCP administration.
- The use of motorized watercraft, except for motorized watercraft listed in the proposed Covered Activities, should be prohibited in Spring Lake and the San Marcos River.
- Climbing and jumping from riparian trees could reduce the strength of the tree and its ability to stabilize the riverbank. Sewell Park Rules (UPPS No. 08.01.07) prohibit hanging from trees but does not specify climbing or jumping from trees. Climbing and jumping from riparian trees should be prohibited by university policies and city park rules.
- Recreation access to the Eastern Spillway is currently restricted to protect flora and fauna, including San Marcos salamander habitat, at flows of 120 cfs or less, consistent with the State Scientific Area designation (31 TAC § 57.910). In recognition of sensitivity to disturbance even during periods of higher flow, prioritization should be given to considering permanently restricting access to the Eastern Spillway, regardless of springflow.

Litter Management

Litter refers to any form of waste or trash that is improperly disposed of, particularly in public spaces such as parks and waterways. Litter has wide-ranging negative impacts on aquatic organisms and their habitat, including disease and death from consumption, water pollution, and habitat reduction. Minimizing litter by promoting sustainable waste management practices and providing accessible recycling and waste receptacles in parks is essential for protecting the Covered Species and their habitat.

City of San Marcos regulations prohibit littering and common sources of recreation-related litter including smoking, vaping , glass, Styrofoam, alcoholic beverages and single-use disposable beverage containers in select zones within parks adjacent to the San Marcos River (COSM § 58.033 & COSM § 58.039). Texas State University prohibits glass, Styrofoam, smoking, vaping and display and consumption of alcoholic beverages in Sewell Park (UPPS 08.01.07).

The City of San Marcos and Texas State University will be responsible for the routine control and removal of litter in Spring Lake, the river from Spring Lake Dam to the San Marcos

Wastewater Treatment Plant, park areas adjacent to Spring Lake and the San Marcos River, and tributaries of the San Marcos River. The City of San Marcos and Texas State University will enforce policies and ordinances related to littering. Prevention efforts undertaken by the City of San Marcos and Texas State University will include providing means for proper disposal of litter in all such areas and educating the community on park rules, proper disposal of litter, and the negative effects of litter on aquatic organisms and their environment.

Original EAHCP Conservation Measures:

- Section 5.3.3: Management of Aquatic Vegetation and Litter below Sewell Park
- Section 5.4.3.2: Management of Aquatic Vegetation from Sewell Park to City Park

Comments for Consideration:

- Clarification and potential changes may be needed for university policies related to littering and prohibited items in Sewell Park and other TXST lands adjacent to the river such as Upper Sewell Park and Spring Lake.

Aquatic Vegetation Management

Submerged aquatic vegetation is essential habitat for fountain darters, providing them with ecological resources and shelter necessary for healthy population resiliency. Aquatic recreation, exposure of wetted habitat during severe drought, competition from non-native aquatic vegetation, scouring from flood events, floating vegetation accumulations, and reduced diversity of native aquatic vegetation can negatively impact fountain darter populations and submerged aquatic vegetation they utilize as habitat. The presence of diverse aquatic vegetation contributes to maintaining quality habitat crucial for the survival and resilience of the fountain darters and other aquatic organisms.

To minimize the impacts of low-flow and recreation, Texas State University and the City of San Marcos will implement aquatic vegetation maintenance strategies in Spring Lake and the San Marcos River. Strategies include the monitoring and maintenance of aquatic vegetation, removal of non-native and/or aggressive, non-preferred native aquatic vegetation, as needed, and planting of native aquatic vegetation. Culling of aquatic vegetation in Spring Lake, undertaken with due care to minimize adverse impacts to Covered Species, may be implemented to aid in the reduction of floating vegetation and to prevent shading and other negative impacts to underlying aquatic vegetation.

Aquatic vegetation used for planting should be sourced from Spring Lake or the Upper San Marcos River, or, as necessary, may be obtained from sources that meet locality and disease-free criteria. Aquatic vegetation propagation may occur in raceways sourced with

Edwards Aquifer water from artesian wells at Freeman Aquatic Biology Building, managed by Texas State University, or at the San Marcos Aquatic Resources Center, managed by USFWS.

San Marcos salamanders occupy limited habitat areas within Spring Lake and the Spring Lake Dam reach and prefer silt-free rocky substrate that is free of rooted aquatic vegetation. Habitat maintenance for the San Marcos salamander involves the routine removal of aquatic vegetation in occupied habitat designated as quality habitat in Biological Objective 4.1 to support the San Marcos salamander habitat objective.

Outside of areas managed for salamander habitat, aquatic vegetation management and maintenance efforts will be designed and implemented to achieve areal coverages for Texas wild-rice consistent with relevant objectives (Objectives 5.1 and 5.2) and areal coverages for complex (*Cabomba, Heteranthera, Hydrocotyle, Ludwigia, and Myriophyllum*) and simple (*Potamogeton, Sagittaria*, and *Zizania*) aquatic vegetation as defined in the San Marcos fountain darter habitat objective (Objective 6.6). The locations of the Long-term Biological Goal and Restoration reaches referenced in those objectives are shown in Figure 6. Aquatic vegetation management may also occur in Spring Lake and in portions of the river outside of the LTBG and Restoration reaches, as needed, to control non-native vegetation and increase the coverage of aquatic vegetation and quality fountain darter habitat. The native aquatic vegetation species listed may be amended through the EAHCP Adaptive Management Process and upon USFWS approval to include additional native vegetation types.

With appropriate care to minimize adverse impacts to all Covered Species, aquatic vegetation that is removed in order to conduct covered activities such as pumping equipment maintenance, USGS gage measurement, or construction projects will be replanted at favorable locations within the Upper San Marcos River, if appropriate.

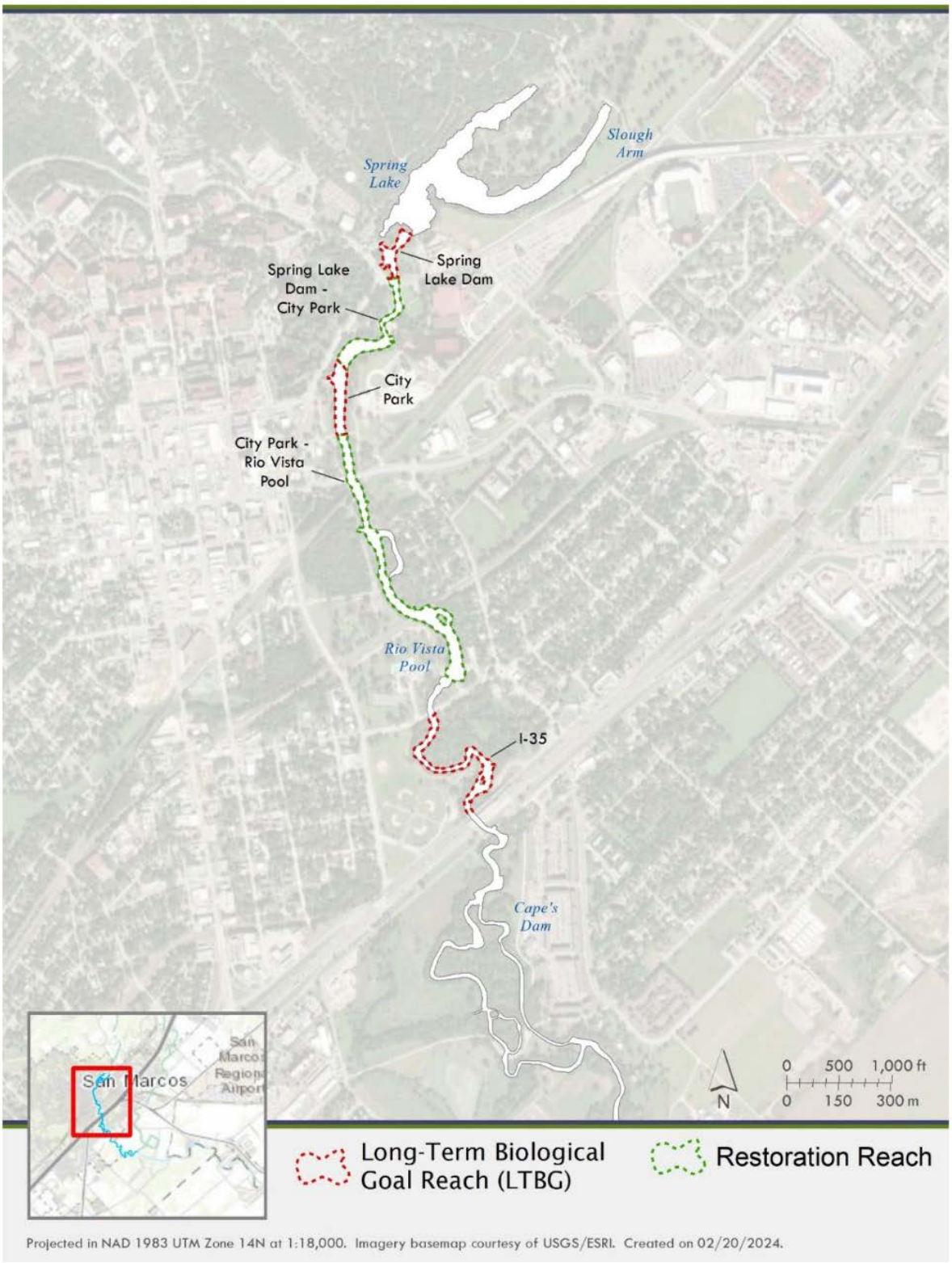

Figure 6. San Marcos Springs System Long-term Biological Goal/Restoration Reaches.

Original EAHCP Conservation Measures:

- Section 5.3.1: Texas Wild-Rice Enhancement and Restoration
- Section 5.3.8: Control of Non-Native Plant Species
- Section 5.4.1: Texas Wild-Rice Enhancement and Restoration
- Section 5.4.3: Management of Vegetation
- Section 5.4.3.1: Management of Submerged and Floating Aquatic Vegetation in Spring Lake
- Section 5.4.3.2: Management of Aquatic Vegetation from Sewell Park to City Park
- Section 5.4.12: Control of Non-Native Plant Species

Comments for Consideration:

- The current Spring Lake Management Plan was last amended in 2012. Revisions are needed to reflect current practices and recommended protocols. Staff and members will work with the Meadows Center for Water and the Environment to revise and update the Spring Lake Management Plan. The updated plan, when available, will be referenced to establish a baseline for protections in Spring Lake.
- Evaluate Texas Parks and Wildlife Departments rules and statutes related to the introduction and removal of fish, plants, aquatic organisms (Chapter 57, Subchapter C) and identify the process for permitting the potential removal of Texas wild-rice.
- The proposed Biological Objective that addresses aquatic vegetation coverage in Spring Lake only covers the removal of vegetation for San Marcos salamander habitat. A Biological Objective for fountain darter habitat in Spring Lake is needed.
- The Spring Lake Dam reach is habitat for the San Marcos salamander, fountain darter, and Texas wild-rice. Members noted a need to better understand the balance between removal of aquatic vegetation for San Marcos salamander in the Eastern Spillway, the aggressive expansion of Texas wild-rice, and maintaining diverse aquatic vegetation habitat for fountain darter.
- Removal and planting methodologies of aquatic vegetation will be reevaluated when San Marcos springflow decreases below 90 cfs.

Floating Vegetation Management

Floating vegetation mats can negatively impact Texas wild-rice and fountain darter habitat because the mats block sunlight, reduce water velocity, and can spread invasive vegetation. Additionally, floating vegetation mats that accumulate on emergent Texas wild-rice and aquatic vegetation may lead to their uprooting. As floating vegetation decays and

decomposes, it consumes oxygen reducing the amount of dissolved oxygen in the water. Management, via reduction, of floating vegetation accumulations increases the health and resilience of submerged aquatic vegetation in Spring Lake and the Upper San Marcos River.

The City of San Marcos and Texas State University will manage floating vegetation mats by reducing/preventing source propagule inputs and dislodging and/or removing accumulations of floating vegetation in Spring Lake and the San Marcos River upstream of IH-35. Litter and aquatic organisms will be removed from floating vegetation during removal from Spring Lake and the river and native organisms will be returned to the water.

Original EAHCP Conservation Measures:

- Section 5.3.3: Management of Aquatic Vegetation and Litter below Sewell Park
- Section 5.4.3: Management of Vegetation
- Section 5.4.3.1: Management of Submerged and Floating Aquatic Vegetation in Spring Lake
- Section 5.4.3.2: Management of Aquatic Vegetation from Sewell Park to City Park

Comments for Consideration:

- The current Spring Lake Management Plan was last amended in 2012, revisions are needed to reflect current practices and recommended protocols. Staff and members will work with the Meadows Center for Water and the Environment to revise and update the Spring Lake Management Plan. The updated plan, when available, will be referenced to establish a baseline for protections in Spring Lake.

Non-Native Animal Species Management

Non-native species are organisms that do not naturally occur in a particular area and are often introduced by human activities. Non-native species can pose serious threats to all Covered Species and their habitats through competition, predation, disease transmission, habitat alteration, and ecosystem disruption. Effective management strategies, such as prevention and removal of problematic non-native species, are essential for minimizing these impacts and conserving native biodiversity.

Management of non-native animal species includes the removal of non-native armored catfish, sailfin catfish, tilapia, nutria, and other species that may negatively impact Covered Species and the San Marcos Springs ecosystem. Contractors and program participants authorized by the City of San Marcos will remove non-native animals with the use of pole spears, spear guns, or other methods chosen to remove large quantities of such animal species with minimal impact to the habitat or to non-target species.

Non-native species introduction will be reduced by the prohibition of the release of any fish, plant, or other aquatic organisms in public parks and waterways (COSM § 58.037 & UPPS 08.01.07). The City of San Marcos will offer a donation program to receive unwanted aquatic animals and will provide and maintain signage educating park visitors about park rules related to non-native species and negative impacts to the ecosystem.

Original EAHCP Conservation Measures:

- Section 5.3.5: Reduction of Non-Native Species Introduction
- Section 5.3.9: Control of Harmful Non-Native and Predator Species
- Section 5.4.11: Reduction of Non-Native Species Introduction
- Section 5.4.13: Control of Harmful Non-Native and Predator Species

Comments for Consideration:

- None.

Riparian Zone Management

Healthy riparian zones are essential for maintaining good water quality in the San Marcos Springs System by stabilizing riverbanks, preventing erosion, storing alluvial water, providing shade for temperature moderation, and filtering runoff before it enters the aquatic system. Managing and maintaining healthy riparian zones is essential for maintaining the quality of habitat for the protection of fountain darter, Texas wild-rice, San Marcos salamander, and Comal Springs riffle beetle.

The City of San Marcos and Texas State University previously installed fences within portions of riverfront parks to prevent disturbance and degradation of the riparian zone and adjacent aquatic vegetation. Existing riparian fencing in parks adjacent to the river will remain in place and be maintained to protect the riparian corridor. Additional fencing may be put in place to protect riparian areas being degraded through overuse.

The City of San Marcos and Texas State University will continue to implement riparian zone restoration and maintenance strategies to protect, enhance, and widen the riparian zone along Spring Lake, the San Marcos River, and major tributaries within city limits. Riparian management and maintenance strategies include routine monitoring, removal of non-native vegetation and the planting of diverse native riparian vegetation. Deer resistant and drought-tolerant native vegetation will be prioritized for planting in the riparian zones. Riparian management and maintenance strategies may also include bank stabilization, installation of additional fencing, and erosion control projects to minimize degradation of the riparian zone and adjacent aquatic vegetation.

Original EAHCP Conservation Measures:

- Section 5.3.8: Control of Non-Native Plant Species
- Section 5.4.12: Control of Non-Native Plant Species
- Section 5.7.1: Native Riparian Habitat Restoration

Comments for Consideration:

- Members noted that future park improvement projects may modify the existing fence line, thus reducing riparian establishment in areas currently protected with fencing. The members want to ensure that future projects have flexibility, but also maintain protections for areas previously restored.
- Members noted that climbing and jumping from riparian trees should be prohibited by university policies and city park rules. This comment is also listed in the San Marcos Springs System Aquatic Recreation Management comments for consideration.

Sediment Accumulation Management

Managing excessive sediment accumulation is important to maintaining the health and functionality of aquatic ecosystems. Detrimental effects of sediment accumulation include increased turbidity, pollutant retention, reduced habitat, and reduced outflow from spring orifices. Deposition and accumulation of sediment can smother and displace stands of Texas wild-rice, reduce or alter fountain darter habitat, fill in open spaces between larger substrate components that are utilized by San Marcos salamander, and cover spring orifices utilized by Comal Springs riffle beetle.

In addition to Riparian Zone Management efforts designed to limit sediment inputs, to mitigate these impacts, active and passive sediment removal techniques will be implemented as needed, and in a manner designed to minimize direct adverse impacts on Covered Species, in Spring Lake and the San Marcos River. Any sediment management activities to be undertaken must first be demonstrated to provide a significant benefit to Texas wild-rice and/or other Covered Species habitat and outweigh any anticipated negative impacts that might be caused by these activities.

Original EAHCP Conservation Measures:

- Section 5.3.6: Sediment Management below Sewell Park
- Section 5.4.4: Sediment Management in Spring Lake and from Spring Lake Dam to City Park
- Section 5.4.6: Sessom Creek Sand Bar Removal

Comments for Consideration:

- None.

Flow-Split Management at Spring Lake Dam

The Spring Lake Dam bifurcates flow from Spring Lake into two channels, the Western and Eastern spillways. Both spillways represent important habitat for the San Marcos salamander and the fountain darter. The Western Spillway generally receives more water than the Eastern Spillway and, as a result, habitat in the Eastern Spillway can become shallow and more susceptible to dewatering during low springflow conditions. Flow-split management is intended to better protect wetted habitat for San Marcos salamanders and fountain darters in the Eastern Spillway.

Texas State University will use boards, barriers, or new infrastructure to adjust the amount of water that flows over the Western Spillway during low flow periods as needed to protect wetted habitat in the Eastern Spillway, while also maintaining flow and wetted habitat in the Western Spillway. Due to the lack of flow and bathymetry data for the spillways, and the lack of infrastructure to precisely control flow over the Western Spillway, no specific flow allocations currently are defined for implementation. Additional flow and bathymetry data are needed for both spillways, in conjunction with biological sampling, to evaluate habitat conditions of the Western and Eastern Spillways and develop, in coordination with the Science Committee, recommended flow-split allocations for use in implementing flow-split management at Spring Lake Dam. This work will continue be undertaken by Texas State University, the City of San Marcos, and the EAA, in coordination with the Science Committee and Texas Parks and Wildlife Department.

Original EAHCP Conservation Measure:

- Not applicable (this is a new conservation measure recommended by the Subcommittee)

Comments for Consideration:

- Additional information is needed to assess flow characteristics between the Western and Eastern spillways. Future coordination between university facilities staff (install boards), Spring Lake Manager, San Marcos HCP Manager, EAHCP and EAA staff, EAHCP Biological Monitoring contractor, and USFWS Refugia staff is needed for collecting flow data and assessing biological data (salamander counts and collection trends), at various flows, before and after board placement.

- Future modifications or repairs to the Spring Lake Dam, should consider potential installation of new infrastructure to enhance control and refinement of the flow-split management of the Eastern and Western spillways.

Surface Water Diversions

Under TCEQ Certificates of Adjudication Nos. 18-3865 and 18-3866, Texas State University's surface water appropriation from the upper San Marcos River, designated as consumptive use, is 200 acre-feet per year. A full description of the surface water rights is included in the Covered Activities chapter of the EAHCP.

Certificate No. 18-3865 authorizes Texas State University to divert and use 100 ac-ft/yr from Spring Lake for the purpose of irrigation. The existing diversion point is located along the Slough Arm of Spring Lake near the intersection of San Marcos Springs Drive and Aquarena Springs Drive. The certificate authorizes a maximum instantaneous diversion rate from Spring Lake of 1.33 cfs (600 gpm).

Certificate No. 18-3866 authorizes Texas State University to divert and use 100 ac-ft/yr from the San Marcos River for the purpose of irrigation (40 ac-ft/yr) and biological/educational purposes (60 ac-ft/yr). The 40 ac-ft authorized for irrigation purposes is currently used to irrigate Sewell Park and is only available to be diverted when the streamflow of the San Marcos River at the diversion point is equal to or greater than 128 cfs. The maximum instantaneous diversion rate for this portion of the certificate is 1.00 cfs (450 gpm). The 60 ac-ft authorized for biological/educational purposes is currently used to fill and maintain the level of seven off-channel reservoirs ("Old Fish Hatchery Ponds") located approximately between the Texas State University JC Kellam Administration Building and University Drive. The existing diversion point is located immediately upstream of City Park. The maximum instantaneous diversion rate for this portion of the certificate is 2.22 cfs (1,000 gpm).

To minimize the impacts of these diversions, Texas State University will limit surface water diversions from Spring Lake to a rate not to exceed 0.75 cfs (340 gpm) and cease diversions from the San Marcos River when San Marcos River streamflow, as measured at USGS gage #08170500, declines below 60 cfs. When San Marcos River streamflow declines below 50 cfs, Texas State University will continue cease the San Marcos River surface water diversions and reduce surface water diversions from Spring Lake to a rate not to exceed 0.50 cfs (225 gpm). When San Marcos River streamflow decreases below 45 cfs, Texas State University will suspend all surface water diversions.

The reductions in Texas State University's total diversion rate for consumptive use is summarized in Table 2 below.

Table 2. Texas State University curtailment of surface water diversions by San Marcos River streamflow levels.

San Marcos River Streamflow as measured at USGS gage #08170500 (cfs)	Spring Lake Diversion: Cert. No. 18-3865	San Marcos River Diversion: Cert. No. 18-3866	Maximum Allowable Diversion Rate
128+	1.33 cfs (600 gpm)	3.22 (1,450 gpm)	4.55 cfs (2,050 gpm)
127 - 60	1.33 cfs (600 gpm)	2.22 cfs (1,000 gpm)	3.55 cfs (1,600 gpm)
59 - 50	0.75 cfs (340 gpm)	0	0.75 cfs (340 gpm)
49 - 45	0.50 cfs (225 gpm)	0	0.50 cfs (225 gpm)
<45	0	0	0

Texas State University uses, and will maintain, a 0.25-inch mesh screen to cover the intake for surface water diversions. These screens are routinely inspected and cleaned. Fountain darters have not been observed when the screen is cleaned; however, there is a possibility for capture of adults against the screen, but not pulled into the pipeline. To avoid or minimize the impacts of the surface water diversions, Texas State University will routinely monitor the screens to determine if any impingement occurs and will make any necessary modifications to the screens to minimize incidental take from the operation of the diversions.

Original EAHCP Conservation Measure:

- Section 5.4.5: Diversion of Surface Water

Comments for Consideration:

- None.

Refugia

The Edwards Aquifer Authority will support off-site refugia for EAHCP Covered Species. The limited geographic distribution of these species leaves their populations vulnerable to extirpation throughout all or a significant part of their range. A series of refugia will house and maintain adequate populations of Covered Species to support re-establishment in the

wild if the wild populations are lost due to catastrophic events such as the cessation of springflow or an unexpected chemical spill. Additionally, the refugia operations will include appropriate research activities focused on the Covered Species. These activities are restricted to species included in this HCP and are designed to inform efforts to maintain healthy populations, through propagation and assessment of genetic diversity, that also supports management measures for wild populations of these species.

Original EAHCP Conservation Measure:

- Section 5.1.1: Refugia

Comments for Consideration:

- None.

Measures that Contribute to Recovery

Measures that Contribute to Recovery go beyond minimizing and mitigating impacts from Covered Activities and include avoidance measures that contribute to the likelihood of downlisting and delisting of listed Covered Species. Recovery of a listed species is a regulatory determination by USFWS that a threatened species is recovered and can survive long-term in the wild without protections afforded by the Endangered Species Act (ESA). USFWS creates Recovery Plans for all listed species to define criteria for downlisting and delisting listed species and recovery actions to achieve those criteria. All listed Covered Species are endangered, except for the San Marcos salamander, that is listed as threatened.

USFWS cannot require that HCPs meet the recovery criteria of listed Covered Species, but applicants are encouraged to develop HCPs that provide a net benefit to the listed species while minimizing and mitigating Covered Activities (USFWS, 2016). Consistency with Recovery Plans is often considered by USFWS when determining issuance of an incidental take permit (ITP), and in order to issue an ITP, USFWS must find that issuance of the permit will not preclude the recovery of any listed species. The current EAHCP was established pursuant to the Edwards Aquifer Recovery Implementation Program (EARIP). As directed by the Texas Legislature, the EARIP Permittees committed to implement strategies specifically intended to aid in the recovery of the Covered Species, exceeding the minimum requirements for obtaining an ITP. Recovery actions and criteria for EAHCP listed species are described in the recently updated *Draft Recovery Plan for the Southern Edwards Aquifer Springs and Associated Aquatic Ecosystems*, hereafter referred to as the Draft Recovery

Plan, released by USFWS on September 10, 2024, for public review and comment (USFWS, 2024).

Strategies within the proposed measures included in this section align with USFWS's recommended recovery actions of the Draft Recovery Plan and the proposed Goal 7 of the *Recommended Biological Goals and Objectives Memorandum* (BIO-WEST and ICF, 2024). Goal 7 is a goal proposed by the EAHCP Biological Goals Subcommittee and seeks to "promote community engagement and awareness of the EAHCP, support land and water conservation, and mitigate anthropogenic stressors and natural disturbances within the Plan Area that will benefit the Covered Species." Proposed Measures that Contribute to Recovery that address Goal 7 and support recovery actions include: Education and Outreach, Water Quality Protection, Water Conservation, and Land Conservation.

The proposed Measures that Contribute to Recovery address the current Measures that Specifically Contribute to Recovery (EAHCP § 5.7), support proposed recovery actions in the Draft Recovery Plan (USFWS, 2024), and address topics listed in the proposed Goal 7 (BIO-WEST and ICF, 2024). Measures may be implemented through available and appropriate mechanisms including existing programs and may be funded through partnerships, other external funding, grant funding, in-kind contributions, or negotiation of requisite interlocal and other agreements.

Education and Outreach

To increase public support for the EAHCP and associated conservation measures, it is crucial to enhance the public's understanding of the Covered Species, their habitat, threats they face, and the protection efforts in place. Additional outreach topics may include water conservation, non-native species control, and rules regarding recreational use of the spring systems. The Permittees will implement outreach and education initiatives beyond those directly associated with the individual spring and river systems addressed in other specific conservation measures. These initiatives will include a combination of signage, brochures, events, workshops, promotional items, educational programs, newsletters, and social media postings.

Original EAHCP Conservation Measure That Include Education and Outreach:

- Section 5.2.3: Management of Public Recreation Use of Comal Springs and River Ecosystem
- Section 5.2.9: Reduction of Non-Native Species Introduction and Live Bait Prohibition
- Section 5.3.5: Reduction of Non-Native Species Introduction
- Section 5.4.11: Reduction of Non-Native Species Introduction

- Section 5.3.2: Management of Recreation in Key Areas
- Section 5.3.2.1: Management of Public Recreational Use of San Marcos Springs and River Ecosystem
- Section 5.4.2: Management of Recreation in Key Areas

Comments for Consideration:

- Outreach is a component of the original Habitat Protection Measures listed above and is included in various proposed Habitat Protection Measures.
- This measure addresses the "community engagement and awareness" component of the proposed Goal 7.

Water Quality Protection

The Edwards Aquifer is a karst aquifer characterized by an abundance of fractures, caves, and recharge features that enhance the rate of recharge but also increase the exposure of the aquifer to stormwater-borne pollutants or chemical spills. The City of New Braunfels, City of San Marcos, and Texas State University are highly urbanized areas with significant amounts of impervious cover near the habitat of the Covered Species, thus increasing the likelihood of nonpoint source pollutants within stormwater runoff directly affecting that habitat. A base level of the programs described below is currently required by municipal, state, or federal law to provide water quality protection and are either implemented by or in collaboration with the Permittees within their jurisdictional boundaries.

The Edwards Aquifer Protection Program (EAPP), administered by the Texas Commission on Environmental Quality (TCEQ), regulates activities that have the potential to contaminate the Edwards Aquifer, such as construction and aboveground or underground storage tank facilities. EAPP plans submitted to TCEQ for review and approval must include a water pollution abatement component.

Urbanized areas with populations greater than 50,000, and universities located within these areas, are required to obtain coverage under TCEQ's Municipal Separate Storm Sewer System (MS4) permitting program. They must develop and implement a Storm Water Management Plan aimed at reducing the introduction of nonpoint source pollutants to surface waters. Storm Water Management Plans associated with MS4 programs focus on reducing stormwater pollution through the implementation of the following measures:

- Public Education, Outreach, and Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-Construction Stormwater Management in Areas of New Development or Redevelopment

- Pollution Prevention and Good Housekeeping for Municipal Operations
- Industrial Stormwater Sources (cities with populations greater than 100,000)

The City of San Marcos Land Development Code (LDC) includes environmental regulations and development criteria that are specific to providing enhanced protection for the San Marcos River. The development standards set forth in Chapter 6 of the LDC include more robust protection standards for development within the Edwards Aquifer Recharge Zone, San Marcos River Protection Zone and San Marcos River Corridor inside the San Marcos city limits. These standards include impervious cover limitations, stormwater quality treatment requirements and stream buffer requirements. These requirements will remain in effect to help protect water quality of the San Marcos River.

The Permittees will continue to implement programs, projects, and strategies that build on the requirements of their respective MS4 programs and collaborate with TCEQ's EAPP to protect Edwards Aquifer groundwater and the water quality of the Comal Springs and San Marcos Springs ecosystems.

Permittees will consider opportunities for water quality protection within the Plan Area. In particular, the City of New Braunfels, the City of San Marcos, and Texas State University will periodically evaluate water quality and runoff patterns from developed areas in close proximity to, and directly affecting, the Comal and San Marcos springs systems. Based on these evaluations, Permittees will prioritize sources of runoff that could pose significant threats to habitat for any Covered Species within those systems for corrective action and planning efforts related to proposed public development.

Original EAHCP Conservation Measure:

- Section 5.7.4: Minimizing Impacts of Contaminated Runoff
- Section 5.7.6: Impervious Cover/Water Quality Protection

Comments for Consideration:

- Include language to encourage pursuing best management practices to benefit water quality, such as implementing more green infrastructure and nature-based solutions to reduce non-point source pollutants and enhance recharge. While implementation at the watershed scale would be beneficial, this scope may be too large for the EAHCP. Therefore, the focus here should be more on sensitive areas, like a buffer zone proximal to urban drainages and the river corridor. This could also involve re-evaluating existing infrastructure or recommending improvements for new infrastructure to enhance stormwater detention capacity, bio-infiltration, and replacing impervious cover with pervious cover. Funding for these efforts could

include minor contributions from HCP funds and cost-sharing with municipalities, Texas State University, and pursuing other funding using HCP costs as matching funds.
- This measure addresses the "anthropogenic stressors" component of the proposed Goal 7.

Hazardous Materials Management

Improper disposal, handling, treatment, and transportation of hazardous materials increases the likelihood of contamination and spread of hazardous chemicals that may be fatal to the Covered Species. Due to the limited geographic distribution of the Covered Species, they are particularly vulnerable to spills and contamination across the Edwards Aquifer, and, particularly, the Comal and San Marcos watersheds and their tributaries. To reduce the likelihood of improper disposal of hazardous materials, the Cities of San Antonio, New Braunfels, and San Marcos will maintain their respective household hazardous waste (HHW) collection programs. City of New Braunfels and City of San Marcos, with support from Texas State University, will coordinate with the Texas Department of Transportation (TxDOT) regarding the transportation of hazardous materials on routes crossing the Comal and San Marcos springs systems and their major tributaries. Implementation efforts to reduce risk from the transportation of hazardous materials may include coordination with city council, TxDOT review and approval, installation of signage, etc. If a spill or contamination does occur, there are currently few options available to mitigate and remove hazardous chemicals. Collectively, Permittees will evaluate and refine the methods and technologies to improve hazardous response readiness. Water quality data collected through the EAHCP monitoring program will be evaluated to assess potential water quality degradation and inform specific responses.

Original EAHCP Conservation Measure:

- Section 5.2.7: Prohibition of Hazardous Materials Transport Across the Comal River and its Tributaries
- Section 5.3.4: Prohibition of Hazardous Materials Transport Across the San Marcos River and Its Tributaries
- Section 5.7.5: Management of Household Hazardous Wastes

Comments for Consideration:

- City of San Antonio, City of New Braunfels, City of San Marcos are required to offer Household Hazardous Wastes (HHW) collection programs as part of their Municipal Separate Storm Sewer System (MS4) programs.

- This measure is intended to support efforts that exceed minimum levels required pursuant to other regulatory programs.
- This measure addresses the "anthropogenic stressors" component of the proposed Goal 7.

Septic System Permitting Program

Septic systems are underground wastewater treatment structures that collect, treat, and disperse wastewater generated by a home or business. The wastewater is treated on-site rather than collected and transported to a wastewater treatment plant. Septic systems can contaminate groundwater and/or surface water due to improper installation, lack of maintenance, location, or faulty operation. The City of New Braunfels and City of San Marcos will maintain an aerobic and anaerobic septic system registration and permitting program to authorize, inspect and track the construction and locations of new septic systems within their respective jurisdictions. The City of New Braunfels and City of San Marcos will respond to complaints regarding faulty systems and identify systems that have significant potential to contribute subsurface pollutant loadings likely to affect the relevant spring system. Based on that information, both cities will prioritize efforts to minimize those loadings, including through efforts to arrange for connection of those septic systems to the municipal wastewater treatment system.

Original EAHCP Conservation Measure:

- Section 5.7.3: Septic System Registration and Permitting Program

Comments for Consideration:

- This measure could include the actions Hays and Comal counties are taking to regulate septic systems.
- This measure could reference an existing septic system database for the Plan Area, if available.
- This measure addresses the "anthropogenic stressors" component of Goal 7.

Integrated Pest Management

To minimize impacts of the use of fertilizers, herbicides, and pesticides used to maintain the Landa Park Golf Course and other open spaces and parklands, the City of New Braunfels, City of San Marcos, and Texas State University will continue to implement, and periodically refine, the Integrated Pest Management Plan (IPMP) for the Landa Park Golf Course, and other IPMPs applicable to parkland in both communities immediately adjacent to the Comal and San Marcos springs systems. The IPMPs will continue to incorporate environmentally sensitive techniques to minimize chemical applications, avoid the introduction of chemicals into the Comal and San Marcos springs systems, and

minimize negative effects to the Covered Species. Any chemicals used will be applied by an applicator licensed by the Texas Department of Agriculture in a manner consistent with the label directions and adhere to U.S. Environmental Protection Agency standards.

Original EAHCP Conservation Measures:

- Section 5.2.11: Management of Golf Course Diversions and Operations
- Section 5.4.9: Management of Golf Course and Grounds

Comments for Consideration:

- The Texas State University Golf Course adjacent to Spring Lake has been closed for years and is no longer maintained as a Golf Course. EAHCP staff will coordinate with the San Marcos HCP Manager to inquire about current Texas State University and City of San Marcos IPMPs for maintaining parkland immediately adjacent to the San Marcos Springs System.
- This measure addresses the "anthropogenic stressors" component of the proposed Goal 7.

Land Conservation

Although the Covered Species are primarily aquatic and reside mainly within the Comal Springs and San Marcos springs systems, the land affecting the quality and quantity of springflows spans several counties and parts of counties in South-Central Texas. This region is among the fastest-growing areas in the country, with changes in land use and cover impacting the quantity and quality of the underlying groundwater and spring systems. Implementing conservation strategies to protect land immediately adjacent to the Comal and San Marcos springs systems, within the Edwards Aquifer Recharge and Contributing zones, and other land with recharge features or otherwise deemed ecologically valuable by the Permittees, could help maintain the groundwater and surface water quality and quantity essential for the Comal Springs and San Marcos springs ecosystems. The Permittees will periodically assess opportunities for land conservation based on potential benefits for the quality and quantity of Comal and San Marcos springflows and will advocate for and support land conservation measures consistent with those assessments.

Original EAHCP Conservation Measure:

- Not applicable (this is a new conservation measure recommended by the Subcommittee).

Comments for Consideration:

- This measure addresses the "land conservation" component of the proposed Goal 7.

Water Conservation

This measure provides for additional non-regulatory efforts to reduce per capita pumping and enhance recharge. Pursuant to this measure, Permittees will assess, on an ongoing basis, the availability and feasibility of additional non-regulatory water conservation strategies to increase Edwards Aquifer groundwater. Strategies assessed should include:

- implementing specific land and vegetation management activities to increase Edwards Aquifer recharge;
- reducing per capita surface water use and/or altering surface water management in order to increase Edwards Aquifer recharge;
- encouraging responsible water usage and conservation practices for aquifers that contribute significant recharge to the Edwards Aquifer; and
- assisting users of Edwards Aquifer water, including exempt users, in reducing water use, particularly during drought periods.

To the extent reasonably practicable, Permittees will promote water conservation and implement strategies identified as having significant potential benefits.

Original EAHCP Conservation Measure:

- Not applicable (this is a new conservation measure recommended by the Subcommittee).

Comments for Consideration:

- In addition to the Springflow Protection Measures, this measure addresses the "water conservation" component of the proposed Goal 7.
- While modeling, including climate modeling, made available to date appears generally consistent with a determination that implementation of the Springflow Protection Measures likely would be sufficient for maintaining identified minimum levels of Comal and San Marcos springflow, there is significant uncertainty and this measure calls for Permittees to keep evaluating and, to the extent reasonably practicable, implement additional water conservation strategies.

EAA's Cibolo Creek Transfer Prohibition

EAA Rule § 711.329 prohibits transferring groundwater withdrawal permits located west of Cibolo Creek to east of Cibolo Creek, without approval from the EAA Board of Directors and

EAA General Manager. This rule benefits Comal and San Marcos springflows by limiting the amount of available permitted groundwater east of Cibolo Creek. Prior to the rulemaking, transfers from west of Cibolo Creek to east of Cibolo Creek were generally made in small amounts, but concern over future cumulative impacts on both Comal and San Marcos springs led to the implementation of a prohibition of such transfers. The EAA will maintain in effect EAA Rule § 711.329 prohibiting transferring groundwater withdrawal permits located west of Cibolo Creek to east of Cibolo Creek.

Original EAHCP Conservation Measure:

- Not applicable (this is a new conservation measure recommended by the Subcommittee).

Comments for Consideration:

- In addition to the Springflow Protection Measures, this measure addresses the "water conservation" component of the proposed Goal 7.

Glossary

ac-ft/yr: acre foot per year, a measurement unit of water volume

cfs: cubic feet per second, a measurement unit of water discharge or flow rate.

Comal discharge: The volume of water passing a defined location in the Comal River; in the EAHCP, this location is often referenced at the USGS gage #08169000, that is below the confluence of the Old and New channels of the Comal River.

Comal River: A two-mile natural watercourse originating from the Comal Springs in New Braunfels, Texas, beginning at Landa Lake and terminating at its confluence with the Guadalupe River in New Braunfels, Texas.

Comal Springs: A collection of artesian springs in New Braunfels, Texas, emanating from the Edwards Aquifer and creating the headwaters of the Comal River, including areas of Landa Lake and the spring runs that feed Landa Lake.

Comal Springs System: The aquatic area and associated riparian zones encompassing the Comal Springs, Landa Lake, Old Channel, New Channel, and Comal River.

CONB: City of New Braunfels. References to "CONB § __" refer to provisions of City of New Braunfels ordinances.

Comments for Consideration: Outstanding issues or questions not addressed in the proposed conservation measures recommendations that did not meet the views of all Subcommittee members, or may require further evaluation, research and data. Some of these comments may not be appropriate for the conservation measures and will be further considered during the permit renewal process.

Conservation Measures: Projects or activities characterized by minimization, mitigation, or avoidance actions, implemented by the Permittees to achieve the Biological Goals and Objectives.

COSM: City of San Marcos. References to "COSM § __" refer to provisions of City of San Marcos ordinances.

Covered Activities: Activities performed by the Permittees within the Permit Area, including management of groundwater pumping from the Edwards Aquifer, aquatic recreation, and restoration, for which incidental take coverage will be provided over the incidental take permit term.

Covered Species: The nine federally listed or petitioned species "covered" by the Incidental Take Permit and EAHCP as recommended in the *Evaluation of Covered Species for the Amended EAHCP Memorandum*.

Goal 7: An HCP management goal developed by the EAHCP Biological Goals Subcommittee and recommended within the *Revised Recommended Biological Goals and Objectives for the Permit Renewal Memorandum*. Goal 7, as written: "Promote community engagement and awareness of the EAHCP, support land and water conservation, and mitigate anthropogenic stressors and natural disturbances within the Plan Area that will benefit the Covered Species."

Groundwater easements: A legal agreement between a groundwater withdrawal permit holder and an entity granting the entity the right to control a specified amount of the permitted groundwater in a specified way for a specified number of years or held in perpetuity as defined within the contract between the original permit holder and the entity.

Groundwater Trust: An account of groundwater withdrawal permits held in trust and administered by the Edwards Aquifer Authority, established in Section 1.22 of the EAA Act.

gpm: gallons per minute, a measurement unit for water discharge or flow rate.

"Incidental take" or "take:" Unintentional taking of a species that results from, but is not the purpose of, carrying out an otherwise lawful activity. *Taking* is defined in the ESA as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting any threatened or endangered species.

Incidental Take Permit: A permit issued by the USFWS under Section 10a(1)(B) of the Endangered Species Act that allows permittees to proceed with an otherwise legal activity that may result in "incidental take" (see above) of a threatened or endangered species.

Long-Term Biological Goal Reach: River segments in both the Comal and San Marcos Springs systems that are specified in the EAHCP and hold quantitative management objectives associated with Covered Species habitat.

Low flow(s), low-flow condition(s): A period of springflow below the long-term average identified in *Revised Recommended Biological Goals and Objectives for the Permit Renewal* (BIO-WEST and ICF, 2024). Low flow may also be specified as 130 cfs or lower at the Comal discharge and 120 cfs or lower at the San Marcos discharge.

Maintenance: To sustain favorable conditions and functionality as part of a conservation measure. For habitat measures, often refers to routine monitoring and minor efforts for removal and planting following initial or major efforts, that are defined below as "management."

Management: To oversee and direct activities to achieve implementation of conservation measures. For habitat measures, often refers to initial or major efforts for removal and planting. Management is typically followed by "maintenance," as defined above.

Negative impacts: Generic term associated with adverse impacts on the Covered Species and their habitat through reduced springflow, flood, contaminated runoff, excess recreation in protected areas, and other potentially threatening activities to the Comal and San Marcos springs ecosystems.

New Channel of the Comal River: From Landa Lake, water flows into two channels, the original "old" channel and a "new" channel created in 1847. New Channel flows are monitored by USGS gage #08168932.

Old Channel of the Comal River: From Landa Lake, water flows into two channels, the original "old" channel and a "new" channel created in 1847. The Old Channel is recognized as an Environmental Restoration and Protection Area (ERPA) in the EAHCP and considered optimal habitat for the fountain darter. For this reason, flow maintenance is prioritized in the Old Channel over the New Channel during low-flow conditions. Old Channel flows are monitored by USGS gage #08168913.

Permittees: The five parties named as co-permittees on the Incidental Take Permit (see above) that are jointly responsible for the EAHCP: Edwards Aquifer Authority, San Antonio Water System, City of New Braunfels, City of San Marcos, and Texas State University.

Permit Renewal: Initiated in 2022 by the Permittees, this multi-year planning process is intended to complete a major amendment of the Incidental Take Permit (see above) to extend the permit duration beyond its expiration in 2028.

Recovery: Determination by USFWS that a listed species has achieved delisting criteria defined in the species Recovery Plan and can survive in the wild long-term without protections afforded by the Endangered Species Act. The first step of recovery of an endangered species is downlisting, or reclassification from endangered to threatened status, defined by downlisting criteria and recovery actions in the species Recovery Plan.

Recovery Plan: A document produced by USFWS for species listed as endangered or threatened that describes downlisting criteria (reclassification from endangered to threatened), delisting criteria (reclassification from threatened to recovered), and recovery actions to achieve criteria that increase the likelihood of the species' long-term survival in the wild.

Restoration Reach: River segments in both the Comal and San Marcos springs systems as defined in the *Revised Recommended Biological Goals and Objectives for the Permit Renewal* (BIO-WEST and ICF, 2024).

Riparian: Land adjacent to a river, creek, or lake.

San Marcos discharge: The rate and volume of water passing a defined location in the San Marcos River; in this HCP, this location is referenced at the USGS gage #08170500, that is located at Aquarena Springs Drive bridge in Sewell Park.

San Marcos River: An 80-mile natural watercourse originating from the San Marcos Springs in San Marcos, Texas, extending from the headwaters of Spring Lake and terminating at its confluence with the Guadalupe River near Gonzales, Texas.

San Marcos River (within city limits): The segment of the Upper San Marcos River extending from Spring Lake Dam to the San Marcos Wastewater Treatment Plant (WWTP). The current city limits end just below the WWTP. The riparian property below the WWTP is private and access requires permission from private landowners.

San Marcos Springs: A collection of artesian springs in San Marcos, Texas, emanating from the Edwards Aquifer and creating the headwaters of the San Marcos River, including areas of Spring Lake, Sink Creek, and springs within lower segment of Sessom Creek; this term generally refers to artesian springs in Spring Lake.

San Marcos Springs System: The aquatic area and associated riparian zones containing the San Marcos Springs, Spring Lake, the lower segment of Sessom Creek, and Upper San Marcos River.

Texas State University (TXST): Includes Texas State University entities: The Meadows Center for Water and the Environment (Spring Lake), Department of Campus Recreation (Sewell Park and Outdoor Center at Sewell Park), Facilities Operations, and University Police Department.

Tributaries (San Marcos): Includes the major creeks that flow into the San Marcos Springs System: Sink Creek, Sessom Creek, Purgatory Creek, and Willow Creek.

Tributaries (Comal): Includes the major creeks that flow into the Comal Springs System: Blieders Creek, Panther Creek, and Dry Comal Creek.

United States Fish and Wildlife Service (USFWS): The USFWS is the federal agency responsible for implementing the Endangered Species Act (ESA), that involves conserving and protecting threatened and endangered species and their habitats.

University Policy and Procedure Statements (UPPS): The Texas State University Policy and Procedure Statements are the policies and procedures that govern various aspects of the university's operations, administrative functions, student affairs, faculty and staff regulations, and institutional practices.

Upper San Marcos River: The 4.5-mile segment of the San Marcos River extending from Spring Lake Dam and terminating at its confluence with the Blanco River. The Upper San Marcos River watershed includes major tributaries, or creeks, that flow into the Upper San Marcos River.

Species of Interest

The species listed in the table below are directly managed by the EAHCP program or otherwise of interest through their relevance to EAHCP implementation activities.

EAHCP Species of Interest

Common Name	Scientific Name	ESA Status
Covered Species		
Comal Springs dryopid beetle	*Stygoparnus comalensis*	Endangered
Comal Springs riffle beetle	*Heterelmis comalensis*	Endangered
Edwards Aquifer diving beetle (or Texas cave diving beetle)	*Haideoporus texanus*	Petitioned
Fountain darter	*Etheostoma fonticola*	Endangered
Peck's cave amphipod	*Stygobromus pecki*	Endangered
San Marcos salamander	*Eurycea nana*	Threatened
Texas blind salamander	*Eurycea rathbuni*	Endangered
Texas wild-rice	*Zizania texana*	Endangered
Submerged Aquatic Vegetation Species for Fountain Darter Habitat		
Carolina fanwort (or Cabomba)	*Cabomba caroliniana*	
Creeping primrose-willow	*Ludwigia repens*	
Delta arrowhead	*Sagittaria platyphylla*	
Potamogeton (or Illinois pondweed)	*Potamogeton illinoensis*	
Mosses, liverworts, and allies	Bryophytes[a]	
Texas wild-rice	*Zizania texana*[b]	
Water celery	*Vallisneria americana*[a]	
Whorled pennywort	*Hydrocotyle verticillata*[b]	
Grassleaf mudplantain	*Heteranthera dubia*	
Hygrophila (or Indian swampweed)	*Hygrophila polysperma*[a]	
Non-Native Animal Species Removed or Monitored		

Giant ramshorn snail	*Marisa cornuarietis*
Nutria	*Myocastor coypus*
Red-rimmed melania	*Melanoides tuberculata*
Suckermouth armored catfishes (suckermouth and sailfin)	Loricariidae: *Hypostomus Plecostomus* and *Pterygoplichthys* spp.
Tilapia (or blue tilapia)	*Oreochromis* spp.
Zebra mussels	*Dreissena polymorpha*
Non-Native Plant Species Removed or Monitored	
Chinaberry	*Melia azedarach*
Chinese privet	*Ligustrum sinense*
Chinese tallow	*Triadica sebifera*
Elephant ear (or coco yam, or taro)	*Colocasia esculenta*
Giant reed	*Arundo donax*
Hydrilla (or water thyme)	*Hydrilla verticillata*
Hygrophila (or Indian swampweed)	*Hygrophila polysperma*
Japanese honeysuckle	*Lonicera japonica*
Japanese privet (or Japanese ligustrum)	*Ligustrum japonicum*
Tapegrass (or eelgrass)	*Vallisneria spiralis*
Water hyacinth	*Eichhornia crassipes or Pontederia crassipes*
Water lettuce	*Pistia stratiotes*
Water sprite	*Ceratopteris thalictroides*
Watercress	*Nasturtium officinale*
White mulberry	*Morus alba*

[a] These species occur as habitat for the fountain darter in the Comal Springs System only.

[b] These species occur as habitat for the fountain darter in the San Marcos Springs System only.

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U.S. Fish and Wildlife Service. 2019. *Amendment 1, Recovery Plan for Zizania texana (Texas wild-rice), fountain darter (Etheostoma fonticola) and Texas blind salamander (Eurycea rathbuni)*. Recovery Plan Amendment 1, provided delisting criteria for the endangered listed species, but excluded delisting criteria for the San Marcos salamander. Prepared by USFWS Ausin Ecological Services Field Office.

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received by November 12, 2024. Prepared by USFWS Ausin Ecological Services Field Office.

APPENDIX A: Subcommittee Charge

Conservation Measures Subcommittee Charge

The Edwards Aquifer Habitat Conservation Plan (EAHCP) is in the process of renewing an Incidental Take Permit with the U.S. Fish and Wildlife Service. As part of that process, the existing components of the Habitat Conservation Plan (HCP) conservation strategy will be reassessed, new elements recommended, and modifications discussed. As a required component of HCPs, Conservation Measures describe specific actions that Permittees will implement to achieve biological objectives in support of the biological goals.

The purpose of this Subcommittee is to review and discuss the Conservation Measures that should be considered for inclusion in the next EAHCP.

Specifically, the Subcommittee will:

- Elect a Chair of the Subcommittee.
- Review the HCP Handbook as it pertains to Conservation Measure purpose and structure.
- Receive an overview of the Biological Goals and Biological Objectives Subcommittee recommendations.
- Use the best available science and knowledge of the current HCP experience to determine the needed Conservation Measures.
- Review the current EAHCP Conservation Measures (EAHCP § 5.0).
- Consider the effects of climate change and other potential variables relative to the proposed HCP period.
- Review and provide feedback on draft Conservation Measures developed and provided by EAHCP staff.
- Finalize and approve Conservation Measure recommendations to be provided to the EAHCP Implementing Committee before submission to the EAHCP Permit Renewal contractor (ICF).

Membership:

- Texas State University: *Represented by Kimberly Meitzen*
- City of San Marcos: *Represented by Mark Enders*
- City of New Braunfels: *Represented by Phillip Quast*
- San Antonio Water System: *Represented by Linda Bevis*
- Edwards Aquifer Authority: *Represented by Marc Friberg*
- Guadalupe-Blanco River Authority: *Represented by Daniel Large*
- EAHCP Stakeholder Committee Member (Bexar County Interest): *Kerim Jacaman*

- EAHCP Stakeholder Committee Member (Recreational Interest)*: Melani Howard*
- EAHCP Stakeholder Committee Member (Agricultural Interest)*: Adam Yablonski*
- EAHCP Stakeholder Committee Member (Environmental Interest)*: Myron Hess*

Subcommittee Organization:

The Conservation Measures Subcommittee is authorized to meet through virtual means, or any combination of virtual and in-person meetings, and to finalize previously discussed drafts through email communications.

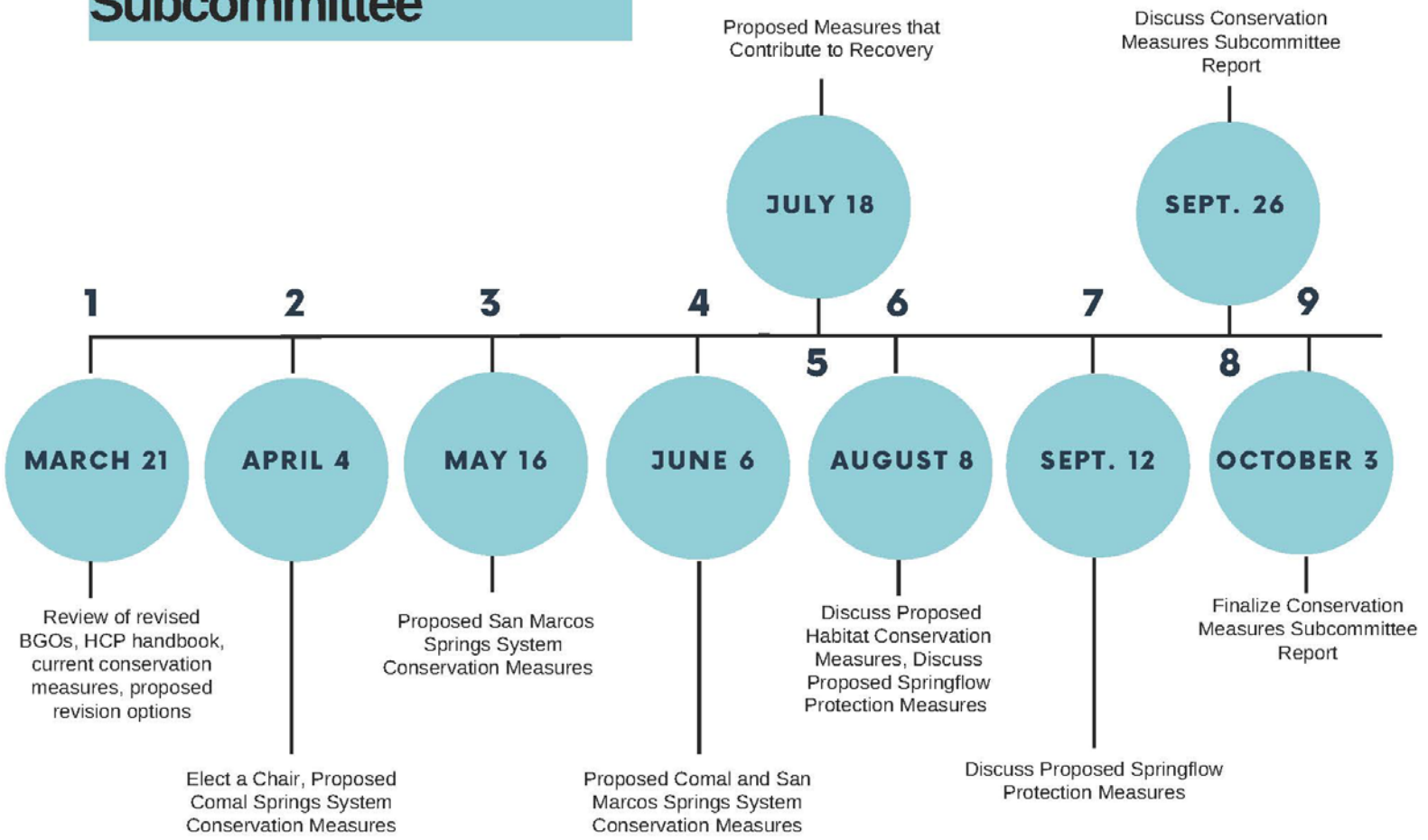
The Subcommittee shall strive to achieve consensus on its recommendations, but, if consensus cannot be achieved by the October 10, 2024 deadline, despite the Subcommittee's best efforts, the recommendations and report may be approved by a 75% vote of the full Subcommittee as long as any member dissenting from approval is provided a reasonable opportunity to provide a succinct summary of the objections to the recommendations, which shall be included in the report.

The purpose of the October 10, 2024, deadline is to finalize a report that can be submitted to the Permit Renewal Contractor prior to the start of the Contractor's preliminary analysis of the EAHCP Conservation Strategy.

APPENDIX B: Subcommittee Timeline

TIMELINE

Conservation Measures Subcommittee



Revised: July 2024

APPENDIX C: Subcommittee Agendas

Conservation Measures Subcommittee

Meeting #1 Agenda

March 21, 2024

1. Call to Order
2. Public Comment
3. Subcommittee member introductions and confirm attendance.
4. Overview of the Conservation Measures Subcommittee Charge.
5. Elect a chair of the Conservation Measures Subcommittee.
   a. Coordinate with EAHCP staff on meeting agendas.
   b. Moderate subcommittee meetings.
6. Overview of the revised Biological Goals and Biological Objectives.
7. Presentation on the USFWS Habitat Conservation Planning and Incidental Take Permit Processing Handbook – Chapter 9.3: Conservation Measures.
8. Examples of Conservation Measures from other HCPs.
9. Proposed plans to revise current Conservation Measures.
10. Public Comment
11. Future meetings
12. Adjourn

Conservation Measures Subcommittee

Meeting #2 Agenda

April 4, 2024

1. Call to Order
2. Public Comment
3. **Action Item:** Elect a Chair of the Subcommittee.
4. Conservation Measures Subcommittee Timeline.
5. Overview of Meeting #1 discussion.
6. Discuss proposed revisions to Conservation Measures implemented in the Comal Springs System.
7. Public Comment
8. Future meetings
9. Adjourn

Conservation Measures Subcommittee

Meeting #3 Agenda

May 16, 2024

1. Call to Order

2. Public Comment

3. Review of revised Comal Springs System Conservation Measures.

4. Discuss proposed revisions to Conservation Measures implemented in the Comal Springs System.

5. Discuss proposed revisions to Conservation Measures implemented in the San Marcos Springs System – Part 1.

6. Public Comment

7. Future meetings

8. Adjourn

Conservation Measures Subcommittee

Meeting #4

June 6, 2024

1. Call to Order
2. Public Comment
3. Action Item: Approve additional Conservation Measures Subcommittee meetings.
   a. Thursday, July 18, 2024 – EAA
   b. Thursday, September 26, 2024 – EAA
4. Discuss proposed revisions to Conservation Measures implemented in the Comal Springs System.
5. Discuss proposed revisions to Conservation Measures implemented in the San Marcos Springs System.
6. Next Steps: Structure and Timeline.
7. Public Comment
8. Future meetings
9. Adjourn

Conservation Measures Subcommittee

Meeting #5

July 18, 2024

1. Call to Order
2. Public Comment
3. Overview of the revised Habitat Conservation Measures for the Comal and San Marcos Springs Systems.
4. Discuss proposed revisions to the Measures that Contribute to Recovery.
5. Next Steps
6. Public Comment
7. Future meetings
8. Adjourn

Conservation Measures Subcommittee

Meeting #6

August 8, 2024

1. Call to Order
2. Public Comment
3. Discuss revisions to the proposed Habitat Conservation Measures
4. Discuss revisions to the proposed Measures that Contribute to Recovery
5. Discuss the proposed Springflow Protection Measures
6. Next Steps
7. Public Comment
8. Future meetings
9. Adjourn

Conservation Measures Subcommittee

Meeting #7

September 12, 2024

1. Call to Order
2. Public Comment
3. Discuss revisions to the draft Subcommittee Report
4. Discuss revisions to the Springflow Protection Measures
5. Next Steps
6. Public Comment
7. Future meetings
8. Adjourn

Conservation Measures Subcommittee

Meeting #8

September 26, 2024

1. Call to Order
2. Public Comment
3. Discuss revisions to the draft Subcommittee Report
4. Next Steps
5. Public Comment
6. Future meetings
7. Adjourn

Microsoft Teams:

https://teams.microsoft.com/l/meetup-join/19%3ameeting_NzNjODIwZGQtZjYwOS00ZGZkLTliZTUtYWZhYWZlZjVhM2M5%40thread.v2/0?context=%7b%22Tid%22%3a%225c22012b-e3bb-4a79-903b-5ca9e5027fc5%22%2c%22Oid%22%3a%22e9955ed4-4fd4-4c80-8c5f-0d2258895b13%22%7d
Meeting ID: 230 540 823 050
Passcode: jBcPnZ

Dial in by phone
Phone: 210-729-0064
Conference ID: 119 019 075#

Conservation Measures Subcommittee

Meeting #9

September 26, 2024

1. Call to Order
2. Public Comment
3. Discuss final revisions to the draft Subcommittee Report
4. Action Item: Consider staff recommendation to approve the Conservation Measures Subcommittee Report and submittal to EAHCP Implementing Committee and Permit Renewal Contractor, ICF.
5. Public Comment
6. Adjourn

Microsoft Teams:

https://teams.microsoft.com/l/meetup-join/19%3ameeting_MDZjZWM0ZWMtYTM2MS00OGMzLTgzOWMtMzA3Y2E1ZTM1N2Jk%40thread.v2/0?context=%7b%22Tid%22%3a%225c22012b-e3bb-4a79-903b-5ca9e5027fc5%22%2c%22Oid%22%3a%22e9955ed4-4fd4-4c80-8c5f-0d2258895b13%22%7d
Meeting ID: 250 014 811 540
Passcode: DjhqVm

Dial in by phone
Phone: 1-210-729-0064
Conference ID: 389 643 401#

Appendix M4 | **Stakeholder Committee**

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Stakeholder Committee

Thursday, February 1, 2024 **10:00 AM** **Pauline Espinosa Community Hall & Microsoft Teams**

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. Approval of Minutes

3.1 December 14, 2023 Meeting Minutes

4. Reports

4.1 Receive report from Mike Warriner, USFWS Supervisory Biologist and Listing and Recovery Branch Supervisor, on the toothless blindcat and widemouth blindcat proposed ESA listings.

4.2 Receive report from Mike Warriner, USFWS Supervisory Biologist and Listing and Recovery Branch Supervisor, on the delisting of the San Marcos gambusia, recovery plans, 5-year reviews and other Species Status Assessments.

5. Future Meetings

6. Questions from the Public

7. 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, February 1, 2024 **10:00 AM Pauline Espinosa Community Hall & Microsoft Teams**

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

Chairperson Dr. Kimberly Meitzen called the meeting to order at 10:05 A.M. Committee Members present: Melani Howard, Javier Hernandez, Bruce Alexander, Buck Benson, Ryan Kelso, John Byrum, James Dodson, Doris Cooksey, Kerim Jacaman, Jennifer Walker, Cindy Hooper, Mark Enders, David Villarreal, Kevin Mayes, Jason Ammermann, Shaun Donovan, Gary Middleton, Ray Joy Pfannstiel, Patrick Shriver, Jana Gray, Rachel Sanborn and Carol Patterson.

Dr. Meitzen introduced the new DOW Chemical Representative, Jason Ammerman, to the Stakeholder Committee.

2. Public Comment

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

3. Approval of Minutes

3.1

December 14, 2023 Meeting Minutes

A motion was made by Kevin Mayes, seconded by Rachel Sanborn, to approve the meeting minutes from the December 14, 2023, Stakeholder Committee meeting. There were no objections.

4. Reports

4.1 **Receive report from Mike Warriner, USFWS Supervisory Biologist and Listing and Recovery Branch Supervisor, on the toothless blindcat and widemouth blindcat proposed ESA listings.**

Mike Warriner, USFWS Supervisory Biologist and Listing and Recovery Branch Supervisor, provided a federal status timeline for listing species as well as the USFWS listing and recovery work plan updates.

4.2 **Receive report from Mike Warriner, USFWS Supervisory Biologist and Listing and Recovery Branch Supervisor, on the delisting of the San Marcos gambusia, recovery plans, 5-year reviews and other Species Status Assessments.**

Mike Warriner, USFWS Supervisory Biologist and Listing and Recovery Branch Supervisor, provided an overview timeline of the delisting of the San Marcos gambusia and noted the updated revised recovery plan for the Southern Edwards Aquifer Springs and associated aquatic ecosystems will be made available for review and comment in fiscal year 2024.

5. Future Meetings

The next Stakeholder Committee meeting will be held on March 28, 2024

6. Questions from the Public

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

7. Adjourn

There being no further business to discuss, the meeting adjourned at 10:56 A.M.

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, Stakeholder Committee

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Stakeholder Committee

Thursday, July 25, 2024 **10:00 AM** **Edwards Aquifer Authority & Microsoft Teams**

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. Approval of Minutes

3.1
- **February 1, 2024**

4. EAHCP Program Announcement

5. Reports

5.1 **Receive report from Olivia Lopez, HCP Coordinator, on the Conservation Measures Subcommittee.**

5.2 **Receive report from Scott Storment, EAHCP Program Manager, on the ITP permit renewal process.**

6. Individual Consideration

6.1 **Receive report from Dr. Kimberly Meitzen, Stakeholder Committee Chair, regarding the Science Committee member vacancy and consider recommendation to convene the Science Committee Vacancy Work Group 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, July 25, 2024 **10:00 AM** **Edwards Aquifer Authority & Microsoft Teams**

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

Chairperson Dr. Kimberly Meitzen called the meeting to order at 10:00 A.M. Committee Members present: Melani Howard, Javier Hernandez, Bruce Alexander, Buck Benson, Michael Short, John Byrum, Doris Cooksey, Phillip Quast, Adam Yablonski, Kerim Jacaman, Myron Hess, Cindy Hooper, Mark Enders, David Villarreal, Kevin Mayes, Shaun Donovan, Gary Middleton, Carol Patterson, Ray Joy Pfannstiel, Patrick Shriver, Nathan Pence, and Rachel Sanborn.

2. Public Comment

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

3. Approval of Minutes

3.1

- **February 1, 2024**

Carol Patterson made a motion to approve the revised February 1, 2024, meeting minutes to include her presence in the call to order. Myron Hess seconded the motion. The meeting minutes, as revised, were approved without objection.

4. EAHCP Program Announcement

Dr. Chad Furl and Kristy Smith provided the hydrologic update.

5. Reports

5.1 **Receive report from Olivia Lopez, HCP Coordinator, on the Conservation Measures Subcommittee.**

Olivia Lopez, EAHCP Coordinator, updated the Committee on the progress of the Conservation Measures Subcommittee. To date, this Subcommittee has held six meetings. The meeting calendar and meeting materials are available online at: www.edwardsaquifer.org/habitat-conservation-plan/administration/work-groups-and-subcommittees/conservation-measures-subcommittee/.

5.2 **Receive report from Scott Storment, EAHCP Program Manager, on the ITP permit renewal process.**

Scott Storment, EAHCP Program Manager, provided an update on the ITP permit renewal process. The current ITP expires on March 31, 2028, and is in the second phase of its four-phase process.

6. Individual Consideration

6.1 **Receive report from Dr. Kimberly Meitzen, Stakeholder Committee Chair, regarding the Science Committee member vacancy and consider recommendation to convene the Science Committee Vacancy Work Group to review nominations for the Stakeholder Committee appointee to the Science Committee.**

A motion was made by Mark Enders, seconded by Myron Hess, to approve the Science Committee Vacancy Work Group and adopt the updated Work Group Charge to review nominations for the Stakeholder Committee appointee to the Science Committee.

7. Future Meetings

The next meeting of the Stakeholder Committee will be held on December 19, 2024.

8. Questions from the Public

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

9. Adjourn

There being no further business to discuss, the meeting adjourned at 11:02 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
LINDA BEVIS
Secretary, San Antonio Water System

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Stakeholder Committee

Thursday, December 19, 2024 | **10:00 AM** | **EAA Board Room and Microsoft Teams**

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

4. Approval of Minutes

4.1 July 25, 2024, meeting minutes

5. Reports

5.1 **Receive report from Olivia Lopez, EAHCP Coordinator, on the National HCP Coalition's Annual Meeting.**

5.2 **Receive report from BIOWEST, Inc. and U.S. Fish and Wildlife Service staff on Comal Springs Riffle Beetle research.**

5.3 **Receive report from Dr. Chad Furl, EAHCP Chief Science Officer, on the San Marcos Salamander research.**

6. Individual Consideration

6.1 **Consider recommendation from EAHCP 2024 Science Committee Vacancy Work Group's recommendation to approve the nomination of Dr. Joshua Perkin to the EAHCP Science Committee.**

6.2 **Election of 2025 Stakeholder Committee officers.**

7. Future Meetings

7.1 2025 EAHCP Committee Meeting Calendar

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, December 19, 2024 | **10:00 AM** | **EAA Board Room and Microsoft Teams**

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

Chairperson Dr. Kimberly Meitzen called the meeting to order at 10:03 A.M. Committee Members present: Melani Howard, Javier Hernandez, Bruce Alexander, Buck Benson, Michael Short, Doris Cooksey, James Dodson, Phillip Quast, Adam Yablonski, Kerim Jacaman, Myron Hess, Cindy Hooper, Mark Enders, David Villarreal, Kevin Mayes, Jason Ammermann, Shaun Donovan, Gary Middleton, Ray Joy Pfannstiel, Linda Bevis, Nathan Pence, and Rachel Sanborn.

2. Public Comment

Phillip Quast, City of New Braunfels, informed the Committee on the flow decrease event that occurred at the Old Channel of the Comal River.

3. EAHCP Program Manager Announcements

Scott Storment announced the departure and retirement of Doris Cooksey, CPS Energy, from the Stakeholder Committee and David Britton's retirement from USFWS.

4. Approval of Minutes

4.1

July 25, 2024, meeting minutes

Attachments: Stakeholder Committee Meeting_July 25.2024_MeetingMinutes_unsigned

A motion was made by Myron Hess, seconded by Mark Enders, to approve the meeting minutes from the July 25, 2024, Stakeholder Committee meeting. There were no objections.

5. Reports

5.1 **Receive report from Olivia Lopez, EAHCP Coordinator, on the National HCP Coalition's Annual Meeting.**

Olivia Lopez, EAHCP Coordinator II, provided a recap of the National HCP Coalition's

Annual Meeting held in Palm Springs, California.

5.2 Receive report from BIOWEST, Inc. and U.S. Fish and Wildlife Service staff on Comal Springs Riffle Beetle research.

Mathew Pintar, BIO-WEST, Inc. presented on the Comal Springs Riffle Beetle Population Assessment study summary and synopsis results. Dr. Katie Bockrath, USFWS, presented on Genetic Assessment of Comal Springs Riffle Beetles.

5.3 Receive report from Dr. Chad Furl, EAHCP Chief Science Officer, on the San Marcos Salamander research.

Dr. Chad Furl, EAHCP Chief Science Officer, presented on the EAHCP applied research for the San Marcos Salamander Monitoring Study.

6. Individual Consideration

6.1 Consider recommendation from EAHCP 2024 Science Committee Vacancy Work Group's recommendation to approve the nomination of Dr. Joshua Perkin to the EAHCP Science Committee.

Attachments: SC Vacancy Work Group Report Final 2024

A motion was made by Melani Howard, seconded by Rachel Sanborn, to approve the nomination of Dr. Josh Perkin to the EAHCP Science Committee. There were no objections.

6.2 Election of 2025 Stakeholder Committee officers.

Attachments: EAHCP-Stakeholder-Committee-Operational-Rules-2022

A motion was made by Mark Enders, seconded by Melani Howard, to elect by acclimation Kimberly Meitzen, Myron Hess, and Patrick Shriver as the 2025 Stakeholder Committee Chair, Vice-Chair, and Secretary, respectively. There were no objections.

7. Future Meetings

7.1 2025 EAHCP Committee Meeting Calendar

Attachments: 2025 EAHCP Committee Meeting Calendar

The next Stakeholder Committee meeting will be on Thursday, February 6 at 10:00 AM at the Pauline Espinosa Community Center in San Marcos, Tx.

8. Questions from the Public

There were no citizens who requested to address the committee.

9. Adjourn

There being no further business to discuss, the meeting adjourned at 11:17 AM.

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).

Linda Bevis

Patrick Shriver
Secretary, EAHCP Stakeholder Committee

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

Edwards Aquifer Habitat Conservation Plan

Report of the 2024 Science Committee Vacancy Work Group

September 19, 2024

Overview

The Edwards Aquifer Habitat Conservation Plan (EAHCP) Program Adaptive Management Stakeholder Committee (SH) approved the creation of the Science Committee Vacancy Work Group at their meeting on March 24, 2022. An updated charge for the Work Group was subsequently approved by the SH at their meeting on July 25, 2024.

The Work Group was established to address a vacancy in the Adaptive Management Science Committee (SC). The SC comprises members with technical expertise in the Edwards Aquifer, the Comal or San Marcos springs systems, or the Covered Species, as outlined in the EAHCP Funding and Management Agreement (§ 7.9). The EAHCP Implementing Committee (IC) and SH each select an equal number of members for the SC, with one additional member selected jointly. The SC vacancy arose due to the resignation of Megan Bean, who was appointed by the Stakeholder Committee. Mrs. Bean, previously with the Texas Parks and Wildlife Department, accepted a position with the U.S. Fish and Wildlife Service, where she will be involved in the Service's ongoing oversight responsibilities for the EAHCP.

Beginning in August 2024, EAHCP staff solicited recommendations from members of the EAHCP Science, Stakeholder, and Implementing committees. A final call for nominations was made prior to the Work Group meeting on August 29, 2024.

Charge of the Science Committee Vacancy Work Group

The Work Group was charged with reviewing nominations to fill the vacancy 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 the vacancy. See **Appendix A** – 2024 Science Committee Vacancy Work Group Charge.

Members of the Science Committee Vacancy Work Group

Members of the Work Group met August 29, 2024, to discuss a nomination submitted for consideration to fill the SC vacancy. 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 2024 Work Group are:

- Kevin Mayes – Texas Parks and Wildlife Department
- Rachel Sanborn – San Marcos River Foundation
- Dr. Kimberly Meitzen – Texas State University
- Patrick Shriver – San Antonio Water System
- Shaun Donovan – San Antonio River Authority

The nominations and a summary of the Work Group's discussion follows.

Nominations to the Science Committee Vacancy Work Group

The Work Group received a single nomination – Dr. Joshuah Perkin, Ph.D., an Associate Professor in the Department of Ecology and Conservation at Texas A&M University. Dr. Perkin's research and teaching specialize in freshwater fish ecology and native species conservation. For more details on his qualifications, please refer to his curriculum vitae in **Appendix E.**

Discussion of the Science Committee Vacancy Work Group

The Work Group was reminded of the Science Committee's responsibilities and the expertise of its current members, with a focus on finding a replacement for Megan Bean, a fish conservation expert with the Texas Parks and Wildlife Department. Dr. Joshuah Perkin, a native fish conservation expert and Associate Professor at Texas A&M University, was the sole nominee received for the vacant position. His educational background, expertise in fisheries biology, familiarity with the San Marcos River system, and willingness to serve were presented to the Work Group. Dr. Kimberly Meitzen praised Dr. Perkin as an excellent addition to the committee, highlighting his relevant expertise and research contributions. Kevin Mayes, who has closely collaborated with Dr. Perkin through contracted research and publications, fully endorsed his nomination. Patrick Shriver expressed concerns about the single nomination and potential biases due to personal relationships, stressing the need for independence and impartiality. Mr. Mayes attested to Dr. Perkin's independence in his research and professional roles, and Shaun Donovan supported this by sharing positive experiences working with Dr. Perkin at the San Antonio River Authority.

Recommendations of the Science Committee Vacancy Work Group

The Work Group recommends, by consensus, that the SH appoints Dr. Joshuah Perkin to the Science Committee.

Appendix A

2024 Science Committee Vacancy Work Group Charge

2024 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 the resignation of Megan Bean, for one of the positions appointed by the Stakeholder Committee. Megan, who previously worked for the Texas Parks and Wildlife Department and has extensive knowledge of the biology and ecology of fishes, has taken a position with the U.S. Fish and Wildlife Service and will be involved in the Service's ongoing oversight responsibilities for the EAHCP.

Work Group Membership: TBD following Stakeholder Committee discussion on July 25th, 2024, goal of at least five members including the Work Group chair.

- Kevin Mayes – Texas Parks and Wildlife
- Rachel Sanborn – San Marcos River Foundation
- Kimberly Meitzen – Texas State University
- Patrick Shriver – San Antonio Water System
- Shaun Donovan – San Antonio River Authority

Charge: The Work Group is charged with reviewing nominations to fill the vacancy for a Stakeholder-Committee-appointed position on the Science Committee and with presenting a recommendation to the Stakeholder Committee at the December 19, 2024, meeting for filling the vacancy. Anyone can submit a nomination by providing relevant information about the nominee, including contact information and confirmation of the nominee's willingness to serve, to EAHCP staff, preferably by August 23rd, 2024. We are tentatively planning for a virtual meeting of this Work Group the week of August 26th-30th to discuss nominations and recommend a specific nominee.

Term: The term of membership on the Work Group is initially set to extend until the end of the Stakeholder Committee meeting held on December 19, 2024.

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 July 25, 2024.

Approved by the Stakeholder Committee on July 25, 2024

Appendix B

2024 Science Committee Vacancy Work Group Agenda

Science Committee Vacancy Work Group

Agenda

August 29, 2024

Microsoft Teams Link

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 nomination(s) to the Science Committee or consider additional meeting to discuss nominations.
5. Next Steps.
6. Public Comment.
7. Future meetings: TBD
8. Adjourn.

Appendix C

2024 Science Committee Vacancy Work Group Presentation

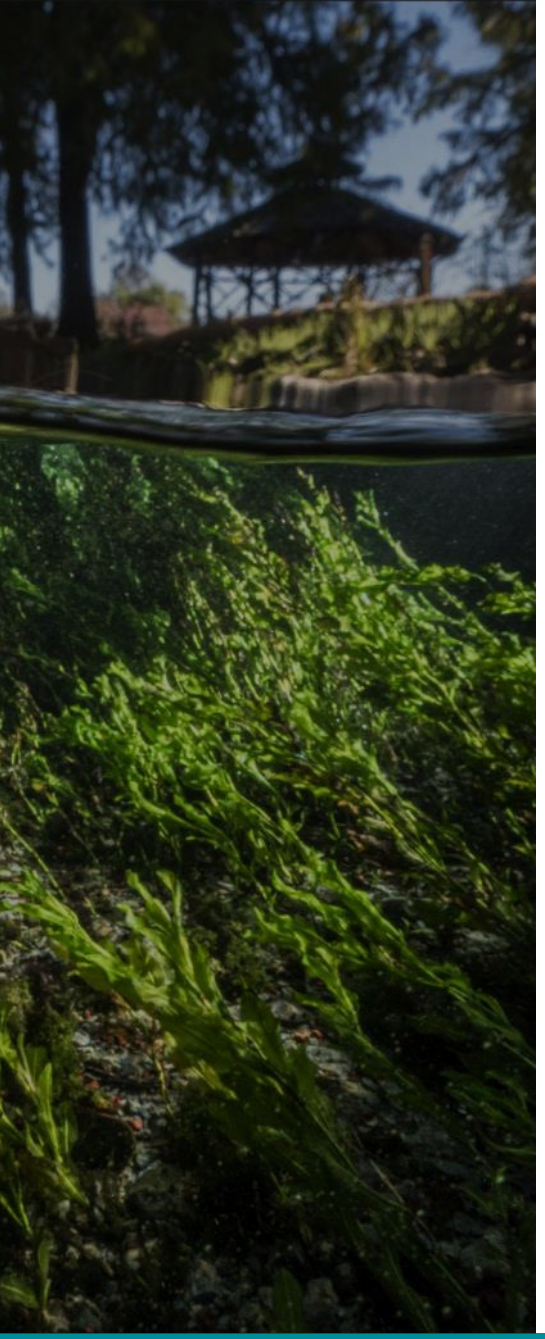
Science Committee Vacancy Work Group

August 29, 2024

Microsoft Teams

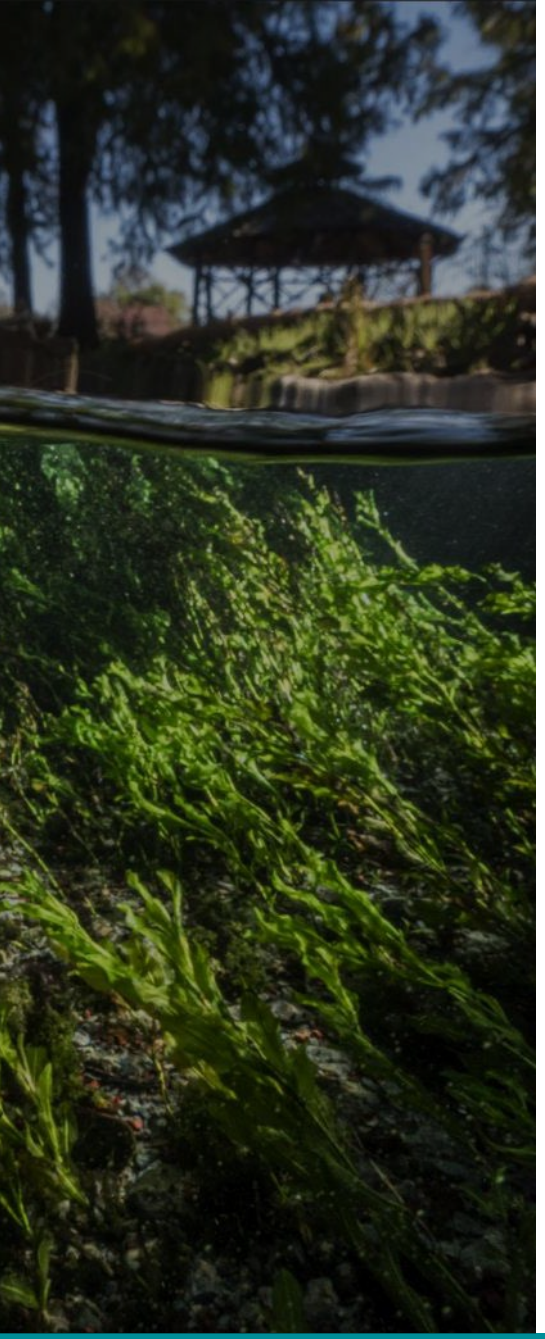
This meeting is being recorded

EAHCP
EDWARDS AQUIFER
HABITAT CONSERVATION PLAN



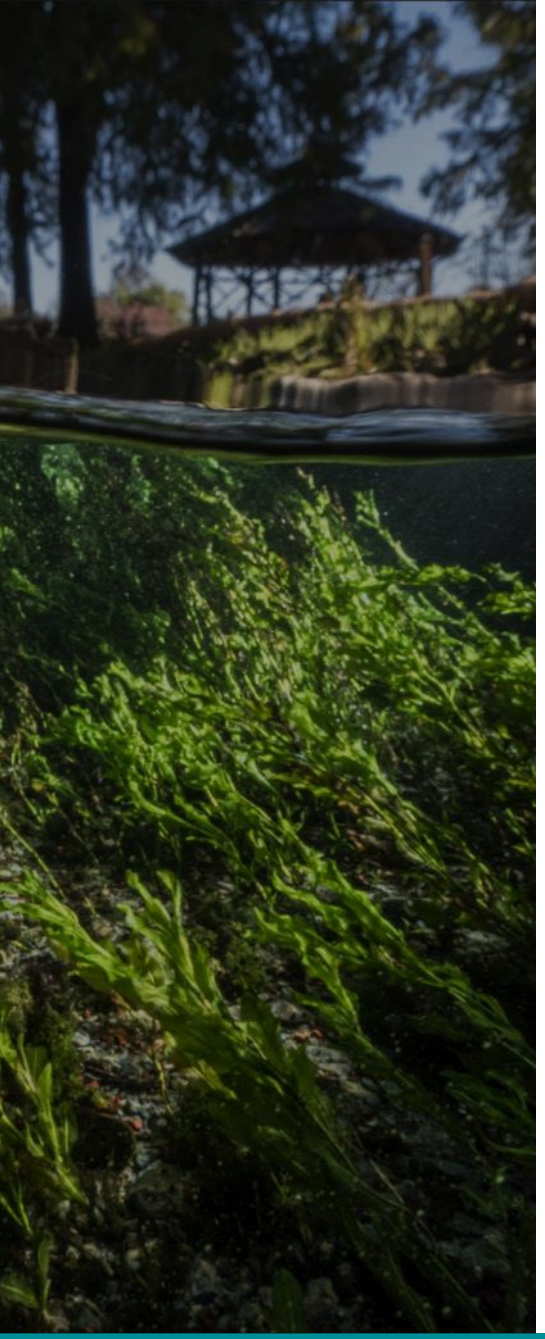
Science Committee Vacancy Work Group

- Call to order:
- Roll Call:
  - Kevin Mayes – TPWD
  - Rachel Sanborn – SMRF
  - Kimberly Meitzen – TXST
  - Patrick Shriver – SAWS
  - Shaun Donovan - SARA



Charge

- The Work Group is charged with reviewing nominations to fill the vacancy for a Stakeholder Committee-appointed position on the Science Committee and with presenting a recommendation to the Stakeholder Committee at the December 19, 2024, meeting for filling the vacancy.



Term and Procedure

Term: The term of membership on the Work Group is initially set to extend until the end of the Stakeholder Committee meeting held on December 19, 2024.

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 July 25, 2024.

FMA § 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.

FMA § 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.

The Science Committee's role is to:

- Consult with, advise and make recommendations to the Program Manager, the Implementing Committee and the Stakeholder Committee on any Adaptive Management Process (AMP) Decision upon request.
- 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.

Current Science Committee Members and Expertise

- Jason Martina – Aquatic Macrophytes
- Tom Arsuffi – Stream Ecology
- Jacquelyn Duke – Riparian Ecology
- Conrad Lamon – Environmental Statistics
- Butch Weckerly – Environmental Statistics
- Nathan Bendik – Central Texas Salamanders
- Janis Bush – Biological Diversity and Sustainability
- Charlie Kreitler – Hydrogeology
- Chad Norris – Macroinvertebrates/Spring Systems
- Jack Sharp - Hydrogeology

Nominee – Dr. Josh Perkin

- Education:
  - Ph.D. Kansas State University, Biology, 2012
  - M.S. Texas State University, Aquatic Resources, 2009
  - B.S. Texas State University, Aquatic Biology, 2006
- Current Position:
  - Associate Professor
  - Department of Ecology and Conservation Biology, Texas A&M University

Nomination

- Science Committee Vacancy Work Group approval of final nomination(s) to the Science Committee or consider additional meeting to discuss nominations.

Next Steps

- Draft report and report approval.
- Stakeholder Committee Meeting – December 19th
- Comments from the public.
- Future Meetings: TBD
- Adjourn.


Questions?

Meeting Adjourned.

Appendix D

2024 Science Committee Vacancy Work Group Meeting Minutes

EAHCP

Science Committee Vacancy Work Group

Meeting Minutes

August 29, 2024

1. **Call to Order**

   The meeting was called to order by Olivia Lopez, EAHCP Coordinator, at 11:02 AM. Work Group members present: Rachel Sanborn, Kimberly Meitzen, Kevin Mayes, Shaun Donovan, and Patrick Shriver.

2. **Review of the Work Group Charge**

   Ms. Lopez summarized the work group charge to review the nomination to fill the vacancy and to present the recommendation to the Stakeholder Committee. The term of the work group extends through December 2024. To finalize the text of the work group report and/or approve meeting minutes, the work group is authorized to use email communications or individual conversations, including phone calls, instead of convening a formal meeting.

3. **Discussion of Nominations to the Science Committee**

   The work group was reminded of the responsibilities of the Science Committee and the expertise of the current members of the Science Committee. The vacant membership was previously held by Megan Bean, a fish conservation expert employed by the Texas Parks and Wildlife Department. Therefore, the Stakeholder Committee is seeking a fish conservation expert to fill the vacant position.

   Dr. Josh Perkin is a native fish conservation expert and was the sole nominee received by the Science Committee Vacancy Work Group for consideration. Information about his educational background and current position at Texas A&M University was presented to the work group as well as his willingness to serve on the Science Committee.

   Dr. Kimberly Meitzen commended Dr. Perkin as an excellent addition to the Science Committee, highlighting his expertise as a fisheries biologist, familiarity with the San Marcos River system, contributions to fish species research, and interest in contributing to habitat conservation.

   Kevin Mayes described his close working relationship with Dr. Perkin including contracted research and joint publications. He mentioned Dr. Perkin's experience with the Texas Parks and Wildlife Department and work at Texas A&M University. Mr. Mayes fully endorsed Dr. Perkin.

   Patrick Shriver raised concerns about having only one nomination and the potential for biases stemming from personal relationships. Although he acknowledged Dr. Perkin's impressive CV, Mr. Shriver emphasized the need for assurance regarding Dr. Perkin's ability to work independently and impartially. Mr. Mayes addressed these concerns by affirming

Dr. Perkin's demonstrated independence in his research and service on the Texas Parks and Wildlife Freshwater Fisheries Advisory Board. Shaun Donovan added that he had positive experiences working with Dr. Perkin on projects at the San Antonio River Authority.

4. **Science Committee Vacancy Work Group approval of final nomination(s) to the Science Committee or consider additional meeting to discuss nominations.**

   A motion was made by Dr. Kimberly Meitzen, seconded by Kevin Mayes, to approve Dr. Perkin as the Stakeholder Committee nomination to join the Science Committee. All members present voted in favor of the nomination. There were no objections.

5. **Next Steps**

   EAHCP staff will prepare a draft report and submit it to the Science Committee Vacancy Work Group for approval. Dr. Kimberly Meitzen will present the Work Group's recommended nomination at the Stakeholder Committee meeting on December 19, 2024. Additionally, EAHCP staff will notify Dr. Perkin about the upcoming Science Committee meeting and encourage his attendance. The next Science Committee meeting is scheduled for September 5, 2024.

6. **Public Comment**

   There were no citizens who requested to address the Science Committee Vacancy Work Group.

7. **Future Meetings**

   There are no future meetings scheduled for the Science Committee Vacancy Work Group.

8. **Adjournment**

   There being no further business to discuss, the meeting was adjourned at 11:27 AM.

Appendix E

Curriculum Vitae

CURRICULUM VITAE

August 2024

1. Personal information

Joshuah S. Perkin
Associate Professor
Department of Ecology and Conservation Biology
Texas A&M University, College Station, TX 77843-2258
Date of Appointment: September 2023

2. Education

Ph.D. Kansas State University, Biology, 2012
M.S. Texas State University, Aquatic Resources, 2009
B.S. Texas State University, Aquatic Biology, 2006

3. Professional experience

3.1 Current position

Associate Professor
September 2023-present
Department of Ecology and Conservation Biology, Texas A&M University

3.2 Current position description

Research: 60% Effort
The field of inquiry is freshwater fish ecology and conservation, aquatic landscape ecology, ecohydrology, and aquatic invasive species management.

Teaching: 30% Effort
Teaching responsibilities include an undergraduate course in fisheries management, a special topics writing intensive course for undergraduate students, and a graduate course in applied computer programming.

Service: 10% Effort
Service responsibilities include serving as the faculty sponsor for the Texas A&M University Student Subunit of the American Fisheries Society, chair of the Texas Chapter American Fisheries Society Student Outreach Committee, visiting associate editor for the North American Journal of Fisheries Management, and member of the American Fisheries Society Publication Overview Committee.

3.3 Former positions

Assistant Professor
2017-2023
Department of Ecology and Conservation Biology, Texas A&M University

Assistant Professor
2014-2017
Department of Biology, Tennessee Technological University

Postdoctoral Research Associate
2013-2014
Division of Biology, Kansas State University

4 Research

4.1 Peer-reviewed journal articles

[U] Indicates undergraduate student author and [G] Indicates graduate student author.

72. Santee[G], N.S., K.W. Conway, W.H. Nowlin, D. Smith, and **J.S. Perkin**. *In Press*. Alterations to water quality and quantity elicit similar stream fish functional trait responses in three North American rivers. Ecological Indicators.
71. Yancy[U], L.E., N.S. Santee[G], E.B. Parker[U], M.J. Madewell[U], F.E. Chavez[U], L.W. Stevens[U], J.P. Wolff[G], H. Evans[U], and **J.S. Perkin**. *In Press*. A framework for integrating stream ecosystem theories into spatial modelling of fish richness and assemblage structure. Freshwater Science.
70. Winemiller, K.O., **J.S. Perkin**, J. Trungale, D. Hoeinghaus, G. Moore, A. Schwalb, Z. Mitchell, A. Trimble, C. Reeves, H. Hardy, and D. Buzan. *In Press*. Advancing environmental flows science: Hindcasting and forecasting flow-ecology. Fisheries.
69. Elkins[G], L.C., M.R. Acre, M.G. Bean, S.M. Robertson, R. Smith, and **J.S. Perkin**. *In Press*. A multiscale perspective for improving conservation of Conchos Pupfish. Animal Conservation.
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67. Steffensmeier[G], Z.D., K.B. Mayes, and **J.S. Perkin**. 2024. Linking short-term movement rate of pelagic-broadcast spawning fishes to river fragment length and conservation status. Biological Conservation 293:110585.
66. Blanchard[G], R.C., S. Young, T.J. DeWitt, and **J.S. Perkin**. 2024. Predictability and conceptual repeatability of the predator associated burst speed ecophenotype in western mosquitofish (*Gambusia affinis*). Journal of Fish Biology 104:1276-1279.
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63. Shepta, E., **J.S. Perkin**. K.B. Mayes, C.M. Schalk, C.G. Montaña. 2023. The ecological niche of native and invasive fish congeners in Texas streams: Evidence from morphology, stable isotope analysis, and stomach contents analysis. Biological Invasions 25:3993-4008.
62. Evans[U], H.A., M.I. Booknis[U], N.S. Santee[G], R.D. Mangold[G], H.C. Roberts[G], J.P. Wolff[G], J.K. Ellard[G], D. Smith, and **J.S. Perkin**. 2023. Mesohabitat and macroecological correlates for blue sucker (*Cycleptus elongatus*) occurrence in regulated rivers. River Research and Applications 39:2102-2109.
61. Perkin, J.S., S.K. Brewer, A.A. Echelle, and P.M. Kocovsky. 2023. Avoiding a macabre future for Macrhybopsis - A special section on improving management and conservation of chubs. North American Journal of Fisheries Management 43:1145-1150.
60. Perkin, J.S., P. Kocovsky, Z.D. Steffensmeier[G], and G.B. Gido. 2023. Why are larger fish farther upstream? Testing multiple hypotheses using Silver Chub (*Macrhybopsis storeriana*) in two Midwestern United States riverscapes. North American Journal of Fisheries Management 43:1225-1245.
59. Nguyen[G], E., K.B. Mayes, R. Smith, J.F. Trungale, and **J.S. Perkin**. 2023. The duality of drought: Pelagic- and benthic-spawning stream fishes show opposing responses to drought in the southern Great Plains. North American Journal of Fisheries Management 43:1276-1293.
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55. Troia, M.J, and J.S. Perkin. 2022. Can fisheries bioenergetics modelling refine spatially explicit assessments of climate change vulnerability? Conservation Physiology 10(1):coac035
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53. Best, A., **J.S. Perkin**, A.K. Pinion[G], H. Binkley[U], and K.W. Conway. 2022. First record of the Gangetic Swamp Eel, *Ophichthys cuchia* (Hamilton, 1822)(Teleostei: Synbranchidae), from Texas (USA) based on museum vouchered material, and confirmation of a second established non-native population in the USA. Check List 18:475-482.
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51. Steffensmeier[G], Z.D., M. Wedgeworth, L.E. Yancy, N.S. Santee, S.K. Brewer, **J.S. Perkin**. 2022. Paradigm versus paradox on the prairie: Testing competing stream fish movement frameworks using an imperiled Great Plains minnow. Movement Ecology 10:8.
50. Malone[G], E.W., **J.S. Perkin**, W.K. Gibbs, M. Padgett, M.A. Kulp, and S. Moore. 2022. High and dry in days gone by: Life history theory predicts Appalachian Mountain stream fish assemblage transformation during historical drought. Ecology of Freshwater Fish 31:29-44.
49. **Perkin, J.S.**, M.J. Trioa, M.R. Acre. 2021. Conservation status of native fishes in the Chihuahuan Desert region of the United States: A spatial perspective. Proceedings of the Desert Fishes Council Special Publication 2021:77-101.
48. Mollenhauer, R., S.K. Brewer, **J.S. Perkin**, D. Swedberg, M. Wedgeworth, Z.D. Steffensmeier[G]. 2021. Connectivity and flow regime direct conservation priorities for pelagophil fishes. Aquatic Conservation: Marine and Freshwater Ecosystems 31(11):3215-3227.
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41. **Perkin, J.S.**, M.R. Acre, J. Graham, K. Hoenke. 2020. An integrative conservation planning framework for aquatic landscapes fragmented by road-stream crossings. Landscape and Urban Planning 202:103860.
40. Blanton[U], C.S., **J.S. Perkin**, N. Menchaca, K.A. Kollaus. 2020. A gap in the armor: Spearfishing reduces biomass of invasive suckermouth armored catfish. Fisheries 45:293-302.
39. **Perkin, J.S.**, K.W. Gibbs, J. Ridgway[G], S.B. Cook. 2019. Riverscape correlates for distribution of threatened spotfin chub (*Erimonax monachus*) in the Tennessee River Basin, USA. Endangered Species Research 40:91-105.
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36. **Perkin, J.S.**, S. Murphy[U], C.M. Murray, W.K. Gibbs, A.E. Gebhard[G]. 2019. If you build it, they will go: A case study of stream fish diversity loss in an urbanizing riverscape. Aquatic Conservation: Marine and Freshwater Ecosystems 29:623-638.
35. Wellemeyer[G], J.C., **J.S. Perkin**, M.L. Jameson, K.H. Costigan, R. Waters. 2019. Hierarchy theory reveals multiscale predictors of Arkansas Darter (*Etheostoma cragini*) abundance in a Great Plains riverscape. Freshwater Biology 64:659-670.
34. McManamay, R.A., **J.S. Perkin**, and H. Jager. 2019. Commonalities in stream connectivity restoration alternatives: An attempt to simplify barrier removal optimization. Ecosphere 10(2):1-25.
33. Pinion[G], A.K., S.D. George[G], **J.S. Perkin**, K.W. Conway. 2018. First record of the Conchos Shiner *Cyprinella panarcys* (Hubbs & Miller, 1978) from the mainstem of the Rio Grande along the US-México Border. Check List 14:1123-1129.
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22. Wells[G], W.G., T.C. Johnson[G], A.E. Gebhard[G], R.T.R. Paine[G], L.A. Hix[G], H.N. Ferrel[G], A.N. Engle[G], and **J.S. Perkin**. 2017. March of the sculpin: measuring and predicting short-term movement of Banded Sculpin *Cottus carolinae*. Ecology of Freshwater Fish 26:280-291.
21. Pennock[G], C.A., K.B. Gido, **J.S. Perkin**, V.D. Weaver. 2017. Collapsing Range of an Endemic Great Plains Minnow, Peppered Chub *Macrhybopsis tetranema*. American Midland Naturalist 177:57-68.
20. Wellemeyer[G], J.C., C. Harty[G], and **J.S. Perkin**. 2016. Occurrence of *Lepomis miniatus* (Redspotted Sunfish) in the Cumberland River Basin of Tennessee. Southeastern Naturalist 15:N33-N36.
19. **Perkin, J.S.**, and T.H. Bonner. 2016. Historical changes in assemblage composition following improved water quality in the mainstem Trinity River of Texas. River Research and Applications 32:85-99.
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16. **Perkin, J.S.**, K.B. Gido, K.H. Costigan, M.D. Daniels, and E.R. Johnson. 2015. Fragmentation and drying ratchet down Great Plains stream fish diversity. Aquatic Conservation: Marine and Freshwater Ecosystems 25:639-655.
15. **Perkin, J.S.**, K.B. Gido, A.R. Cooper, T.F. Turner, M.J. Osborne, E.R. Johnson, and K.B. Mayes. 2015. Fragmentation and dewatering transform Great Plains stream fish communities. Ecological Monographs 85:73-92.
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12. Alexander[U], A.M., and **J.S. Perkin**. 2013. Notes on the feeding ecology of a relict population of the Cardinal Shiner, *Luxilus cardinalis* (Teleostei: Cyprinidae), in Kansas. Transactions of the Kansas Academy of Science 167:11-21.
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1. **Perkin, J.S.**, C.S. Williams, and T.H. Bonner. 2009. Aspects of chub shiner *Notropis potteri* life history with comments on native distribution and conservation status. American Midland Naturalist 162:279-291.

4.2 Invited book chapters

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8. Labay, B.J., **J.S. Perkin**, D.A. Hendrickson, A.R. Cooper, G.P. Garrett, and T.W. Birdsong. 2019. Who's Asking?: Inter-jurisdictional conservation assessment and

planning for Great Plains fishes. Pages 57-83 *In* Multispecies & Watershed Approaches to Freshwater Fish Conservation. American Fisheries Society Symposium 91, Bethesda, MD.

7. **Perkin, J.S.**, J.C. Wellemeyer[G], J.D. Fore. 2019. Multiscale fish assemblage distribution models to guide riverscape conservation planning. Pages 409-440 *In* (Hughes, Infante, and Li; eds) Advances in Understanding Landscape Influences on Freshwater Habitats and Biological Assemblages. American Fisheries Society Symposium 90, Bethesda, MD.
6. Gido, K.B., J.E. Whitney, **J.S. Perkin**, and T.F. Turner. 2015. Fragmentation, connectivity, and species persistence in freshwater ecosystems. Pages 292-323 *In* G. Closs, M. Krkosek, and J. Olden (editors). Conservation of Freshwater Fishes. Cambridge University Press.
5. Curtis, S.G., **J.S. Perkin**, P.T. Bean, M.S. Sullivan, and T.H. Bonner. 2015. Guadalupe Bass *Micropterus treculii* (Vaillant & Bocourt, 1874). Pages 55-60 In M.D. Tringali, J.M. Long, T.W. Birdsong, and M.S. Allen (editors). Black Bass Diversity: Multidisciplinary Science for Conservation. American Fisheries Society Symposium 82, Bethesda, MD.
4. **Perkin, J.S.** 2014. Prairie Chub *Macrhybopsis australis*. Page 443 *In* Kansas Fishes, University of Kansas Press, Lawrence.
3. **Perkin, J.S.** 2014. Shoal Chub *Macrhybopsis hyostoma.* Pages 181-183 *In* Kansas Fishes, University of Kansas Press, Lawrence.
2. **Perkin, J.S.** 2014. Peppered Chub *Macrhybopsis tetranema*. Pages 189-191 *In* Kansas Fishes, University of Kansas Press, Lawrence.
1. Eberle, M.E., D.R. Edds, **J.S. Perkin**, and J. Tiemann. 2014. Kansas Stream and Native Species Conservation. Pages 9-16 *In* Kansas Fishes, University of Kansas Press, Lawrence.

4.3 Invited book reviews

1. **Perkin, J.S.** 2018. Synthesizing stream fish community dynamics in the southern Great Plains and beyond. Ecology 99:763-764.

4.4 Invited research seminars

24. **Perkin, J.S.** 2024. Little fish, big decisions: Theory and practice of advancing environmental management using minnows. U.S. Geological Survey Columbia Environmental Research Center.
23. **Perkin, J.S.** 2024. Little fish, big decisions: Theory and practice of advancing environmental management using minnows. Iowa State University.
22. **Perkin, J.S.** 2024. Application of functional traits in understanding and addressing freshwater fish diversity conservation. Texas A&M University.
21. **Perkin, J.S.** 2021. Fish Ecology and Conservation in Four-Dimensional Riverscapes. Baylor University.
20. **Perkin, J.S.** 2021. The young and the wetless: Stream fish life history traits predict response to drought. Southeastern Louisiana University.

19. **Perkin, J.S.** 2019. The dimensions and scales of fish conservation in riverscapes. Middle Tennessee State University.
18. **Perkin, J.S.** 2019. Fish SCALES: Scaling, conservation, and landscape ecology in streams. Texas State University.
17. **Perkin, J.S.** 2018. When in drought: extreme climatic events homogenize stream fish assemblages. Sam Houston State University.
16. **Perkin, J.S.** 2018. Fish ecology and conservation in riverscapes, or what to do about these dammed Great Plains rivers. Texas A&M University.
15. **Perkin, J.S.** 2018. Dams, Drought, and Desiccation Constrain the Macroecology of Great Plains Stream Fishes. University of North Texas.
14. **Perkin, J.S.** 2017. Fish landscape ecology and conservation in the Great Plains. Texas A&M University.
13. **Perkin, J.S.** 2016. Life history theory as a framework for predicting fish assemblage structure in altered riverscapes. Southern Illinois University.
12. **Perkin, J.S.** 2016. Groundwater extraction form the High Plains Aquifer drains streams that support Great Plains fishes. Great Plains Landscape Conservation Cooperative.
11. **Perkin, J.S.** 2016. All dry on the western front: applying landscape ecology theory to conceptualize the past, present, and future of Great Plains fishes. University of Oklahoma.
10. **Perkin, J.S.** 2015. FRAGMENTS: Fish responses along gradients of modified ecological networks in temperate streams. University of Missouri.
9. **Perkin, J.S.** and K.B. Gido. 2015. Conservation priorities for Great Plains fish communities based on riverscape connectivity and genetic integrity of populations. Great Plains Landscape Conservation Cooperative.
8. **Perkin, J.S.** 2014. The trilateral continuum of doom: broad-scale environmental changes threaten Great Plains stream fishes. Oak Ridge National Laboratory.
7. **Perkin, J.S.** 2014. A riverine landscape approach to fish conservation and management. Tennessee Technological University.
6. **Perkin, J.S.** 2014. A riverine landscape approach to fish conservation and management. Murray State University.
5. **Perkin, J.S.**, K.B. Gido, T.F. Turner, M.J. Osborne, E.R. Johnson, K.B. Mayes. 2014. Conservation priorities for Great Plains fish communities based on riverscape connectivity and genetic integrity of populations. Great Plains Landscape Conservation Cooperative Steering Committee Meeting, Kansas City, MO.
4. **Perkin, J.S.** 2013. Stream fragmentation and desiccation threaten fish biodiversity in the Great Plains. Center for Limnology Seminar, University of Wisconsin.
3. **Perkin, J.S.** 2013. A riverine landscape approach to fisheries conservation and management. Georgia Southern University.
2. **Perkin, J.S.** 2013. Evaluating fish community response to habitat fragmentation in Great Plains streams. Ottawa State University.
1. **Perkin, J.S.** 2012. Conservation of Great Plains fishes in human-dominated riverine landscapes. Wichita State University.

4.5 Presentations at professional meetings

First author listed was the presenter, ^{U} designates undergraduate presenter and ^{G} designated graduate student presenter. Presentations were oral unless noted as (poster)

2024

255. Roberts^{G}, H.C., P.T. Bean, K.W. Conway, G. Voelker, H.L. Bart, and **J.S. Perkin**. Edwards Plateau Anomaly: Morphology and Genetics of a Potentially Undescribed Catostomid, the Llano River Carpsucker (*Carpiodes* sp.) of Central Texas. Joint Meeting of Ichthyologists and Herpetologists, Pittsburgh, PA.
254. **Perkin, J.S.**, L.C. Elkins^{G}, R.D. Mangold^{G}, J.P. Wolff^{G}, M. Perez Rocha, A.N. Schwalb, B.F. Schwartz, W.H. Nowlin, M.J. Troia, C. Saltus, R. Johansen, and D. Smith. 2024. Integrating climate and land use projections to assess ecological futures for stream fish assemblages arranged along an aridity gradient. Society for Freshwater Science, Philadelphia, PA.
253. Perez Rocha1,M., E. Austin-Bingamon1, M. Sams, N. Santee^{G}, B. Schwartz, **J.S. Perkin**, W. Nowlin, and A. Schwalb. 2024. When dryer makes it more diverse: hydrological gradients affect facets of biodiversity in similar ways. Society for Freshwater Science, Philadelphia, PA.
252. Mangold^{G}, R.D., J.K. Ellard^{G}, K.W. Conway, C.G. Montaña, K.M. Kubicek, A. Umstott, and **J.S. Perkin**. 2024. Exorcising the ghosts of riverscape past: Historical alterations to a riverine landscape shape contemporary fish assemblages and guide future restoration actions. Society for Freshwater Science, Philadelphia, PA.
251. Ellard^{G}, J.K., R.D. Mangold^{G}, K.W. Conway, C.G. Montaña, K.M. Kubicek, A. Umstott, and **J.S. Perkin**. 2024. Spatially intensive fish inventories conducted 70 years apart reveal strong spatial footprints of reservoirs in a regulated temperate river. Society for Freshwater Science, Philadelphia, PA.
250. Mangold^{G}, R.D., L.C. Elkins, C. Saltus, R. Johansen, and **J.S. Perkin**. 2024. Multiscale stream fish species-discharge relationships: The relative roles of evenness, density, and spatial aggregation. Society for Freshwater Science, Philadelphia, PA. (poster)
249. Yancy^{U}, L.E., N.S. Santee^{G}, E.B. Parker^{U}, M.J. Madewell^{U}, F.E. Chavez^{U}, L.W. Stevens^{U}, J.P. Wolff^{G}, H. Evans^{U}, and **J.S. Perkin**. 2024. A framework for integrating stream ecosystem theories into spatial modelling of fish richness and assemblage structure. Society for Freshwater Science, Philadelphia, PA. (poster)
248. Ellard^{G}, J.K., H.C. Roberts, D.J. Daugherty, P. Fleming, M.R. Acre, and **J.S. Perkin**. *In Press*. Scale-dependent tradeoffs between habitat and time in explaining Alligator Gar (*Atractosteus spatula*) movement. Society for Freshwater Science, Philadelphia, PA. (poster)
247. **Perkin, J.S.** 2024. Freshwater fish data products for advancing applied ecological models. Collaborative project meeting of US Army Corps Engineering Research and Development Center (ERDC) and Texas Research Institute for Aquatic and Groundwater Ecology (TRIAGE) at Texas State University, San Marcos, TX.
246. Booknis^{U}, M., H. Evans^{U}, N. Santee^{G}, H. Roberts^{G}, D. Smith, and **J.S. Perkin**. 2024. Mesohabitat and macroecological correlates for Blue Sucker (*Cycleptus elongatus*) occurrence in regulated rivers. Collaborative project meeting of US Army Corps Engineering Research and Development Center (ERDC) and Texas Research Institute

for Aquatic and Groundwater Ecology (TRIAGE) at Texas State University, San Marcos, TX. (poster)

245. Dodson[G], T., J. Barrett[G], N. Santee,[G] D. Smith, and **J.S. Perkin**. 2024. Combining spatial gradients and sparse time series data to predict fish assemblage response to increasing aridity. Collaborative project meeting of US Army Corps Engineering Research and Development Center (ERDC) and Texas Research Institute for Aquatic and Groundwater Ecology (TRIAGE) at Texas State University, San Marcos, TX. (poster)
244. Barrett[G], J., T. Dodson[G], D. Smith, and **J.S. Perkin**. 2024. Longitudinal gradients of fish assemblages in proximity to potential passage barriers in the San Antonio River. Collaborative project meeting of US Army Corps Engineering Research and Development Center (ERDC) and Texas Research Institute for Aquatic and Groundwater Ecology (TRIAGE) at Texas State University, San Marcos, TX. (poster)
243. **Perkin, J.S.**, J.J. Jones, J. Barrett[G], T. Dodson[G], M. Booknis[U], and D. Smith. 2024. Application of ground-based LiDAR to measure and model the dimensions of potential fish passage structures. Collaborative project meeting of US Army Corps Engineering Research and Development Center (ERDC) and Texas Research Institute for Aquatic and Groundwater Ecology (TRIAGE) at Texas State University, San Marcos, TX. (poster)
242. Alves, A., Nowlin W., **Perkin J.S.**, and A. N. Schwalb. 2024. Impacts of changes in fish community composition on stream functioning during drying and flowing conditions in remnant pools. Collaborative project meeting of US Army Corps Engineering Research and Development Center (ERDC) and Texas Research Institute for Aquatic and Groundwater Ecology (TRIAGE) at Texas State University, San Marcos, TX. (poster)
241. Ellard[G], J.K., R.D. Mangold[G], K.W. Conway, C.G. Montaña, K.M. Kubicek, A. Umstott, and **J.S. Perkin**. 2024. Spatially intensive fish inventories conducted 70 years apart reveal strong spatial footprints of reservoirs in a regulated temperate river. Texas A&M University Ecological Integration Symposium, College Station, TX.
240. Mangold[G], R.D., J.K. Ellard[G], K.W. Conway, C.G. Montaña, K.M. Kubicek, A. Umstott, and **J.S. Perkin**. 2024. Long-term changes in fish assemblage structure across the Neches River basin. Texas A&M University Ecological Integration Symposium, College Station, TX.
239. Evans[U], H., M. Booknis[U], N. Santee[G], H. Roberts[G], D. Smith, and **J.S. Perkin**. 2024. Mesohabitat and macroecological correlates for Blue Sucker (*Cycleptus elongatus*) occurrence in regulated rivers. Texas A&M University Ecological Integration Symposium, College Station, TX. (poster)
238. Stevens[U], L.W., L.E. Yancy[U], N.S. Santee[G], E.B. Parker[U], M.J. Madewell[U], F.E. Chavez[U], J.P. Wolff[G], H. Evans[U], and **J.S. Perkin**. 2024. A framework for integrating stream ecosystem theories into spatial modelling of fish richness and assemblage structure. Texas A&M University Ecological Integration Symposium, College Station, TX. (poster)
237. Elzi[U], B., H. Evans[U], L. Stevens[U], and **J.S. Perkin**. Hydrodynamics and fish assemblage fluxes in a forested riverscape. Texas A&M University Ecological Integration Symposium, College Station, TX. (poster)

236. Arend[U], W.A., R.D. Mangold[U], C.L. Riggins, C. Groutte, Y. Rodriguez, T.C. Heard, N. Menchaca, J. Williamson, D. McDonald, D. Daugherty, M. McGarrity, K.W. Conway, and **J.S. Perkin**. 2023. Sexual dimorphism in an invasive population of suckermouth armored catfish: Implications for management. Texas A&M University Ecological Integration Symposium, College Station, TX. (poster)
235. Blanchard[G], R., A.M. Lawing, and **J.S. Perkin**. 2024. Sexual Dimorphism in Dispersal Traits for the Highly Invasive Western Mosquitofish. Texas A&M University Ecological Integration Symposium, College Station, TX.
234. Blanchard[G], R., A.M. Lawing, and **J.S. Perkin**. 2024. Sexual Dimorphism in Dispersal Traits for the Highly Invasive Western Mosquitofish. Texas A&M University Student Research Week, College Station, TX.
233. Ellard[G], J.K., R.D. Mangold[G], K.W. Conway, C.G. Montaña, K.M. Kubicek, A. Umstott, and **J.S. Perkin**. 2024. Seventy years of change: Analyzing fish assemblage shifts of the upper Sabine River, Texas. Texas Chapter American Fisheries Society, Nacogdoches, TX.
232. Umstott, A., R.D. Mangold[G], J.K. Ellard[G], **J.S. Perkin**, K.W. Conway, K. Kubicek, and C. Montaña. 2024. Beta diversity of stream fishes in east Texas: partitioning variation among spatial scales. Texas Chapter American Fisheries Society, Nacogdoches, TX.
231. Lindholm, J., A. Umstott, R.D. Mangold[G], J.K. Ellard[G], **J.S. Perkin**, K.W. Conway, K. Kubicek, and C. Montaña. 2024. Local Stream Predictors of Darter (Percidae) Assemblages in East Texas Streams. Texas Chapter American Fisheries Society, Nacogdoches, TX.
230. Mangold[G], R.D., J.K. Ellard[G], K.W. Conway, C.G. Montaña, K.M. Kubicek, A. Umstott, and **J.S. Perkin**. 2024. Long-term changes in fish assemblage structure across the Neches River basin. Texas Chapter American Fisheries Society, Nacogdoches, TX.
229. Booknis[U], M., H. Evans[U], S. Santee[G], R. Mangold[G], H. Roberts[G], J. Wolff[G], J. Ellard[G], D. Smith, and **J.S. Perkin**. Mesohabitat and macroecological correlates of Blue Sucker occurrence in regulated rivers. Texas Chapter American Fisheries Society, Nacogdoches, TX.
228. Blanchard[G], R., A.M. Lawing, and **J.S. Perkin**. 2024. Sexual dimorphism and dispersal: What morphological differences can tell us about dispersal capability in the highly invasive Western Mosquitofish (*Gambusia affinis*). Texas Chapter American Fisheries Society, Nacogdoches, TX.
227. Roberts[G], H.C., P. Bean, K.W. Conway, G. Voelker, H. Bart, and **J.S. Perkin**. The Carpiodes conundrum: Molecular and morphological patterns of a putative undescribed Catostomid, the Llano River Carpsucker.
Texas Chapter American Fisheries Society, Nacogdoches, TX.
226. Dodson[G], T.A., J. Barrett[G], D. Smith, and **J.S. Perkin**. 2024.Combining spatial gradients and sparse time series data to predict fish assemblage response to increasing aridity. Texas Chapter American Fisheries Society, Nacogdoches, TX. (poster)
225. Wolff[G], J., C. Johnson, and **J.S. Perkin**. 2024. Does Rio Grande Cichlid (*Herichthys cyanoguttatus*) induce trophic niche shifts in native Centrarchids? Texas Chapter American Fisheries Society, Nacogdoches, TX. (poster)
224. Stevens[U], L.W., L.E. Yancy[U], N.S. Santee[G], E.B. Parker[U], M.J. Madewell[U], F.E. Chavez[U], J.P. Wolff[G], H. Evans[U], and **J.S. Perkin**. A framework for integrating

stream ecosystem theories into spatial modelling of fish richness and assemblage structure. Texas Chapter American Fisheries Society, Nacogdoches, TX. (poster)

223. Ellard[G] , J.K., H.C. Roberts[G], D. Daugherty, M.R. Acre, and **J.S. Perkin**. Scale-dependent tradeoffs between habitat and time in explaining Alligator Gar (*Atractosteus spatula*) movement. Texas Chapter American Fisheries Society, Nacogdoches, TX. (poster)
222. Byckovski, K.J., C.L. Riggins, T.C. Heard, C.J. Garoutte, W.A. Arend[U], R.D. Mangold[G], and **J.S. Perkin**. 2024. A novel approach to estimating Suckermouth Armored Catfish population size in the San Marcos River. Texas Chapter American Fisheries Society, Nacogdoches, TX. (poster)
221. Elzi[U], B., H. Evans[U], L. Stevens[U], and **J.S. Perkin**. Hydrodynamics and fish assemblage fluxes in a forested riverscape. Texas Chapter American Fisheries Society, Nacogdoches, TX. (poster)
220. Lee, K., K.J. Byckovski, C.L. Riggins, T.C. Heard, C.J. Garoutte, W.A. Arend[U], R.D. Mangold[G], and **J.S. Perkin**. Diel activity, site fidelity, and experimental exclusion of Suckermouth Armored Catfish in the San Marcos River. Texas Chapter American Fisheries Society, Nacogdoches, TX. (poster)
219. Booknis[U], M., H. Evans[U], S. Santee[G], R. Mangold[G], H. Roberts[G], J. Wolff[G], J. Ellard[G], D. Smith, and **J.S. Perkin**. 2024. Environmental Correlates of Blue sucker occurrence in regulated rivers. Southern Division American Fisheries Society, Chattanooga, TN.
218. Roberts[G], H.C., P. Bean, K.W. Conway, G. Voelker, H. Bart, and **J.S. Perkin**. 2024. The Carpiodes Conundrum: Molecular and Morphological Patterns of a Putative Undescribed Catostomid, the Llano River Carpsucker.
217. Dodson[G], T.A., J. Barrett[G], D. Smith, and **J.S. Perkin**. 2024. Combining spatial gradients and sparse time series data to predict fish assemblage response to increasing aridity. Southern Division American Fisheries Society, Chattanooga, TN. (poster)
216. Roberts[G], H.C., J.K. Ellard[G], D. Daugherty, M.R. Acre, and **J.S. Perkin**. 2024. Scale-dependent tradeoffs between habitat and time in explaining Alligator Gar (*Atractosteus spatula*) movement. Southern Division American Fisheries Society, Chattanooga, TN. (poster)
215. Elzi[U], B., H. Evans[U], L. Stevens[U], and **J.S. Perkin**. 2024. Hydrodynamics and Fish Assemblage Fluxes in a Forested Riverscape. Southern Division American Fisheries Society, Chattanooga, TN. (poster)
214. Wolff[G], J., C. Johnson, and **J.S. Perkin**. 2024. Does Rio Grande Cichlid (*Herichthys cyanoguttatus*) induce trophic niche shifts in native centrarchids? Southern Division American Fisheries Society, Chattanooga, TN. (poster)
213. Stevens[U], L., Z.D. Steffensmeier[G], K.B. Mayes, and **J.S. Perkin**. 2024. Quantifying Movement of Seven Imperiled Pelagic-Broadcast Spawning Fishes in Three Great Plains Rivers. Southern Division American Fisheries Society, Chattanooga, TN. (poster)

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212. Santee[G], N.S., K.W. Conway, W.H. Nowlin, D. Smith, and **J.S. Perkin**. 2023. Symptoms of a syndrome: Linking stream fish functional traits to riverscape alterations. American Fisheries Society, Grand Rapids, MI.

211. Mangold[G], R.D., L.C. Elkins, C. Saltus, R. Johansen, and **J.S. Perkin**. 2023. Community ecology mechanisms underlying fish species-discharge relationships are scale dependent. American Fisheries Society, Grand Rapids, MI.
210. Wolff[U], J., L.C. Elkins[G], J.E. Pease, T.B. Grabowski, P.T. Bean, N.G. Smith, and **J.S. Perkin**. 2023. Multiple tracking methods reveal Guadalupe Bass dispersal is heterogeneous and predictable. American Fisheries Society, Grand Rapids, MI.
209. Blanchard[G]. R., C. Roberts, S. Young, T. DeWitt, and **J.S. Perkin**. 2023. Predictability of predation driven morphological adaptations in populations of Western Mosquitofish. American Fisheries Society, Grand Rapids, MI.
208. Perkin, J.S. 2023. A meta-presentation: Emergent themes for effective scientific presentations. American Fisheries Society, Grand Rapids, MI.
207. Roberts[G], H.C., P.T. Bean, K. W. Conway, G.A. Volker, H.L. Bart, and **J.S. Perkin**. 2023. River Carpsucker vs. Llano River Carpsucker: Morphological divergence of undescribed catostomid. American Fisheries Society, Grand Rapids, MI.
206. Booknis[U], M., H. Evans[U], N. Santee[G], H. Roberts[G], D. Smith, and **J.S. Perkin**. 2023. Mesohabitat and macroecological correlates for Blue Sucker (*Cycleptus elongatus*) occurrence in regulated rivers. American Fisheries Society, Grand Rapids, MI.
205. Steffensmeier, Z.D., S.K. Brewer, A. Rodger, T. Starks, M. Wedgeworth, E. Nguyen, and **J.S. Perkin**. 2023. Nexus of niches: Multidimensional niche modelling to improve management of Prairie Chub. American Fisheries Society, Grand Rapids, MI.
204. Hoeinghaus, D., K.O. Winemiller, C. Reeves, D. Daugherty, N. Smith, D. Buckmeier, J. Jensen, **J.S. Perkin**, and A. Pease. 2023. Retrospective analysis of flow-recruitment relationships of periodic life-history strategist fishes. American Fisheries Society, Grand Rapids, MI.
203. Acre, M.R., **J.S. Perkin**, K. Hoenke, and J. Graham. 2023. An integrative conservation planning framework for riverine landscapes fragmented by road-stream crossings. American Fisheries Society, Grand Rapids, MI.
202. Roberts[G], H.C., P.T. Bean, K. W. Conway, G.A. Volker, H.L. Bart, and **J.S. Perkin**. 2023. Morphological divergence of an undescribed catostomid, the Llano River Carpsucker (*Carpiodes* sp. cf. *carpio*) in the Colorado River basin of Texas. Texas A&M University Ecological Integration Symposium.
201. Blanchard[G]. R., C. Roberts, S. Young, T. DeWitt, and **J.S. Perkin**. 2023. Predictability and conceptual repeatability of the predator associated burst speed body shape in independently evolved populations of Western Mosquitofish. Texas A&M University Ecological Integration Symposium.
200. Santee[G], N.S., K.W. Conway, W.H. Nowlin, D. Smith, and **J.S. Perkin**. 2023. Testing responsiveness of stream fish functional traits to anthropogenic riverscape alterations. Texas A&M University Ecological Integration Symposium.
199. Ellard[U], J.K., H.C. Roberts[G], D.J. Daugherty, P.B. Fleming, and **J.S. Perkin**. 2023. A multiscale conceptual framework to predict movement and habitat associations of an imperiled megafish, the Alligator Gar (*Atractosteus spatula*). Texas A&M University Ecological Integration Symposium.
198. Holderness[U], E., R. Blanchard[G], and **J.S. Perkin**. 2023. Morphological adaptations of the Western Mosquitofish, *Gambusia affinis*, in relation to naiad predation. Texas A&M University Ecological Integration Symposium. (poster)

197. Evans[U], H., M. Booknis[U], N. Santee[G], H. Roberts[G], D. Smith, and **J.S. Perkin**. 2023. Mesohabitat and macroecological correlates for Blue Sucker (*Cycleptus elongatus*) occurrence in regulated rivers. Texas A&M University Ecological Integration Symposium. (poster)
196. Stevens[U], L. Z.R. Steffensmeier[G], K.B. Mayes, and **J.S. Perkin**. 2023. Quantifying movement of seven imperiled pelagic-broadcast spawning fishes in three Great Plains rivers. Texas A&M University Ecological Integration Symposium. (poster)
195. Mangold[G], R.D., L.C. Elkins[G], C. Saltus, R. Johansen, and **J.S. Perkin**. 2023. Multiscale stream fish species-discharge relationships: The relative roles of evenness, density, and spatial aggregation. Texas A&M University Ecological Integration Symposium. (poster)
194. **Perkin, J.S.** 2023. Addressing uncertainty in fish assemblage responses to increased stream drying. Plenary talk at Colorado-Wyoming Chapter of the American Fisheries Society Meeting, Fort Collins, Colorado.
193. Roberts[G], H.C., P.T. Bean, K. W. Conway, G.A. Volker, H.L. Bart, and **J.S. Perkin**. 2023. Morphological divergence of an undescribed catostomid, the Llano River Carpsucker (*Carpiodes* sp. cf. *carpio*) in the Colorado River basin of Texas. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas.
192. Blanchard[G]. R., C. Roberts, S. Young, T. DeWitt, and **J.S. Perkin**. 2023. Predictability and conceptual repeatability of the predator associated burst speed body shape in independently evolved populations of Western Mosquitofish. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas.
191. Wolff[U], J., L.C. Elkins[G], J.E. Pease, T.B. Grabowski, P.T. Bean, N.G. Smith, and **J.S. Perkin**. 2023. Multiple tracking methods reveal Guadalupe Bass dispersal is consistent with the restricted movement paradigm. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas.
190. Ellard[U], J.K., H.C. Roberts[G], D.J. Daugherty, P.B. Fleming, and **J.S. Perkin**. 2023. A multiscale conceptual framework to predict movement and habitat associations of an imperiled megafish, the Alligator Gar (*Atractosteus spatula*). Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas.
189. Santee[G], N.S., K.W. Conway, W.H. Nowlin, D. Smith, and **J.S. Perkin**. 2023. Testing responsiveness of stream fish functional traits to anthropogenic riverscape alterations. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas.
188. Elkins[G], L.C., R. Mangold[G], M. Perez Rocha, A. Schwalb, B. Schwartz, W.H. Nowlin, K. Cottenie, C. Saltus, R. Johansen, D. Smith, and **J.S. Perkin**. 2023. Testing the cold-water climate shield model with stream fishes in the middle Colorado River of Texas. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas.
187. **Perkin, J.S.** 2023. Addressing uncertainty in fish assemblage responses to increased stream drying. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas. (poster)
186. Evans[U], H., M. Booknis[U], N. Santee[G], H. Roberts[G], D. Smith, and **J.S. Perkin**. 2023. Mesohabitat and macroecological correlates for Blue Sucker (*Cycleptus elongatus*) occurrence in regulated rivers. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas. (poster)

185. Mangold[G], R.D., L.C. Elkins[G], C. Saltus, R. Johansen, and **J.S. Perkin**. 2023. Multiscale stream fish species-discharge relationships: The relative roles of evenness, density, and spatial aggregation. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas. (poster)
184. Stevens[U], L. Z.R. Steffensmeier[G], K.B. Mayes, and **J.S. Perkin**. 2023. Quantifying movement of seven imperiled pelagic-broadcast spawning fishes in three Great Plains rivers. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas. (poster)
183. Bean, M.G., D. Lutz-Carrillo, J. Hatt, B. Ferguson, **J.S. Perkin**, and S. Parker. 2023. Assessment of Headwater Catfish (*Ictalurus lupus*) genetics in Texas & New Mexico. Texas Chapter of the American Fisheries Society Meeting, Corpus Christi, Texas. (poster)

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182. **Perkin, J.S.**, L.C. Elkins[G], R. Mangold, M. Perez Rocha, A. Schwalb, B. Schwartz, W.H. Nowlin, K. Cottenie, C. Saltus, R. Johansen, and D. Smith. 2022. Fish Assemblage Structure Along an Existing Aridity Gradient Mirrors Future Assemblage Projections Under Climate Change Scenarios. Desert Fishes Council Meeting, St. George, Utah.
181. Elkins[G], L.C, M.R. Acre, M.G. Bean, S.M. Robertson, R. Smith, and **J.S. Perkin**. 2022. Walking a Fine Line: Miniature Distance Sampling Reveals Greater Abundance of Imperiled Conchos Pupfish in Marginal Habitats. Desert Fishes Council Meeting, St. George, Utah.
180. Bean, M.G., D. Lutz-Carrillo, J. Hatt, B. Ferguson, **J.S. Perkin**, and S. Parker. 2022. Assessment of Headwater Catfish (*Ictalurus lupus*) genetics in Texas & New Mexico. Desert Fishes Council Meeting, St. George, Utah. (poster)
179. Bean, M.G., P. Bean, D. Chilleri, R. Mollenhauer, **J.S. Perkin**, and M. Acre. The Development & Feasibility of Using Camera Traps to Monitor Pupfish Populations. 2022. Desert Fishes Council Meeting, St. George, Utah. (poster)
178. Wolf[U], J., L.C. Elkins[G], **J.S. Perkin**, J.E. Pease, T.B. Grabowski, P.T. Bean, and N.G. Smith. Guadalupe Bass (*Micropterus treculii*) movement is predictable: Implications for conservation. Texas Chapter American Fisheries Society Meeting, Hunt, Texas.
177. **Perkin, J.S.**, M.R. Acre, J.K. Ellard[U], A.W. Rodger, J.F. Trungale, K.O. Winemiller, and L.E. Yancy[U]. 2022. Flow-recruitment relationships for Shoal Chub (*Macrhybopsis hyostoma*) and implications for managing environmental flows. Texas Chapter American Fisheries Society Meeting, Hunt, Texas.
176. Nguyen[G], E., **J.S. Perkin**, K.B. Mayes, J.F. Trungale, and R. Smith.2022. Drier and dire: Ecological forecasting and conservation contingency planning for imperiled Great Plains fishes in Texas. Texas Chapter American Fisheries Society Meeting, Hunt, Texas.
175. Steffensmeier[G], Z.R., **J.S. Perkin**, S.K. Brewer, T. Rodger, T. Starks, M. Wedgeworth, and N. Nguyen[G]. 2022. Delineating the fundamental versus realized niche of prairie chub. Texas Chapter American Fisheries Society Meeting, Hunt, Texas.
174. Elkins[G], L.C. M.R. Acre, M.G. Bean, S.M. Robertson, R. Smith, and **J.S. Perkin**. 2022. Going the distance: Multiscale assessment of Conchos Pupfish (*Cyprinodon eximius*)

abundance and distribution in West Texas. Texas Chapter American Fisheries Society Meeting, Hunt, Texas.

173. Ellard[U], J.K., H.C. Roberts, D.J. Daugherty, P. Flemming, and **J.S. Perkin**. 2022. Multiscale movement and habitat associations for Alligator Gar (*Atractosteus spatula*). Texas Chapter American Fisheries Society Meeting, Hunt, Texas.
172. Shepta[G], E., **J.S. Perkin**, K.B. Mayes, and C.G. Montaña. 2022. Assessing the Texas live bait industry as a pathway of introduction for two invasive cyprinodontids. Texas Chapter American Fisheries Society Meeting, Hunt, Texas.
171. Winemiller, K.O., **J.S. Perkin**, G. Moore, A. Trimble, A. Schwalb, T. Hardy, D. Hoeinghaus, C. Reeves, J.F. Trungale, and D. Buzan. 2022. Methods for establishing flow-ecology relationships useful for validating environmental flow standards for Texas rivers. Texas Chapter American Fisheries Society Meeting, Hunt, Texas. (poster)
170. Mangold[U], R., L.C. Elkins[G], **J.S. Perkin**. 2022. Does spatial location matter when estimating stream fish richness? A test of spatially constrained rarefaction in the Colorado River Basin, Texas. Texas Chapter American Fisheries Society Meeting, Hunt, Texas. (poster)
169. Roberts[G], H.C., M.R. Acre, M. Claus[G], F.J. Kappen[G], K.O. Winemiller, D.J. Daugherty, and **J.S. Perkin**. 2022. A trip up the tributary: Affluent streams provide floodplain access for Alligator Gar in a regulated river. Texas Chapter American Fisheries Society Meeting, Hunt, Texas. (poster)
168. Riggins, C.L., A. Hay[U], T.C. Heard, C. Garoutte, Y. Rodriguez, F. Fillipone, K.K. Smith, N. Menchaca, J. Williamson, and **J.S. Perkin**. 2022. Movement and mortality of invasive suckermouth armored catfish during a spearfishing control experiment. Texas Chapter American Fisheries Society Meeting, Hunt, Texas. (poster)
167. Shepta[G], E., **J.S. Perkin**, K.B. Mayes, and C.G. Montaña. 2022. Ecological niche similarities between native (*Cyprinodon rubrofluviatilis* and *Fundulus zebrinus*) and invasive (*C. variegatus* and *F. grandis*) Cyprinodontids in Texas Streams: Evidence from Morphology, Diet, and Stable Isotope Analysis. Texas Chapter American Fisheries Society Meeting, Hunt, Texas. (poster)
166. Nguyen[G], E., **J.S. Perkin**, K.B. Mayes, J.F. Trungale, and R. Smith. 2022. The duality of drought: Pelagic- and benthic-spawning stream fishes show opposing responses to drought in the southern Great Plains. Texas Chapter American Fisheries Society Meeting, Hunt, Texas. (poster)
165. Rodriguez, Y., C. Garoutte, T.C. Heard, C. Riggins, W. Arend[U], R. Mangold[U], **J.S. Perkin**. 2022. Piercing and patching the armor: Assessment of abdominal incision closure and healing during transmitter insertion on invasive suckermouth armored catfish. Texas Chapter American Fisheries Society Meeting, Hunt, Texas. (poster)
164. Arend[U], W., C. Garoutte, T.C. Heard, R. Mangold[U], Y. Rodriguez, C.L. Riggins, and **J.S. Perkin**. 2022. Testing for sexual dimorphism in an invasive population of Suckermouth Armored Catfish. Texas Chapter American Fisheries Society Meeting, Hunt, Texas. (poster)
163. Perez Rocha, M., K. Cottenie, K. Cline, L.C. Elkins, R. Mangold, Z. Mitchell, J.S. Perkin, W.H. Nowlin, A.N. Schwalb. 2022. Differential responses of riverine communities to environmental heterogeneity: a multi-taxon approach across different spatial scales. Joint Aquatic Sciences Meeting, Grand Rapids, Michigan.

162. Roberts[G], H.C., M.R. Acre, M. Claus[G], F.J. Kappen[G], K.O. Winemiller, D.J. Daugherty, and **J.S. Perkin**. 2022. A trip up the tributary: Affluent streams provide floodplain access for Alligator Gar in a regulated river. Texas A&M University Ecological Integration Symposium, College Station, Texas.
161. Wolf[U], J., L.C. Elkins[G], **J.S. Perkin**, J.E. Pease, T.B. Grabowski, P.T. Bean, and N.G. Smith. Guadalupe Bass (*Micropterus treculii*) movement is predictable: Implications for conservation. Texas A&M University Ecological Integration Symposium, College Station, Texas.
160. Ellard[U], J.K., H.C. Roberts[G], D.J. Daugherty, and **J.S. Perkin**. 2021. Assessing Fine-Scale Movement of Alligator Gar in the Lower Brazos River Basin. Texas A&M University Ecological Integration Symposium, College Station, Texas.

2021

159. **Perkin, J.S.**, M.R. Acre, and M.G. Bean. 2021. Multiple survey methods reveal greater abundance of endangered pupfish in restored habitats. Desert Fishes Council Virtual Meeting.
158. Elkins[G], L.C., M.R. Acre, M.G. Bean, S.M. Robertson, R.K. Smith, and J.S. Perkin. 2021 Going the Distance: Multiscale Assessment of Conchos Pupfish (*Cyprinodon eximius*) Abundance and Distribution in West Texas. Desert Fishes Council Virtual Meeting.
157. Nguyen[G], E., **J.S. Perkin**, R. Smith, K.B. Mayes, J. Trungale. 2021. Characteristics of the natural flow regime paradigm explain occurrence of imperiled Great Plains fishes. National American Fisheries Society Meeting, Baltimore, Maryland. (poster)
156. Roberts[G], H.C., J.S. Perkin, M.R. Acre, D.J. Daugherty, F.J. Kappen, M.P.A. Claus, and D.L. Buckmeier. 2021. Patterns and predictors of Alligator Gar movement across mainstem-tributary ecotones. National American Fisheries Society Meeting, Baltimore, Maryland.
155. Elkins[G], L.C., M.R. Acre, M.G. Bean, S.M. Robertson, R.K. Smith, and **J.S. Perkin**. 2021 Going the Distance: Multiscale Assessment of Conchos Pupfish (*Cyprinodon eximius*) Abundance and Distribution in West Texas. National American Fisheries Society Meeting, Baltimore, Maryland.
154. Yancy[U], L.E., N.S. Santee[U], and **J.S. Perkin**. 2021. Theoretical models as spatial proxies for stream fish metacommunities in a fragmented stream network. National American Fisheries Society Meeting, Baltimore, Maryland.
153. Wolff[U], J.P., L.C. Elkins[G], **J.S. Perkin**, J.E. Pease, T. B. Grabowski, P.T. Bean, and N.G. Smith. Guadalupe Bass (*Micropterus treculii*) Movement is Predictable: Implications for Conservation. National American Fisheries Society Meeting, Baltimore, Maryland. (poster)
152. Ellard[U], J.K., H.C. Roberts[G], D.J. Daugherty, and **J.S. Perkin**. 2021. Assessing Fine-Scale Movement of Alligator Gar in the Lower Brazos River Basin. National American Fisheries Society Meeting, Baltimore, Maryland. (poster)
151. Binkley[U], H.R., K.W. Conway, A. Best, and **J.S. Perkin**. 2021. Ecology of an Introduced Population of Gangetic Swamp Eel (*Ophichthys cuchia*) in Texas. National American Fisheries Society Meeting, Baltimore, Maryland. (poster)

150. Yancy[U], L., N.S. Santee[U], E. Parker[U], and **J.S. Perkin**. 2021. Longitudinal fragmentation of stream fish metacommunities. Texas Chapter of the American Fisheries Society Virtual Meeting.
149. Hay[U], A., **J.S. Pekin**, T.C. Heard, C. Riggins, C. Garoutte, Y. Rodrigquez, F. Fillipone, K. Kollaus, N. Menchaca, and J. Williamson. 2021. Movement and survival of invasive suckermouth armored catfish within the San Marcos River. Texas Chapter of the American Fisheries Society Virtual Meeting.
148. Roberts[G], H., J.S. Perkin, M. Acre, D. Daugherty, F. Kappen, M. Claus. 2021. Patterns and predictors of Alligator Gar movement across mainstem-tributary ecotones. Texas Chapter of the American Fisheries Society Virtual Meeting.
147. Nguyen[G], E., **J.S. Perkin**, K. Mayes, R. Smith, J. Trungale. 2021. Characteristics of the natural flow regime paradigm explain occurrence of imperiled Great Plains fishes. Texas Chapter of the American Fisheries Society Virtual Meeting.
146. Parker[G], S. D., **J.S. Perkin**, M.G. Bean, D. Lutz-Carrillo, M.R. Acre. 2021. Temporal distribution modelling reveals upstream habitat drying and downstream non-native introgression are squeezing out an imperiled headwater fish. Texas Chapter of the American Fisheries Society Virtual Meeting.
145. Shepta[G], E., J.S. Perkin, K.B. Mayes, and C.G. Montana. 2021. Insights on the establishment of the invasive Sheepshead Minnow (*Cyprinodon variegatus*) in the Brazos River. Texas Chapter of the American Fisheries Society Virtual Meeting.
144. Acre, M.R., **J.S. Perkin**, M.G. Bean. 2021. Multiple survey methods reveal greater abundance of endangered pupfish in restored habitats. Texas Chapter of the American Fisheries Society Virtual Meeting.
143. **Perkin, J.S.**, C.S. Blanton[U], N. Menchaca, K.A. Kollaus. 2021. A gap in the armor: Spearfishing reduces biomass of invasive suckermouth armored catfish. Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)
142. Santee[U], N.S., L.E. Yancy[U], Z.R. Steffensmeieir[G], and **J.S. Perkin**. 2021. Testing restricted movement of plains killifish (*Fundulus zebrinus*). Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)
141. Tschirhart[U], C., and **J.S. Perkin**. 2021. Standard weight analysis of largemouth bass in Texas A&M University's Aquacultural Research and Teaching Facility reservoir. Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)
140. Ellard[U], J., H. Roberts[G], M. Acre, F. Kappen[G], M. Claus[G], D. Daugherty, and **J.S. Perkin**. 2021. Assessing Alligator Gar diel activity in the lower Brazos River basin. Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)
139. Stinebaugh[U], W., C. Cottar[U], L. Yancy[U], **J.S. Perkin**, and A. Best. 2021. Spatially constrained rarefaction to estimate fish species richness in reservoir environments. Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)
138. Stearns[G], S., and **J.S. Perkin**. 2021. Spatial scales of inference from stream fish standard sampling protocols. Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)
137. Kappen[G], F., **J.S. Perkin**, M. Claus[G], H. Roberts[G], M.R. Acre, D. Daugherty, and D. Buckmeier. 2021. Megafish Movement: Testing Stream Fish Movement Paradigms using Alligator Gar. Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)

136. Elkins[G], L., M.R. Acre, **J.S. Perkin**, S.D. Parker[G], M.G. Bean, S. Robertson, and R. Smith. 2021. Going the distance: multiscale assessment of Conchos Pupfish (*Cyprinodon eximius*) abundance and distribution in West Texas. Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)
135. Nguyen[G], E., H.H. Wang, W.E. Grant, and **J.S. Perkin**. 2021. Modeling fish metacommunities in intermittent streams. Texas Chapter of the American Fisheries Society Virtual Meeting. (poster)

2020

134. **Perkin, J.S.**, Z.R. Steffensmeier[G], and K. Gido. 2020. Testing the Compensatory Upstream Spawning Paradigm with Silver Chub (*Macrhybopis storeriana*) in a Great Plains Riverscape. American Fisheries Society Virtual Meeting.
133. Nguyen[G], E., **J.S. Perkin**, R. Smith, K. Mayes, and J. Trungale. 2020. Harnessing the Natural Flow Regime Paradigm for Chub Conservation. American Fisheries Society Virtual Meeting.
132. Roberts[G], H.C., **J.S. Perkin**, M.R. Acre, D. Daugherty, M. Claus, and F. Kappen. 2020. Movement Behavior and Mainstem Versus Tributary Habitat Use of Alligator Gar across Multiple Spatial Scales American Fisheries Society Virtual Meeting.
131. Steffensmeier[G], Z.R., **J.S. Perkin**, and S.K. Brewer. 2020. Movement of Prairie Chub: A Great Plains Endemic Pelagic-Broadcast Spawner. American Fisheries Society Virtual Meeting.
130. Yancy[U], L., and **J.S. Perkin**. 2020. Diel Fluctuations in Comanche Springs Pupfish Abundances in San Solomon Springs, Balmorhea State Park. American Fisheries Society Virtual Meeting. (poster)
129. Steffensmeier[G], Z.R., **J.S. Perkin**, S.K. Brewer. 2020. Movement ecology of Red River Endemic Prairie Chub. Texas Chapter American Fisheries Society, Waco, TX.
128. Madewell[U], M.J., F. Chavez[U], **J.S. Perkin**. 2020. Here today, gone tomorrow: Assessing changes in stream fish assemblage structure in relation to habitat fluctuations. Texas Chapter American Fisheries Society, Waco, TX.
127. Nguyen[G], E., **J.S. Perkin**, K.B. Mayes, R. Smith, J. Trungale. 2020. Do components of the natural flow regime predict occurrence of imperiled Great Plains fishes? Texas Chapter American Fisheries Society, Waco, TX.
126. Troia, M.J., and **J.S. Perkin**. 2020. Assessing climate change vulnerability of Guadalupe Bass (*Micropterus treculii*): comparing bioenergetics and species distribution modeling. Texas Chapter American Fisheries Society, Waco, TX.
125. Yancy[U], L., M.R. Acre, and **J.S. Perkin**. 2020. Diel fluctuations in Comanche Springs Pupfish abundances in San Solomon Springs, Balmorhea State Park. Texas Chapter American Fisheries Society, Waco, TX. (poster presentation)
124. George[G], S.D., M.G. Bean, M.R. Acre, and **J.S. Perkin**. 2020. Conservation biogeography of Headwater Catfish (*Ictalurus lupus*) in the United States. Texas Chapter American Fisheries Society, Waco, TX. (poster presentation)
123. Acre, M.R., M.G. Bean, S. Robertson, and **J.S. Perkin**. 2020. Hands-off: A visual approach to monitoring a threated pupfish. Texas Chapter American Fisheries Society, Waco, TX. (poster presentation)

122. Stinebaugh[U], W., C. Cottar[U], L. Yancy[U], and **J.S. Perkin**. 2020. Assessing fish assemblage structure in Lake Conroe using rarefaction and electrofishing. Texas Chapter American Fisheries Society, Waco, TX. (poster presentation)
121. Ellis[U], M., L. Yancy[U], W. Stinebaugh[U], and **J.S. Perkin**. 2020. A student's perspective on fisheries management. Texas Chapter American Fisheries Society, Waco, TX. (poster presentation)
120. Chavez[U], F., M.J. Madewell[U], and **J.S. Perkin**. 2020. A riverscape divided: Longitudinal change in fish community structure in White Creek, College Station, TX. Texas Chapter American Fisheries Society, Waco, TX. (poster presentation)
119. Mattox, G.M.T., K.W. Conway, K. Montana, and **J.S. Perkin**. 2020. Fish assemblage structure in leaflitter patches in the Jacunda River, Lower Amazon. Texas Chapter American Fisheries Society, Waco, TX. (poster presentation)

2019

118. Acre, M.R., **J.S. Perkin**, and M.S. Bean. 2019. Tradeoffs in spatially structured abundance estimates for endangered Comanche Springs Pupfish using hotspot analysis and N-mixture modelling. Joint Meeting of the American Fisheries Society and The Wildlife Society, Reno, NV.
117. George[G], S.D., **J.S. Perkin**, M.S. Bean, and D. Lutz-Carrillo. 2019. Conservation biogeography of Headwater Catfish (*Ictalurus lupus*) in the United States. Desert Fishes Council, Alpine, TX.
116. **Perkin, J.S.**, and M.J. Troia. 2019. Conservation status of Chihuahuan Desert fishes in the United States: A spatial perspective. Desert Fishes Council, Alpine, TX.
115. Acre, M.R., **J.S. Perkin**, and M.S. Bean. 2019. Spatial structure and survey method influence population estimates for endangered Comanche Springs Pupfish. Desert Fishes Council, Alpine, TX.
114. **Perkin, J.S.**, N.E. Knorp, T.C. Boersig, A.E. Gebhard[G], L.A. Hix, T.C. Johnson. 2019. Life history theory predicts long-term fish assemblage response to stream impoundment. Southern Division American Fisheries Society, Galveston, TX.
113. George[G], S.D., and **J.S. Perkin**. 2019. Habitat conservation priorities for headwater catfish in West Texas. Southern Division American Fisheries Society Meeting, Galveston, TX.
112. Conway, K.W., A. Pinion[G], S.D. George[G], **J.S. Perkin**. 2019. First record of the Conchos Shiner *Cyprinella Panarcys* (Hubbs & Miller, 1978) from the mainstem of the Rio Grande along the Us-México Border. Southern Division American Fisheries Society, Galveston, TX.
111. Mayes, K.B., **J.S. Perkin**, G. Wilde. 2019. State wildlife action plan case study: Conservation of prairie rivers and native fishes in the southern Great Plains of Texas. Southern Division American Fisheries Society, Galveston, TX.
110. Corrington[U], C., and **J.S. Perkin**. 2019. Spot-on: using natural markers to identify individual shoal chub (*Macrhybopsis hyostoma*) for mark-recapture studies. Southern Division American Fisheries Society, Galveston, TX. (poster)

109. Ecker[U], J.K., S.D. George[G], **J.S. Perkin**. 2019. Size structure of an introgressed pupfish (Cyprinodon pecosensis x variegatus) population in West Texas. Southern Division American Fisheries Society Meeting, Galveston, TX. (poster)
108. Madewell[U], M.J., F. Chavez[U], **J.S. Perkin**. 2019. A riverscape divided: longitudinal change in fish community structure in White Creek, College Station, TX. Southern Division American Fisheries Society Meeting, Galveston, TX. (poster)
107. Nguyen[G], E., and **J.S. Perkin**. 2019. Flow chart: A conceptual framework for discovering flow-ecology relationships. Southern Division American Fisheries Society Meeting, Galveston, TX. (poster)

2018

106. **Perkin, J.S.**, J.C. Wellemeyer[G], and J.A. Fore. 2018. Multiscale, community-level fish distribution modeling to guide riverscape conservation planning. American Fisheries Society, Atlantic City, NJ.
105. George[G], S.D., and **J.S. Perkin**. 2018. Evaluating fish community change in arid and semi-arid riverscapes using historical data and a contemporary model. American Fisheries Society, Atlantic City, NJ. (poster)
104. Loveland[U], R., J. Hietikko[U], and **J.S. Perkin**. 2018. Hypothesis development and testing to describe movement ecology of alligator gar (*Atractosteus spatula*). American Fisheries Society, Atlantic City, NJ. (poster)
103. Madewell[U], M., F. Chavez[U], and **J.S. Perkin**. 2018. A riverscape divided: longitudinal change in fish community structure associated with barriers to dispersal. American Fisheries Society, Atlantic City, NJ. (poster)
102. Corrington[U], C., and **J.S. Perkin**. 2018. Spot-on: using natural markers to identify individual shoal chub (*Macrhybopsis hyostoma*) for mark-recapture studies. American Fisheries Society, Atlantic City, NJ. (poster)
101. **Perkin, J.S.**, J.E. Pease[G], T.B. Grabowski. 2018. Loiterers, leavers, and leptokurtosis: synthesizing movement ecology of Guadalupe Bass *Micropterus treculii*. Texas Chapter American Fisheries Society Meeting, College Station, TX.
100. Madewell[U], M.J., F. Chavez[U], **J.S. Perkin**. 2018. A riverscape divided: longitudinal change in fish community structure in White Creek, College Station, TX. Texas Chapter American Fisheries Society Meeting, College Station, TX. (poster)
99. Papraniku[G], I.F., D. Walker, **J.S. Perkin**. 2018. Impact of water fluctuations and intermittency on stream fish community structure. Tennessee Chapter American Fisheries Society Meeting, Knoxville, TN.

2017

98. Dorn[G], T., C.H. Costigan, **J.S. Perkin**. 2017. Broad- and local-scale geologic influences on intermittency in Tennessee streams. American Geophysical Union Meeting, New Orleans, LA. (poster)
97. Malone[G], E.W., **J.S. Perkin**, B.M. Leckie, M.A. Kulp, C.R. Hurt, D.M. Walker. 2017. Prioritizing native fish reintroductions in the Great Smoky Mountains National Park. Southeastern Fishes Council Meeting, Chattanooga, TN. (oral presentation)

96. Gibbs, W.K., **J.S. Perkin**, J.L. Ridgeway[G], S.B. Cook. 2017. Range reduction and restoration of spotfin chub, *Erimonax monachus*. Southeastern Fishes Council Meeting, Chattanooga, TN. (oral presentation)
95. Papraniku[G], I.F., T. Slalge[U], G. Shin[U], R. Conradi[U], D. Walker, **J.S. Perkin**. 2017. Impact of water fluctuations and intermittency on stream fish community structure. Southeastern Fishes Council Meeting, Chattanooga, TN. (poster presentation)
94. Murphy[U], S.P., W.J. Curtis[U], A.E. Gebhard[G], J.C. Wellemeyer[G], C. Underwood[U], **J.S. Perkin**. 2017. Testing diel fish migrations between riffle-pool habitats. Southeastern Fishes Council Meeting, Chattanooga, TN. (poster presentation)
93. Papraniku[G], IF, **J.S. Perkin**, D. Walker. 2017. Impact of water fluctuations and intermittency on stream biota and community structure. Tennessee-Kentucky Branch American Society of Microbiology Meeting, Cookeville, TN. (oral presentation)
92. Wellemeyer[G], J.C., **J.S. Perkin**, J. Fore, J. Wisby, M. Clark, and C. Boyd. 2017. Development of Fish Community Indices of Biotic Integrity for West Tennessee streams. West TN Water Resources Symposium, Jackson, TN.
91. Slagle[U], T.J., W.J. Curtis[U], N. Goodman[U], and **J.S. Perkin.** 2017. Spatial and Temporal Variability of Fish Assemblage Structure in the Roaring River, Tennessee. Tennessee Tech University Creative Inquiry and Research Day, Cookeville, TN. (poster).
90. Murphy[U], S.P., W.J. Curtis[U], A.E. Gebhard[G], J.C. Wellemeyer[G], and **J.S. Perkin**. 2017. Testing Diel Fish Migrations between Riffle-Pool Habitats. Tennessee Tech University Creative Inquiry and Research Day, Cookeville, TN. (poster).
89. Underwood[U], C.D., W.J. Curtis[U], A.E. Gebhard[G], J.C. Wellemeyer[G], and **J.S. Perkin**. 2017. Diel Fish Community Turnover in Riffle Habitats. Tennessee Tech University Creative Inquiry and Research Day, Cookeville, TN. (poster).
88. Wellemeyer[G], J.C., **J.S. Perkin**, J. Fore, J. Wisby, M. Clark, and C. Boyd. 2017. Comparing Fish Community Biotic Integrity Metrics across Regions of Western Tennessee: Does One IBI Fit All? TN American Fisheries Society Meeting, Knoxville, TN.
87. Malone[G], E., **J.S. Perkin**, C. Hurt, M. Kulp, B. Leckie, and D. Walker. 2017. Restoring Ecosystem Function to Abrams Creek by Reintroducing Three Native Fishes. TN American Fisheries Society Meeting, Knoxville, TN.
86. Curtis[U], W.J., A.E. Gebhard[G], and **J.S. Perkin**. 2017. The river continuum concept predicts prey community structure for an insectivorous fish. TN American Fisheries Society Meeting, Knoxville, TN.
85. Slagle[U], T.J., W.J. Curtis[U], N. Goodman[U], and **J.S. Perkin.** 2017. Spatial and Temporal Variability of Fish Assemblage Structure in the Roaring River, Tennessee. TN American Fisheries Society Meeting, Knoxville, TN. (poster).
84. Murphy[U], S.P., W.J. Curtis[U], A.E. Gebhard[G], J.C. Wellemeyer[G], and **J.S. Perkin**. 2017. Testing Diel Fish Migrations between Riffle-Pool Habitats. TN American Fisheries Society Meeting, Knoxville, TN. (poster).
83. Underwood[U], C.D., W.J. Curtis[U], A.E. Gebhard[G], J.C. Wellemeyer[G], and **J.S. Perkin**. 2017. Diel Fish Community Turnover in Riffle Habitats. TN American Fisheries Society Meeting, Knoxville, TN. (poster).
82. Papraniku[G], I.F., **J.S. Perkin**, K. Gibbs, T.J. Slagle[U], D. Roysdon[U], B. Jones[U], C. Hall[U], D.M. Walker. 2017. Impact of water fluctuation and intermittency on stream fish

community structure. TN American Fisheries Society Meeting, Knoxville, TN. (poster).

81. Gebhard[G], A.E., **J.S. Perkin**, T.C. Boersig[G], , L.A. Hix[G], T.C. Johnson[G], and N.E. Knrop[G]. 2017. Life History Theory Predicts Long-Term Fish Assemblage Response to Impoundment Construction. Dakota Chapter American Fisheries Society Meeting, Jamestown, ND.

2016

80. Gebhard[G], A.E., and **J.S. Perkin**. 2016. Banded Sculpin (*Cottus carolinae*) life history trait variation across a stream size gradient. American Fisheries Society, Kansas City, MO.
79. Wellemeyer[G], J.C., **J.S. Perkin**, M.L. Jameson, K.H. Costigan, R. Waters. 2016. Hierarchy theory reveals multiscale threats to Arkansas Darter (*Etheostoma cragini*) in modified Great Plains riverscapes. American Fisheries Society, Kansas City, MO.
78. Malone[G], E., **J.S. Perkin**, K.Gibbs, M. Padgett[G], and M. Kulp. 2016. High and dry: Regional drought regimes regulate fish community structure in Appalachian mountain streams. American Fisheries Society, Kansas City, MO.
77. Curtis[U], W., A. Gebhard[G], and **J.S. Perkin.** 2016. Trophic ecology of Banded Sculpin (*Cottus carolinae*) across a stream size gradient in Tennessee. American Fisheries Society, Kansas City, MO. (poster)
76. Gebhard[G], A.E., W.G. Wells[G], T.C. Johnson[G], , R.T.R. Paine[G], L.A. Hix[G], H.N. Ferrel[G], A.N. Engle[G], and **J.S. Perkin**. 2016. March of the sculpin: measuring and predicting short-term movement of Banded Sculpin *Cottus carolinae*. American Fisheries Society, Kansas City, MO. (poster)
75. **Perkin, J.S.**, K.B.Gido, J. Falke, K. Fausch, H. Crockett, E. Johnson, J. Sanderson. 2016. The ecological consequences of groundwater depletion in Great Plains riverscapes. American Fisheries Society, Kansas City, MO.
74. **Perkin, J.**S., K.B. Gido, K. Costigan, M. Daniels, and E. Johnson. 2016. Fragmentation and drying ratchet down Great Plains stream fish diversity. American Fisheries Society, Kansas City, MO.
73. Brewer, S.K., T.A. Worthington, N. Farless, D. Logue, J. Dyer, **J.S. Perkin** and T. Echelle. 2016. Threats to pelagic-broadcast spawning cyprinids. American Fisheries Society, Kansas City, MO.
72. **Perkin, J.S.** 2016. Rubber bands and ratchets: why does it take so much MacGyvering to establish a long-term fish community study? Joint Meeting of Ichthyologists and Herpetologists, New Orleans, LA.
71. Gebhard[G], A.E., W.G. Wells[G], T.C. Johnson[G], R.T.R. Paine[G], L.A. Hix[G], H.N. Ferrel[G], A.N. Engle[G], and **J.S. Perkin**. 2016. Loiters, leavers, and leptokurtosis: measuring and predicting short-term movement of banded sculpin *Cottus carolinae* in Tennessee. TN American Fisheries Society Meeting, Montgomery Bell State Park, TN.
70. Wellemeyer[G], J., **J.S. Perkin**, J. Fore, J. Wisby. 2016. Watershed threats to fish communities in agriculturally dominated landscapes of West Tennessee. TN American Fisheries Society Meeting, Montgomery Bell State Park, TN.

69. Grandstaff[G], E., **J.S. Perkin**, T. Roberts, and H. Mattingly. 2016. A GIS tool for prioritizing dams for removal within the Tennessee and Cumberland rivers. TN American Fisheries Society Meeting, Montgomery Bell State Park, TN.
68. Curtis[U], W., A.E. Gebhard[G], and **J.S. Perkin**. Trophic dynamics of Banded Sculpin (Cottus carolinae) across a stream size gradient in Tennessee. TN American Fisheries Society Meeting, Montgomery Bell State Park, TN. (poster)
67. Stephenson[U], K., A.E. Gebhard[G], J. Wellemeyer[G], and **J.S. Perkin**. 2016. Testing predator control of Banded Sculpin (*Cottus carolinae*) distribution in the Blackburn Fork watershed, Tennessee. TN American Fisheries Society Meeting, Montgomery Bell State Park, TN. (poster)
66. Tankersley[U], Z, A.E. Gebhard[G], J.C. Wellemeyer[G], K. Gibbs, and **J.S. Perkin**. 2016. Forty years of fish community change in the Blackburn Fork watershed, Tennessee. TN American Fisheries Society Meeting, Montgomery Bell State Park, TN. (poster)
65. Fausch, K.D., **J.S. Perkin**, K.B. Gido, J.A. Falke, H.J. Crockett, J.S. Sanderson, and E.R. Johnson. 2016. Groundwater depletion in western Great Plains projected to dry 250 stream-km of fish habitat in the next 45 years. Joint meeting of Colorado-Wyoming American Fisheries Society, Laramie, WY.

2015

64. Falke, J.A., **J.S. Perkin**, K.B. Gido, H.J. Crockett, J.S. Sanderson, E.R. Johnson, and K.D. Fausch. 2015. Groundwater depletion in western Great Plains projected to dry 250 stream-km of fish habitat in the next 45 years. American Fisheries Society, Portland, OR.
63. Labay, B., **J.S. Perkin**, D. Hendrickson, and A.R. Cooper. 2015. Who's asking?: Inter-jurisdictional conservation assessment and planning for Great Plains fishes. American Fisheries Society, Portland, OR.
62. **Perkin, J.S.**, K.B. Gido, J.A. Falke, H.J. Crockett, J.S. Sanderson, E.R. Johnson, and K.D. Fausch. 2015. Groundwater depletion in western Great Plains projected to dry 250 stream-km of fish habitat in the next 45 years. Society for Freshwater Science Conference, Milwaukee, WI.
61. Brewer, S.K., T.A. Worthington, N. Farless, D. Logue, J. Dyer, **J.S. Perkin**, and T. Echelle. 2015. Threats to pelagic-broadcast spawning cyprinids. OK American Fisheries Society, Tulsa, OK.
60. **Perkin, J.S.**, T.C. Boersig[G], A.E. Gebhard[G], L.A. Hix[G], T.C. Johnson[G], and N.E. Knrop[G]. 2015. Life History Theory Predicts Long-Term Fish Assemblage Response to Impoundment Construction. Southeastern Fishes Council, Gainesville, FL.
59. Gebhard[G], A.E., Wells[G], W.G., T.C. Johnson[G], , R.T.R. Paine[G], L.A. Hix[G], H.N. Ferrel[G], A.N. Engle[G]., and **J.S. Perkin**. 2015. Loiterers, leavers, and leptokurtosis: measuring and predicting short-term movement of banded sculpin *Cottus carolinae* in Tennessee. Southeastern Fishes Council, Gainesville, FL.
58. Wellemeyer[G], C.J., **J.S. Perkin**, K.H. Costigan, and M.L. Jameson. 2015. Synthesizing multiscale processes regulating persistence of Arkansas Darter (*Etheostoma cragini*). Southeastern Fishes Council, Gainesville, FL.
57. Wells[G], W.G., T.C. Johnson[G], A.E. Gebhard[G], R.T.R. Paine[G], L.A. Hix[G], H.N. Ferrel[G], A.N. Engle[G], and **J.S. Perkin**. 2015. Measuring and predicting short-term movement

of Banded Sculpin *Cottus carolinae* in a second-order, upland stream in middle-Tennessee. TN Academy of Science, Murfreesboro, TN.

56. Wellemeyer[U], C.J., **J.S. Perkin**, and M.L. Jameson. 2015. Environmental associations of Arkansas Darter (*Etheostoma cragini*) after sterilization of a prairie stream. KS Academy of Science, Pittsburg, KS.
55. **Perkin, J.S.**, and E. Granstaff. 2015. Multi-scale prioritization of dam removals to benefit aquatic biodiversity in Tennessee. TN American Fisheries Society, Chattanooga, TN.
54. Wellemeyer[U], CJ, **J.S. Perkin**, and M.L. Jameson. 2015. Fish community structure and environmental associations of Arkansas Darter (*Etheostoma cragini*) one decade after human-induced sterilization of a Great Plains prairie stream. KS American Fisheries Society, Wichita, KS.
53. **Perkin, J.S.**, and J.N. Murdock. 2015. Modeling ecosystem effects of fishes across stream network gradients. Southern Division American Fisheries Society, Savannah, GA.
52. Worthington, T.A., S.K. Brewer, J.J. Dyer, N. Farless, D. Longue, R. Mollenhauer, and **J.S. Perkin**. 2015. Pelagic-broadcast spawning cyprinids: ecology and conservation opportunities. Southern Division American Fisheries Society, Savannah, GA.
51. Nowlin, W.H., C.L. Pray, A.P. Swink, and **J.S. Perkin**. 2015. Contributions of native and non-native fishes to nutrient cycling in a spring-fed river. Southern Division American Fisheries Society, Savannah, GA.

2014

50. **Perkin, J.S.**, K.B. Gido, T.F. Turner, M.J. Osborne. 2014. Multi-scale effects of stream fragmentation and dewatering on Great Plains fishes: community dynamics, species distributions, and genetic diversity. Joint Aquatic Science Meeting, Portland, OR.
49. **Perkin, J.S.**, K.B. Gido, K.H. Costigan, M.D. Daniels, and E.R. Johnson. 2014. Ratcheting down Great Plains fish communities. Southwest Association of Naturalist, Stillwater, OK.
48. **Perkin, J.S.**, K.B. Gido, K.H. Costigan, M.D. Daniels, T.F. Turner, M.J. Osborne, A.R. Cooper, E.R. Johnson, K.B. Mayes. 2014. Fish diversity loss among fragmented and dewatered riverscapes in the central Great Plains. Joint meeting of the Texas-Oklahoma Chapters of the American Fisheries Society, Pottsboro, TX.
47. **Perkin, J.S.**, K.B.Gido, K.H. Costigan, M.D. Daniels, T.F. Turner, M.J. Osborne, A.R. Cooper, E.R. Johnson, K.B. Mayes. 2014. Fish diversity loss among fragmented and dewatered riverscapes in the central Great Plains. Kansas Natural Resources Conference, Wichita, KS.

2013

46. **Perkin, J.S.**, and B.M. Pracheil. 2013. Threats and opportunities for fish habitat connectivity conservation in the Missouri River basin at multiple scales. American Fisheries Society, Little Rock, AR.
45. Gido, K.B., J.E. Whintney, **J.S. Perkin**, T.F. Turner. 2013. Ecological and evolutionary consequences of fragmentation of river networks. American Society of Ichthyologists and Herpetologists, Albuquerque, NM.

44. Curtis, S.G., **J.S. Perkin**, P.T. Bean, M.S. Sullivan, and T.H. Bonner. 2013. Guadalupe bass, *Micropterus treculii*. Southern Division American Fisheries Society, Nashville, TN. (poster).
43. **Perkin, J.S.**, Z.R. Shattuck, G.E. Gerken, and T.H. Bonner. 2013. Stream fragmentation and drought legacy determine distribution of burrhead chub in subtropical streams. TX American Fisheries Society, Lake Conroe, TX.

2012

42. **Perkin, J.S.**, K.B. Gido, K.H. Costigan, M.D. Daniels, and E. Johnson. 2012. Distribution of cyprinid fish reproductive guilds in a fragmented Great Plains Riverscape. American Fisheries Society, St. Paul, MN.
41. **Perkin, J.S.**, K.B. Gido, O. Al' Ta-Ani, and C. Scoglio. 2012. Structural connectivity predicts functional connectivity for fishes in fragmented dendritic ecological networks. American Fisheries Society, St. Paul, MN. (poster)
40. **Perkin, J.S.**, K.B. Gido, E.R. Johnson, T.F. Turner, M.J. Osborne, and K.B. Mayes. 2012. Stream fragmentation and desiccation as broad-scale drivers of fish decline in the Great Plains. Midwest Fish and Wildlife Meeting, Wichita, KS.
39. **Perkin, J.S.**, N. Dameyer, and T.H. Bonner. 2012. Long-term changes in water quality and fish assemblage composition in the Trinity River of Texas. TX American Fisheries Society, Galveston, TX.
38. **Perkin, J.S**., J.E. Gerken, Z.R. Shattuck, and T.H. Bonner. 2012. Life history and population status of burrhead chub (*Macrhybopsis marconis*) in the Western Gulf Slope drainages of Texas. TX American Fisheries Society, Galveston, TX.
37. **Perkin, J.S.**, and K.B. Gido. 2012. Effects of road crossings on the abundance and distribution of prairie stream fishes in Kansas. Kansas Natural Resources Conference, Wichita, KS.
36. Starks^{U}, T.A., **J.S. Perkin**, K.B. Gido, and E. Johnson. 2012. Spatial and temporal variation in the Ninnescah River fish assemblage. Kansas Natural Resources Conference, Wichita, KS. (poster).
34. Alexander^{U}, A.M., and **J.S. Perkin**. 2012. Feeding ecology of a relict cardinal shiner population in Kansas. Kansas Natural Resources Conference, Wichita, KS. (poster).
33. Shaw^{U}, D.C.R., **J.S. Perkin**, G.E. Gerken, and K.B. Gido. 2012. Influence of watershed impoundments on prairie stream fish assemblage structure. Kansas Natural Resources Conference, Wichita, KS.

2011

32. **Perkin, J.S.**, and K.B. Gido. 2011. Prairie stream fish community structure and related effects of semi-permeable barriers. American Fisheries Society, Seattle, WA.
31. **Perkin, J.S.**, and K.B. Gido. 2011. Stream fragmentation thresholds for a reproductive guild of Great Plains fishes. American Fisheries Society, Seattle, WA. (poster)
30. Dodds, W.K., J.E. Gerken, and **J.S. Perkin**. 2011. Human impact on freshwater systems scaled by relative influence on ecosystems goods and services. North American Benthological Society, Providence, RI.
29. **Perkin, J.S.**, and K.B. Gido. 2011. Great Plains fish community structure in prairie streams fragmented by road crossings. Oklahoma-Texas Aquatic Research Group, Lake Texoma, OK.

28. Shaw[U], D.C.R., **J.S. Perkin**, G.E. Gerken, and K.B. Gido. 2011. Effects of impoundments on prairie stream fishes. Southwestern Association of Naturalists, Tyler, TX.
27. **Perkin, J.S.**, and K.B. Gido. 2011. Stream fragmentation thresholds for a reproductive guild of Great Plains fishes. Kansas Academy of Science, Baldwin City, KS.
26. Shaw[U], D.C.R., **J.S. Perkin**, J.E. Gerken, and K.B. Gido. 2011. Effects of small impoundments on prairie stream fishes. Kansas State University Undergraduate Research Forum. (poster).
25. **Perkin, J.S.**, Z.R. Shattuck, and T.H. Bonner. 2011. Life history aspects of a relict ironcolor shiner population in a novel spring environment. TX American Fisheries Society, San Marcos, TX.
24. **Perkin, J.S.**, and K.B. Gido. 2011. Stream fragmentation thresholds for Great Plains pelagic-spawning fishes. TX American Fisheries Society, San Marcos, TX.
23. Kollaus, K.A., **J.S. Perkin**, R.A. Meyers, and T.H. Bonner. 2011. Feeding ecology of introduced smallmouth bass in the Devils River, Texas. TX American Fisheries Society, San Marcos, TX.
22. **Perkin, J.S.**, and K.B. Gido. 2011. Stream fragmentation thresholds for Great Plains pelagic-spawning fishes. Kansas Natural Resources Conference, Wichita, KS.
21. Shaw[U], D.C.R., **J.S. Perkin**, and K.B. Gido. 2011. Effects of impoundments on prairie stream fishes. Kansas Natural Resources Conference, Wichita, KS.
20. Maine[U], J., A. Alexander, J. Rezek, D. Shaw, J. Fischer, J. Gerken, and **J.S. Perkin**. 2011. Spatiotemporal patterns in the fish community of a connected floodplain pond. Kansas Natural Resources Conference, Wichita, KS. (poster)

2010

19. **Perkin, J.S.**, and K.B. Gido. 2010. Status of pelagic-spawning cyprinid communities within fragmented Great Plains Prairie Streams of North America. American Fisheries Society, Pittsburgh, PA.
18. **Perkin, J.S.**, and K.B. Gido. 2010. Effects of fragmentation on fish distribution and community structure in Great Plains prairie stream networks. North American Benthological Society, Santa Fe, NM.
17. **Perkin, J.S.**, and K.B. Gido. 2010. Riverscape fragmentation, hydrologic alteration, and decline of pelagic-spawning fishes in the Great Plains of North America. The Southwestern Association of Naturalists, Junction, TX.
16. **Perkin, J.S.**, and K.B. Gido. 2010. Influence of hydrologic alteration and riverscape fragmentation on distribution and abundance of plains minnow *Hybognathus placitus*. Midwest Fisheries Student Colloquium, Manhattan, KS.
15. **Perkin, J.S.**, and K.B. Gido. 2010. Influence of hydrologic alteration and riverscape fragmentation on distribution and abundance of plains minnow *Hybognathus placitus*. Kansas Natural Resource Conference, Wichita, KS.

2009

14. **Perkin, J.S.**, Z.R. Shattuck, P. Bean, T.H. Bonner, K. Saraeva and T.B. Hardy. 2009. Movement and microhabitat associations of Guadalupe bass in two Texas rivers. American Fisheries Society, Nashville, TN.

13. **Perkin, J.S.** and T.H. Bonner. 2009. Changes in hydrology and fish assemblage composition in the headwaters of the Guadalupe River, Texas 1938-2006. American Fisheries Society, Nashville, TN.
12. Hardy, T.B., **J.S. Perkin**, and T.H. Bonner. 2009. Moving beyond a flat river: multidimensional attributing of river characteristics for aquatic resource investigations. International Symposium on Ecohydraulics, Conception, Chile.
11. **Perkin, J.S.**, Z.R. Shattuck, and T.H. Bonner. 2009. Movement and habitat associations of Guadalupe bass: implications for conservation and the science behind riverine bass angling. Canyon Lake Bass Club annual scholarship meeting, San Marcos, TX.
10. **Perkin, J.S.** and T.H. Bonner. 2009. Ichthyofaunal responses to hydrologic variation in a lotic system: a long-term, species and assemblage scale approach. Southern Division American Fisheries Society, New Orleans, LA.
9. Folb, C.F., **J.S. Perkin**, Z.R. Shattuck and T.H. Bonner. 2009. Life histories of the Guadalupe darter *Percina shumardi* and river dater *Percina apristis*. Texas State University-San Marcos Aquatic Biology Seminar, San Marcos, TX.
8. **Perkin, J.S.**, Z.R. Shattuck, P. Bean, T.H. Bonner, K. Saraeva, and T.B. Hardy. 2009. Movement and microhabitat associations of Guadalupe bass in two Texas rivers. TX American Fisheries Society, Fort Worth, TX.
7. Folb, C.F., **J.S. Perkin**, Z.R. Shattuck and T.H. Bonner. 2009. Life histories of the Guadalupe darter *Percina shumardi* and river dater *Percina apristis*. TX American Fisheries Society, Fort Worth, TX.

2008

6. **Perkin, J.S.**, Z.R. Shattuck, T.H. Bonner and T.H. Hardy. 2008. Movement and microhabitat associations of Guadalupe bass *Micropterus treculii* in two Texas rivers. North American Native Fish Association, Athens, TX.
5. **Perkin, J.S.**, Z.R. Shattuck, P. Bean, T.H. Bonner and T.B. Hardy. 2008. Movement and microhabitat associations of Guadalupe bass *Micropterus treculii* in two Texas rivers. Texas State University Aquatic Biology Society Seminar, San Marcos, TX.

2007

4. **Perkin, J.S.**, C.S. Williams and T.H. Bonner. 2007. Life history of the chub shiner in the lower Brazos River with comments on conservation status and native distribution. American Fisheries Society, San Francisco, CA (poster).
3. **Perkin, J.S.**, C.S. Williams and T.H. Bonner. 2007. Conservation status and life history of the chub shiner in the lower Brazos River. Texas State University-San Marcos Student Colloquium.
2. **Perkin, J.S.**, C.S. Williams and T.H. Bonner. 2007. Conservation status and life history of the chub shiner in the lower Brazos River. TX American Fisheries Society, Lake Jackson, Texas.

2006

1. **Perkin, J.S.** and J. Trungale. 2006. Historical changes in fish assemblages of the Cypress Creek Drainage. Caddo Lake Institute Instream Flows Workshop, Jefferson, Texas.

5. Grants

5.1 Summary of grants and awards

Type	Since TAMU Appointment		Career	
	Total	To Perkin	Total	To Perkin
External	$18,311,694	$2,866,632	$18,637,817	$3,061,922
Internal	$0	$0	$9,997	$9,997
Total	$18,311,694	$2,866,632	$18,647,814	$3,071,919

5.2 External grants since appointment at Texas A&M University

Funding Source	PI/co-PI	Total	To Perkin	Dates	Title
U.S. Army corps of Engineers	Co-PI	$6,750,000	$992,853	2024-2026	Riverine communities and ecosystem responses to a changing world
Texas Comptroller of Public Accounts	PI	$498,658	$211,923	2023-2026	Assessing Historical and Contemporary Distributions of Freshwater Fishes in the Neches River Watershed with Emphasis on Long-Term Trends and Monitoring for Mussel Host Fishes
Texas Comptroller of Public Accounts	PI	$444,681	$147,941	2023-2026	Assessing Historical and Contemporary Distributions of Freshwater Fishes in the Upper Sabine River Watershed with Emphasis on Long-Term Trends and Monitoring for Mussel Host Fishes
National Science Foundation	Co-PI	$1,596,980	$210,768	2022-2024	Conservation incentives and the socio-spatial dynamics of water sustainability

U.S. Army Corps of Engineers	Co-PI	$7,500,000	$355,586	2021-2023	Multiscale patterns and predictors of fish distributions in five Texas river basins
Texas Parks and Wildlife Department	PI	$109,400	$109,400	2022-2024	Distribution, abundance, and current status of Llano River Carpsucker (*Carpiodes* sp. cf. *carpio*)
Texas Parks and Wildlife Department	PI	$50,419	$50,419	2021-2022	Assessing abundance, sex ratio, and space use by suckermouth armored catfish to enhance control efforts
Texas Parks and Wildlife Department	PI	$141,558	$141,558	2019-2022	Measuring and predicting movement ecology for imperiled Great Plains fishes in Texas
Texas Parks and Wildlife Department	PI	$99,641	$99,641	2020-2022	Lateral movements and tributary habitat uses of alligator gar in the lower Brazos River
The Nature Conservancy	PI	$10,000	$10,000	2019-2020	GPLCC flow protection and restoration development project
The Texas Water Development Board	Co-PI	$245,000	$38,586	2019-2021	Environmental flow regime assessment and development of a monitoring framework
Texas Parks and Wildlife Department	PI	$200,000	$200,000	2018-2021	Temporal trajectories and landscape correlates for stream fish community change
Edwards Aquifer Authority	PI	$40,000	$40,000	2017-2018	Statistical analysis of the San Marcos and Comal Springs datasets

Florida Fish and Wildlife Conservation Commission	Co-PI	$424,113	$56,713	2017-2018	Evaluating degree of aquatic habitat fragmentation by incorporating culverts into the Florida barrier inventory
Texas Parks and Wildlife Department	PI	$91,218	$91,218	2019-2022	Ecological forecasting and conservation contingency planning for imperiled Great Plains fishes in Texas
Oklahoma Department of Wildlife Conservation	PI	$110,026	$110,026	2018-2021	Life history and flow-ecology relationships of Prairie Chub: an endemic Great Plains cyprinid

5.3 Grants prior to appointment at Texas A&M University

Funding Source	PI/co-PI	Total	To Perkin	Dates	Title
Tallassee Fund and TN Tech University Water Center	PI	$96,270	$96,270	2016-2018	Prioritizing fish reintroductions in lower Abrams Creek, Great Smoky Mountains Natl Park
TN Natural Resources Agency and TN Tech University Water Center	PI	$96,270	$96,270	2016-2018	West Tennessee fish index of biological integrity
TN Tech University Faculty Research Grant Program	PI	$9,997	$9,997	2015-2016	Multidisciplinary evaluation of aquatic biodiversity response to water shortages
Kansas Academy of Science	PI	$1000	$1000	2010	Influence of stream fragmentation on Great Plains fishes
North American Native Fishes Association	PI	$750	$750	2009	Evolutionary response of a relict ironcolor shiner population to a novel spring environment

6. Teaching

6.1 List of courses taught at Texas A&M University

Course #	Title	Credit	Year	Semester	Mean	Dept. Mean	Response	Enrollment
WFSC/RWFM 410	Principles of Fisheries Management	4	2018	Fall	4.46	4.29*	24	33
			2019	Fall	4.97	4.39*	34	36
			2020	Fall	4.90	4.42*	10	31
			2021	Fall	4.90‡	§	10	31
			2022	Fall	§	§	§	36
			2023	Fall	§	§	§	§
			2024	Fall	§	§	§	§
WFSC/ECCB 631	Ecological Applications in R	3	2018	Spring	4.50	4.41†	14	17
			2019	Spring	4.88	4.29†	8	19
			2020	Spring	5.00	4.78†	2	11
			2021	Spring	4.71	§	7	16
			2022	Spring	§	§	§	18
			2023	Spring	§	§	§	§
WFSC 484	Internship in Wildlife and Fisheries Sciences	1-3	2018	Fall	-	-	-	2
			2019	Spring	-	-	-	1
			2019	Fall	-	-	-	3
			2020	Spring	-	-	-	2
			2020	Fall	-	-	-	1
			2021	Spring	-	-	-	2
			2021	Fall	-	-	-	2
WFSC 491	Research	1-3	2018	Spring	-	-	-	2
			2018	Fall	-	-	-	1
			2019	Spring	-	-	-	1
			2019	Fall	-	-	-	1
			2020	Spring	-	-	-	1
			2021	Fall	-	-	-	1
			2022	Spring	-	-	-	3
EEBL 604	Ecosystem Ecology	1	2017	Fall	-	-	-	6
			2018	Fall	-	-	-	13
			2019	Fall	-	-	-	15
			2020	Fall	-	-	-	15

* Mean scores across all undergraduate lecture course levels for WFSC faculty
† Mean scores across all graduate lecture course levels for WFSC faculty
‡ Score based on question: “The instructor fostered an effected learning environment”
§ Scores not yet available

6.2 List of courses taught at Tennessee Technological University

Course #	Title	Credit	Year	Semester	Mean	Responses
BIOL3130	General Ecology	4	2017	Spring	§	§
			2016	Spring	4.5/5.0	39
			2015	Fall	4.4/5.0	18

BIOL4810	Ichthyology	4	2016 2015 2014	Fall Fall Fall	5.6/5.0 4.6/5.0 4.4/5.0	15 19 16
BIOL6980	Biological Analysis in R	3	2016	Fall	4.6/5.0	4
BIOL6660	Fish Ecology	3	2015	Spring	4.8/5.0	5
BIOL6140	Fish & Wildlife Biometrics	3	2016	Spring	4.1/5.0	11
BIOL6980	Ecological Ordination	3	2015	Spring	4.2/5.0	7

§ Scores not available

6.3 Graduate student research program

Dr. Perkin has chaired 18 graduate student committees and served as a member on 28 others.

6.3.1 Summary of graduate students

Degree	Current		Graduated	
	Chair	**Member**	**Chair**	**Member**
Ph.D.	4	7	2	5
M.S. Thesis	5	1	7	15
Total	**9**	**8**	**9**	**20**

6.3.2 Current graduate students

Student	Program	Degree	Committee	Enrolled	Expected Graduation
Hayden Roberts	ECCB	Ph.D.	Chair	Summer 2022	Spring 2026
Rose Blanchard	ECCB	Ph.D.	Chair	Fall 2021	Fall 2024
Jacob Barrett	ECCB	Ph.D.	Chair	Fall 2023	Spring 2027
Thomas Dodson	EEBL	Ph.D.	Chair	Fall 2023	Spring 2027
Rebecca Mangold	ECCB	M.S.	Chair	Spring 2023	Spring 2025
Johnathan Ellard	ECCB	M.S.	Chair	Fall 2023	Spring 2025
Jacob Wolff	ECCB	M.S.	Chair	Fall 2023	Spring 2025
Meghan Booknis	ECCB	M.S.	Chair	Fall 2024	Spring 2026
Calvin Young	ECCB	M.S.	Chair	Fall 2024	Spring 2026
Hannah Bleth	ECCB	M.S.	Member	Fall 2023	Spring 2025
Milton Torres	ECCB	Ph.D.	Member	Fall 2019	Spring 2025
Owen Dorsey	BIOL	Ph.D.	Member	Fall 2019	Spring 2025
Ryan Weesner	EEBL	Ph.D.	Member	Fall 2019	Spring 2025
Miriam Catalan	ECCB	Ph.D.	Member	Spring 2020	Summer 2024
Langston Haden	U. South. Mississippi	Ph.D.	Member	Spring 2020	Fall 2024
Griffin Nicholson	EEBL	Ph.D.	Member	Fall 2021	Fall 2025
Bentos Fry	EEBL	Ph.D.	Member	Fall 2021	Fall 2025

6.3.3 Former graduate students

Student	Program	Degree	Committee	Enrolled	Graduation
Noah Santee	ECCB	M.S.	Chair	Spring 2022	Fall 2023
Zachary Steffensmeier	EEBL	Ph.D.	Chair	Fall 2018	Fall 2022
Lindsey Elkins	ECCB	M.S.	Chair	Fall 2021	Fall 2022
Erin Nguyen	EEBL	Ph.D.	Chair	Fall 2018	Summer 2022
Hayden Roberts	ECCB	M.S.	Chair	Spring 2019	Spring 2022
Stephanie George Parker	WFSC	M.S.	Chair	Spring 2018	Fall 2019
Eric Malone	Tennessee Tech. U.	M.S.	Chair	Spring 2016	Fall 2017
Corrine Juju Wellemeyer	Tennessee Tech. U.	M.S.	Chair	Fall 2015	Fall 2017
Amy Doll Gebhard	Tennessee Tech. U.	M.S.	Chair	Spring 2015	Fall 2016
Sarah Turner	RWFM	Ph.D.	Member	Fall 2018	Spring 2024
Nicol Scavo	EEBL	Ph.D.	Member	Fall 2021	Fall 2024
Yasmin Quintana	ECCB	Ph.D.	Member	Fall 2018	Fall 2023
Matthew Jake Madewell	ESSM	M.S.	Member	Spring 2019	Fall 2022
Jared Schlottman	RWFM	M.S.	Member	Fall 2020	Fall 2022
Cole Reeves	U. of North Texas	M.S.	Member	Fall 2019	Spring 2021
Aaron Trimble	ESSM	M.S.	Member	Spring 2019	Fall 2020
Michaela Pawluck	WFSC	Ph.D.	Member	Spring 2018	Fall 2020
Zachary Mitchell	Texas State University	Ph.D.	Member	Fall 2017	Fall 2020
Desiree Moore	Oklahoma State U.	M.S.	Member	Fall 2018	Fall 2020
Liliana Castillo	WFSC	M.S.	Member	Spring 2018	Fall 2019
Skylar Wolf	Oklahoma State U.	M.S.	Member	Fall 2017	Spring 2019
Aine Carrol	Texas State University	M.S.	Member	Spring 2016	Fall 2017
Isabel Papraniku	Tennessee Tech. U.	M.S.	Member	Spring 2016	Fall 2017
Jake Leys	Tennessee Tech. U.	M.S.	Member	Fall 2015	Spring 2017
Jason Payne	Tennessee Tech. U.	M.S.	Member	Fall 2015	Spring 2017
Heather Ferrell	Tennessee Tech. U.	M.S.	Member	Fall 2014	Spring 2016

Casey Pennock	Kansas State University	M.S.	Member	Fall 2015	Spring 2017
Josey Ridgway	Tennessee Tech. U.	M.S.	Member	Fall 2014	Spring 2016
Emily Granstaff	Tennessee Tech. U.	M.S.	Member	Fall 2014	Spring 2016

6.3.4 Visiting international student advisees

Name	Years	Project	Home Institution
Maximiliaan Claus	2020	Applying fish movement ecology principles to alligator gar	Wageningen University, Netherlands
Florian Kappen	2020	Synthesis of management of alligator gar	Wageningen University, Netherlands

6.3.5 Postdoctoral advisees

Name	Years	Project	Current Position
Tomasz Koralewski	2024-2025	NSF-funded project on dynamics of integrated socio-environmental systems Red River Basin	-
Christopher Kopack	2023-2024	NSF-funded project on dynamics of integrated socio-environmental systems Red River Basin	U.S. Forest Service
Matthew Acre	2019-2020	New methods for imperiled fish population estimation	U.S. Geological Survey

6.4 Undergraduate student researchers

*Student from underrepresented groups in fisheries science
†Student also advised by graduate student in the lab

Name	Year Began & University	# of Semesters	# of Presentations Delivered	Co-author on publication	Expected co-author on publication
Blake Elzi	2023 TAMU	2	3		
Emilee Holderness*	2022 TAMU	1	0		Y
Meghan Booknis	2022 TAMU	2	1		Y
Hannah Evans*	2022 TAMU	2	1		Y
Wesley Arend	2021 TAMU	2	1		Y
Lucas Stevens†	2021 TAMU	3	1		Y
Rebecca Mangold*	2021 TAMU	3	1		Y
Jacob Wolff	2021 TAMU	3	1		Y
Brynn Johnson*	2021 TAMU	1	0		
Hailey Binkley*	2021 TAMU	1	1	Y	
Johnathan Ellard†	2020 TAMU	4	2		Y

Cade Cottar†	2020 TAMU	4	2		Y
Noah Santee	2020 TAMU	4	3	Y	
Lauren Yancy*	2019 TAMU	5	8	Y	
Allison Hay*	2020 TAMU	2	1	Y	
Caleb Blanton*	2019 TAMU	2	2	Y	
Emily Parker	2019 TAMU	2	1		Y
Chase Corrington	2018 TAMU	3	2		
Austin Stafford	2018 TAMU	2	0	Y	
Jayne Ecker*	2018 TAMU	2	1	Y	
Jake Madewell	2017 TAMU	4	5		Y
Fernando Chavez*	2017 TAMU	4	5		Y
Joshua Heitikko	2017 TAMU	2	1		
Nick Loveland	2017 TAMU	2	1		
Tyler Slagle	2017 TTU	1	3		
Shannon Murphy*	2016 TTU	2	3	Y	
Codi Underwood*	2016 TTU	2	3		
Kelsey Stephenson*	2016 TTU	2	1		
Zac Tankersley	2016 TTU	2	1		
Will Curtis	2015 TTU	4	10	Y	
TOTAL	-	71	63	9	7

7 Service

7.1 Service to the Department of Ecology and Conservation Biology (ECCB)/Wildlife and Fisheries Sciences (WFSC)

Committee	Department	Role	Years
Graduate Programs Committee	ECCB	Chair	2024-current
Tenure-Track Faculty Search Committee	ECCB	Member	2024
Undergraduate Programs Committee	ECCB	Member	2021-2024
Undergraduate Curriculum Development Committee	ECCB	Member	2020-2021
Undergraduate Curriculum Implementation Committee	WFSC	Member	2018-2019
Seminar Committee	WFSC	Member	2017-2019
Wildlife and Fisheries Sciences Curriculum Committee	TTU-Biology	Member	2014-2016
Equipment and Technology Committee	TTU-Biology	Member	2014-2016
Public Relations Committee	TTU-Biology	Member	2014-2016

7.2 Service to Texas A&M University

Program	Role	Years

Student Subunit of the American Fisheries Society	Advisor	2017-present
Ecology and Evolutionary Biology IDP	Core Member	2018-present
EEB Seminar Committee	Member	2019-2021

7.3 Service to professional societies

Society	Committee	Role	Years
Texas Chapter American Fisheries Society	Executive Committee	President Elect	2024
Texas Chapter American Fisheries Society	Student Outreach Committee	Chair	2018-2024
American Fisheries Society	Publications Overview Committee	Member	2021-present
American Fisheries Society	Imperiled Species Committee	Member	2017-present
American Fisheries Society	Imperiled Species Committee	Past-President	2016-2017

7.4 Professional society memberships

American Fisheries Society
Texas Chapter American Fisheries Society
Society for Freshwater Science
Desert Fishes Council

7.5 Service to the scientific community

7.5.1 Journal reviewer

American Midland Naturalist, Aquatic Conservation – Marine and Freshwater Ecosystems, Aquatic Ecology, Biological Invasions, Canadian Journal of Fisheries and Aquatic Sciences, Copeia, Ecology, Ecology and Evolution, Ecology of Freshwater Fish, Ecological Applications, Ecological Engineering, Ecological Modelling, Ecosphere, Environmental Management, Fisheries, Freshwater Biology, Freshwater Science, Global Change Biology, Hydrobiologia, Journal of Applied Ecology, Journal of Fish Biology, Journal of Freshwater Ecology, Knowledge and Management of Aquatic Ecosystems, Landscape Ecology, Marine and Coastal Fisheries, Marine and Freshwater Research, North American Journal of Fisheries Management, PeerJ, PLoS One, Restoration Ecology, River Research and Applications, Southeastern Naturalist, Southwestern Naturalist, Transactions AFS, Western North American Naturalist, WIREs Water

7.5.2 Journal editorial service

Journal	Role	Years
Fisheries	Editorial Board	2023-present
Frontiers in Environmental Science	Editorial Board	2023-present
Ecology of Freshwater Fish	Editorial Board	2022-present
Northa American Journal of Fisheries Management	Visiting Associate Editor	2022-2023

7.5.3 Peer review of species listings

Dr. Perkin participates in workshops and provides peer-review of U.S. Fish and Wildlife Service species status assessments, recovery plans, and recovery implementation plans, as well as Texas Parks and Wildlife Department species of greatest conservation need assessments.

Species	Agency	Service provided
Arkansas River Shiner (*Notropis Girardi*)	U.S. Fish and Wildlife Service	Species status assessment workshop participation
Peppered Chub (*Macrhybopsis tetranema*)	U.S. Fish and Wildlife Service	Species status assessment workshop participation
Smalleye Shiner (*Notropis buccula*)	U.S. Fish and Wildlife Service	Recovery plan and recovery implementation plan peer-review
Sharpnose Shiner (*Notropis oxyrhynchus*)	U.S. Fish and Wildlife Service	Recovery plan and recovery implementation plan peer-review
Texas fish Species of Greatest Conservation Need	Texas Parks and Wildlife Department	Species status assessment workshop participation

7.6 Service to the public

7.6.1 River cleanups

River System	Organization	Year
San Marcos River	Texas River Protection Association	2022
San Marcos River	Texas River Protection Association	2020
White Creek	TAMU Student Subunit of the American Fisheries Society	2019

7.6.2 Press engagement

Research conducted by Dr. Perkin has received local, regional, national, and international media attention.

Year	Media Outlet	Title	Web Link
2022	Texas Parks and Wildlife Television	Fighting an Armored Invasion	https://www.youtube.com/watch?v=P3kcQqu5c1M
2022	Agrilife Today	Detecting Texas Drought Conditions with Small Fish	https://agrilifetoday.tamu.edu/2022/01/21/detecting-texas-drought-conditions-with-small-fish/
2022	Smithsonian Magazine	More Than 400 Invasive Fish Dumped from Aquariums Found in Texas River	https://www.smithsonianmag.com/smart-news/four-hundred-invasive-fish-dumped-from-aquariums-found-in-texas-river-180979485/

2022	Newsweek	More Than 400 Invasive Fish Dumped from Aquariums Found in River	https://www.newsweek.com/more-400-invasive-fish-dumped-aquariums-found-river-1670901
2022	Spectrum News	Texas Parks and Wildlife Reports 406 Invasive Fish Removed from San Marcos River	https://spectrumlocalnews.com/tx/south-texas-el-paso/news/2022/01/26/texas-parks-and-wildlife-reports-406-invasive-fish-removed-from-san-marcos-river
2020	Brave Wilderness	Catching a RARE Crocodile Gar!	https://www.youtube.com/watch?v=WQAZenZq5zo
2020	Brave Wilderness	GAR WARS! The Battle to Save this GIANT Fish!	https://www.youtube.com/watch?v=QuZwgnXMbsg
2020	Brave Wilderness	GIANT FISH CAUGHT - Real River Monster!	https://www.youtube.com/watch?v=MbMcYTJ2VnQ
2020	Brave Wilderness	MURDER IN TEXAS - a BIG FISH Crime Story!	https://www.youtube.com/watch?v=fUG0DgjuPVc
2020	TAMU ECCB Newsletter	A Stake in the Game	https://eccb.tamu.edu/stake-in-the-game/
2020	EAHCP Newsletter	Tag… You're it! Invasive Catfish Tagging Study to Help Assist EAHCP Removal Programs	https://ae0ec937-6ecf-4655-8267-4339e5b8e509.filesusr.com/ugd/3c31eb_eb0a9612ff8a4910aed9800240d0a552.pdf
2019	NPR All Things Considered	Irrigation For Farming Could Leave Many Of The World's Streams And Rivers Dry	https://www.npr.org/sections/thesalt/2019/10/02/766510790/irrigation-for-farming-could-leave-many-of-the-worlds-streams-and-rivers-dry
2018	Morning AgClips	Scientists Find Mexican Fish Never Identified in U.S.	https://www.morningagclips.com/scientists-find-mexican-fish-never-identified-in-u-s/
2018	Futurity	Rare Mexican Fish is a Surprise Discovery in Texas	https://www.futurity.org/cyprinella-panarcys-fish-1934262/
2018	In the Drift	Article Spotlight: The RCC Predicts Prey Assemblage Structure for Fish	https://freshwater-science.org/news/in-drift-issue-32-fall-2018
2017	Texas Water Resource Institute	Meet a Scientist: Joshuah Perkin	https://twri.tamu.edu/news/2017/november/meet-a-scientist-joshuah-perkin/
2017	ScienceDaily	Loss of 350 Miles of Great Plains Streams	https://www.sciencedaily.com/releases/2017/08/170802102803.htm

		Causing Changes in Aquatic Food Web	
2015	ScienceDaily	Aquatic Ecologist Says Dams are Boxing in Fish, Causing Them to Disappear from Kansas	https://www.sciencedaily.com/releases/2015/04/150428105633.htm
2014	Environmental Monitor	Study of Texas' Trinity River Shows 40 years of Improved Water Quality and Fish Diversity	https://www.fondriest.com/news/study-texas-trinity-river-shows-40-years-improved-water-quality-fish-diversity.htm
2013	Great Bend Tribune	Study: Drought Impacting Fish Populations	https://www.gbtribune.com/news/local-news/news2/study-drought-impacting-fish-populations/
2009	Bass Master Magazine	The 'Other' Bass Destinations	https://www.espn.com/outdoors/bassmaster/news/story?page=b_bm_mag_slam_other_dest

8 Awards

8.1 University Awards

Year	University Unit	Award
2022	Texas A&M University College of Agriculture and Life Sciences	Dugas Early Career Award for Research Excellence
2022	Texas A&M University Department of Ecology and Conservation Biology	Faculty Undergraduate Teaching Award
2020	Texas A&M University	Adair Student Organization Advisor of the Year

8.2 Society Awards

Dr. Perkin has received awards from the Education Section of the American Fisheries Society, Texas, Tennessee, and Colorado/Wyoming chapters of the American Fisheries Society, the Southern Division of the American Fisheries Society, and the Southeastern Fishes Council.

Year	Society	Award
2023	Texas Chapter American Fisheries Society	Outstanding Fisheries Research Worker of the Year
2022	Education Section American Fisheries Society	Early Career Fisheries Education Award
2022	Texas Chapter American Fisheries Society	Outstanding Fisheries Education Worker of the Year

2022	Desert Fishes Council	Carl L. Hubbs Award for Best Student presentation to coauthor Lindsey Elkins
2022	Texas Chapter American Fisheries Society	Best Student Poster Presentation to coauthor Rebecca Mangold
2022	Texas Chapter American Fisheries Society	Best Student Oral Presentation to coauthor Erin Nguyen
2021	Texas Chapter American Fisheries Society	Best Professional Poster Presentation
2020	Texas Chapter American Fisheries Society	Best Professional Poster Presentation
2020	Texas Chapter American Fisheries Society	Best Student Poster Presetnation to coauthor Lauren Yancy
2019	Texas Chapter American Fisheries Society	Best Professional Presentation
2019	Southern Division American Fisheries Society	Best Student Poster Presentation to coauthor Erin Nguyen
2018	Texas Chapter American Fisheries Society	Best Professional Presentation
2017	Southeastern Fishes Council	Best Student Paper to coauthor Eric Malone
2017	Tennessee Chapter American Fisheries Society	Best Student Paper to coauthor Eric Maline
2017	Tennessee Chapter American Fisheries Society	Best Student Paper to coauthor Juju Wellemeyer
2017	Tennessee Chapter American Fisheries Society	Best Student Poster to coauthor Isabel Papraniku
2016	Tennessee Chapter American Fisheries Society	Best Student Paper award to coauthor Amy Gebhard
2016	Colorado/Wyoming Chapter American Fisheries Society	Best Professional Presentation to coauthor Kirk Fausch
2015	Southeastern Fishes Council	Best Student Paper award to coauthor Amy Gebhard
2015	Texas Chapter American Fisheries Society	Best Professional Presentation

Appendix M6 | **Science Committee**

Edwards Aquifer Authority

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

NOTICE OF OPEN MEETING

EAHCP Science Committee

Thursday, March 7, 2024 | **9:00 AM** | **EAA Board Room**

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

4. Approval of Minutes

4.1 **Approval of previous Committee meeting minutes.**
- September 6, 2023

5. Individual Consideration

5.1 **Election of Science Committee Officers for 2024 and 2025.**

6. Reports

6.1 **Receive report from EAHCP Permit Renewal subcontractor, BIO-WEST, Inc., and Dr. Chad Furl, P.E., Chief Science Officer at EAA, to the Science Committee on the revised Biological Goals and Objectives for the EAHCP Permit Renewal.**

6.2 **Receive report from Dr. Daniel Bishop, Climate Resiliency Manager at ICF, to the Science Committee on the Temperature and Rainfall Projections modeled for the EAHCP Permit Renewal.**

7. Future Meetings

7.1

The next Science Committee meeting will be on Thursday, April 18th at 9:00 AM at the Edwards Aquifer Authority.

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

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Meeting Minutes

EAHCP Science Committee

Thursday, March 7, 2024 | **9:00 AM** | **EAA Board Room**

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

Committee Chair, Dr. Jacquelyn Duke, called the meeting to order at 9:04 AM. All Committee members, except Janis Bush, were present either in-person or online.

2. Public Comment

There were no public comment requests to address the Science Committee.

3. Program Announcements

3.1

- Hydrologic Update

4. Approval of Minutes

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

- September 6, 2023

A motion was made by Jack Sharp, and was seconded by Charlie Kreitler, to approve the meeting minutes from the previous Science Committee meeting on September 6, 2023. There was no opposition, the minutes were approved.

5. Individual Consideration

5.1 **Election of Science Committee Officers for 2024 and 2025.**

A motion was made by Tom Arsuffi, and was seconded by Butch Weckerly, to nominate Jacquelyn Duke as Chair and Charlie Kreitler as Vice-Chair of the Science Committee. There were no other nominations and there was no opposition, the Chair and Vice-Chair were approved.

6. Reports

6.1 **Receive report from EAHCP Permit Renewal subcontractor, BIO-WEST, Inc., and Dr. Chad Furl, P.E., Chief Science Officer at EAA, to the Science Committee on the revised Biological Goals and Objectives for the EAHCP Permit Renewal.**

Dr. Chad Furl, P.E., Chief Science Officer at EAA, presented an overview of the Science Committee's process to develop a Memorandum Concerning Biological Goals and Objectives. This memorandum will represent the Science Committee's response to the recently proposed Biological Goals and Objectives as part of the future EAHCP. The process will start on March 7th, two drafts will be circulated to members, and the report is anticipated to be finalized by April 4th. Report recommendations will be presented to the Implementing Committee at their meeting on April 11th.

Christa Kunkel, Aquatic Ecologist at BIO-WEST, EAHCP Permit Renewal contractor, presented an overview of the revised proposed Biological Goals and Biological Objectives for the EAHCP Permit Renewal. The memorandum summarizing the proposed Biological Goals and Objectives was shared with members in November 2023, members submitted comments and suggested edits in December 2023, and the memorandum was recently revised and updated per the comments received. This presentation summarized the differences between the current and recently revised Biological Goals and Objectives, the revised Biological Goals and Objectives and BIO-WEST's Response Memorandum summarizing revisions and comments received will be shared with all EAHCP Committee members later today, on March 7, 2024.

7. Future Meetings

6.2 **Receive report from Dr. Daniel Bishop, Climate Resiliency Manager at ICF, to the Science Committee on the Temperature and Rainfall Projections modeled for the EAHCP Permit Renewal.**

Dr. Daniel Bishop, Climate Resilience Manager at ICF, EAHCP Permit Renewal contractor, presented an overview of the ongoing process to model future temperature and precipitation conditions for the EAHCP Permit Renewal. A detailed summary of the results will be presented at the Science Committee's April meeting, also referred to as the Hydrological Modeling Workshop, at Edwards Aquifer Authority on April 18, 2024.

7.1

The next Science Committee meeting will be on Thursday, April 18th at 9:00 AM at the Edwards Aquifer Authority.

8. Questions from the Public

There were no questions or comments from the public.

9. Adjourn

There being no additional business to discuss, the meeting adjourned at 12:29 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

Thursday, April 18, 2024 | **9:00 AM** | **EAA Board Room**

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

4. Approval of Minutes

4.1
- March 7, 2024

5. Reports

5.1 **Receive a report from the Permit Renewal Hydrological Modeling Team to the Science Committee on the hydrological modeling efforts for the EAHCP Permit Renewal.**

6. Future Meetings

6.1

The next Science Committee meeting will be on Thursday, September 5th at 9:00 AM at the Meadows Center Conference Room.

7. Public Comment

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
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EdwardsAquifer.org

Meeting Minutes

EAHCP Science Committee

Thursday, April 18, 2024 | **9:00 AM** | **EAA Board Room**

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

Committee Chair, Dr. Jacquelyn Duke, called the meeting to order at 9:05 AM. All Committee members, except Dr. Janis Bush, were present either in-person or online.

2. Public Comment

There were no public comment requests to address the Science Committee.

3. Program Announcements

3.1

- Hydrologic Update

4. Approval of Minutes

4.1

- March 7, 2024

A motion was made by Megan Bean, and was seconded by Butch Weckerly, to approve the meeting minutes from the previous Science Committee meeting on March 7, 2024. There was no opposition, the minutes were approved.

5. Reports

5.1

Receive a report from the Permit Renewal Hydrological Modeling Team to the Science Committee on the hydrological modeling efforts for the EAHCP Permit Renewal.

The Science Committee received a report from the Permit Renewal Hydrological Modeling Team, regarding the modeled conditions and projections that will be used for the EAHCP Permit Renewal. The presentation and Committee member discussion are available within the meeting recording.

6. Future Meetings

6.1

The next Science Committee meeting will be on Thursday, September 5th at 9:00 AM at the Meadows Center Conference Room.

7. Public Comment

There were no comments or questions from the public.

8. Adjourn

There being no additional business to discuss, the meeting adjourned at 11:21 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

Thursday, September 5, 2024 | **9:00 AM** | **Meadows Center Conference Room**

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 Vacancy Work Group
- Comal Springs Riffle Beetle Work Group
- San Marcos Salamander Sampling Request for Proposals
- USFWS 5-year Reviews and Blindcats Listing Update
- USFWS Team of the Year
- Springs Communities Update
- Permit Renewal Update

4. Approval of Minutes

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

- April 18, 2024

5. Reports

5.1 **Receive a report on the EAHCP Environmental Monitoring Programs and process for developing program changes as part of the EAHCP Permit Renewal.**

6. Future Meetings

6.1

The next Science Committee meeting will be on Thursday, December 19th at 10:00 AM at the Edwards Aquifer Authority.

7. Public Comment

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

Thursday, September 5, 2024 | **9:00 AM** | **Meadows Center Conference Room**

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

Committee Chair, Dr. Jacquelyn Duke, called the meeting to order at 9:01 AM. All Committee members were present either in-person or online.

2. Public Comment

There were no comments or questions from the public.

3. Program Announcements

3.1

- Hydrologic Update
- Science Committee Vacancy Work Group
- Comal Springs Riffle Beetle Work Group
- San Marcos Salamander Sampling Request for Proposals
- USFWS 5-year Reviews and Blindcats Listing Update
- USFWS Team of the Year
- Springs Communities Update
- Permit Renewal Update

4. Approval of Minutes

4.1 Approval of previous Committee meeting minutes.

- April 18, 2024

A motion was made by Dr. Butch Weckerly and seconded by Chad Norris, to approve the meeting minutes from the previous Science Committee meeting on April 18, 2024. There were no objections, the minutes were approved.

5. Reports

5.1 Receive a report on the EAHCP Environmental Monitoring

Programs and process for developing program changes as part of the EAHCP Permit Renewal.

The Science Committee received a report from Kristy Smith, Environmental Scientist at EAA, about the current environmental monitoring programs including water quality sampling and annual biological assessments. Proposed changes to the environmental monitoring programs will be discussed at the next Science Committee meeting on February 26, 2025.

6. Future Meetings

6.1

The next Science Committee meeting will be on Thursday, December 19th at 10:00 AM at the Edwards Aquifer Authority.

7. Public Comment

There were no comments or questions from the public.

8. Adjourn

There was no additional business to discuss, the meeting adjourned at 11:19 AM.

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 | **Science Committee comments on the proposed Biological Goals and Objectives**

To:	EAHCP Implementing Committee Scott Storment, EAHCP Program Director
From:	EAHCP Science Committee Jacquelyn Duke, PhD, EAHCP Science Committee Chair
Date:	April 4, 2024
Re:	**EAHCP Science Committee Commentary on the Proposed Biological Goals and Objectives Under Consideration for Permit Renewal.**

Introduction

This memorandum is in response to a request from the Implementing Committee to understand the thoughts of the Science Committee on the Revised Biological Goals and Objectives (BGO) memorandum for the permit renewal process. Individuals from the Science Committee had the opportunity to review the BGO memorandum during the November-December 2023 review period open to all EAHCP Committee members. Implementing Committee members can view those individual comments in the appendix of the Revised BGO memorandum (version 2) sent to all EAHCP Committees on March 7, 2024. This memorandum from the Science Committee to the Implementing Committee does not cover individual Science Committee members' comments during the review process, but captures a synopsis of the Science Committee discussion of the BGO memorandum and presentation by Dr. Chad Furl and others at the March 7, 2024 Science Committee meeting. Additionally, version 2 was made available to the Science Committee members during the creation of this memorandum from the Science Committee to the Implementing Committee. Lastly, Science Committee members were given the opportunity to provide their comments on the BGO memorandum directly to the Implementing Committee. These comments as well as specific responses by SC members following the March 7 Science Committee meeting are attached as an Appendix to this memorandum.

The Permit Renewal team developing the BGO memorandum appears to have done reasonable due diligence in crafting the memorandum, as demonstrated by the utilization of the HCP handbook, incorporating program experience through the National Academy of Sciences (NAS) review, creation of objectives from biological data collected by the program, and information development through a multi-part Work Group process. While members of the Science Committee are not necessarily experts on best practices for HCP Goal and Objective development, we understand the need to balance goal achievability and species protection. Further, the hypotheses are sound that species populations will continue to remain similarly protected if environmental conditions and population responses measured over the past 23 years are maintained into the future. As was reiterated several times during the March 7 meeting: the rationale for proposed BGOs was that they be specific, measurable, and achievable.

The data-derived hypotheses developed within this rationale provide a more suitable, rigorous approach from existing, often best-guess parameters.

Some individual topics for consideration discussed at the March 7 meeting:

Data Collection:

The program must ensure that the biological and water quality monitoring programs are compatible with the proposed BGOs to allow for a proper evaluation of the metrics described in the memorandum.

Springflow:

In suggesting revisions to the springflow goals/objectives, the permit renewal team considered the same stressors that were considered during the development of the original goals. Namely, connectivity along Spring Run 3/Western Shoreline areas of the Comal springs system, and maintaining suitable water quality conditions for the recruitment of fountain darters during the most extreme low flows. The proposed goals are similar to the existing goals in that they identify minimum, intermediate, and long-term objectives. Additionally, the revised goals remove (to the extent currently possible) the ambiguity that is present in the interpretation of the existing springflow goals.

The same uncertainty present during the original objectives' development persists concerning the impacts of the minimum flows given we have not experienced them in real time; however, the proposed springflow objectives appear as protective or more protective than the existing springflow objectives. Springflow discharge for minimum, 1-year, 3-year, and 30-year flows are all equal to or greater than are found in the original goals.

Comal Springs Riffle Beetle (CSRB):

While it is noted that BGOs for CSRB (similar to other species) incorporate a more systematic approach, the Science Committee recommends the permit renewal team consider results from the ongoing CSRB population assessment in finalizing their objectives for this species. This multi-year project may provide new information to craft better objectives, with the caveat that the current drought conditions will not negatively affect recommended population means.

Water Quality:

The Science Committee agrees with the sentiment that water quality monitoring is an integral part of the EAHCP. No new information has been presented to the Committee on the short or long-term biological effects of temperatures exceeding 25C, which serves as the threshold for the current criteria. According to data presented by Dr.

Furl at the March meeting, temperatures regularly range from 25-27C during low-flow periods (2014 and 2023 used as examples). This is within the range of the proposed temperature criteria. At a minimum, staff should evaluate the health of the fountain darters in coming years when known temperatures range from 25-27C to further examine whether this is a protective range.

San Marcos Salamanders:

Shortcomings in the monitoring program described by the National Academies and Salamander BGO workgroup suggest the EAHCP focus efforts on developing a quality, robust monitoring program that provides meaningful results for this species during the next iteration of the permit. The Science Committee recommends that a better description of 'quality habitat' be included in the BGO chapter of the HCP since this is suggested as the measure for the objective as opposed to a population count. Furthermore, because the size of quality habitat can be directly managed and manipulated by staff (unlike abundance targets), the Science Committee suggests that a larger, less conservative goal be considered.

Texas Wild-Rice (TWR):

Given its poor utilization by fountain darters and prolific footprint, the Permit renewal team should consider developing a maximum coverage number for TWR. Not all Science Committee members thought this was a necessary addition to the BGO, but still supported the investigation for the next HCP.

Appendix | **Additional Comments Received from Science Committee Members**

Document: EAHCP Science Committee Commentary on the Proposed Biological Goals and Objectives Under Consideration for Permit Renewal.				
Science Committee Member: Chad Norris				
Document	**Page # or Section**	**Line # or Subject**	**Science Committee Member**	**Reviewer Comment**
SC BGO Response Memo	p.1/3; Intro	12-14	Chad Norris	I feel like this is misleading because the Science Committee was not part of the "process". The Science Committee was not formally asked to provide comments on the BGO memo as a group. Furthermore, there was also no formal request for the SC to review the revised BGO memo, rather we received the revised BGO memo on March 7th and were asked to comment on this short summary of the March 7th meeting, not the revised memo itself. I believe members of the IC committee requested to have the SC formally review the BGO memo, which does not appear to be happening.
SC BGO Response Memo	p.1/3; Intro	31-34	Chad Norris	This is not incorrect, but it is also not the same as the conditions anticipated under the BGOs, which would represent lower flows for a significantly longer time period. The flow-related responses of covered species populations observed between 2000-2022 cannot be used to say flows lower then we observed are protective of the species. There is no data to back up such an assertion. This should be clarified.
SC BGO Response Memo	p.2/3; Springflow	16	Chad Norris	I brought up the point that we are assuming discharge will remain at SR3 and the Western shoreline at 45 cfs. We do not have data at these low flows and this is a HUGE assumption based on limited flow split data. Chad presented the fitted predictions of discharge by area and that showed SR3 could be as low as 0.95 cfs at 45 cfs total and 0 at 30 cfs total. Again, this is a prediction and I am not confident there would be any flow in SR3 between 45 and 30 cfs every time we reach those levels. I do not see this comment captured in the document.
SC BGO Response Memo	p.2/3; Springflow	17-18	Chad Norris	This was specifically to maintain water quality at low flows within the Old Channel ERPA section.
SC BGO Response Memo	p.2/3; Springflow	18-22	Chad Norris	I feel like comparing the new goals to the old goals Is not the right approach. I believe the review of the goals should focus on whether or not they are protective of the species in the short and long-term. The criticisms of the first BGO memo that compared the new BGO's to old BGO's were more about the difference in analysis used as compared to the first EAHCP – the shorter time frame that included management under the current ITP, the lack of drought of record comparison, and the differing presentation of analysis as compared to the first round.
SC BGO Response Memo	p.2/3; Springflow	26-27	Chad Norris	It was discussed that we have not truly seen if 30 and 45 cfs in the Comal system are protective of the species as we have not seen flows at these levels in a pattern reflective of the proposed springflow regime. Eleven months at 45 cfs is much different than a month or two at 50-60 cfs, which is the lowest flows we observed in the system. Given the short lifespan of the CSRB, this is still a major concern. Again, this was discussed at the meeting and is not captured in this memo.
SC BGO Response Memo	p.2/3; CSRB	34-36	Chad Norris	If there is information learned from this work that brings the current BGOs into question, we should act on that information to adaptively manage and not continue to kick the can down the road. This was mentioned and seemingly supported by other SC members and is not captured in this memo.

Document: EAHCP Science Committee Commentary on the Proposed Biological Goals and Objectives Under Consideration for Permit Renewal.				
Science Committee Member: Jack Sharp				
Document	**Page # or Section**	**Line # or Subject**	**Science Committee Member**	**Reviewer Comment**
Revised BGO Memo	p.5-6/80	Figure 1	Jack Sharp	Fig.1, This is a good figure, I recommend a similar figure for the San Marcos system (also showing the location of gages #08170000 & #08170500) be included immediately after this figure.
Revised BGO Memo	p.5-6/80	Figure 1	Jack Sharp	Gage #08168710 is not shown on this or any other figure. This must be rectified.
Revised BGO Memo	p.5-6/80	Springflow Objectives	Jack Sharp	The rationale on why flow conditions for #08168710 were used to quantify spring flow, and not #08169000, needs to be clearly a stated here.
Revised BGO Memo	p.5-6/80	Springflow Objectives	Jack Sharp	Why is the Old Channel station omitted? Show its location also on Fig.1.
Revised BGO Memo	p.9/80	Springflow Objectives	Jack Sharp	similar to the above comment, what is the rationale on why flow conditions for #08170500 were used to quantify spring flow, and not #08170000, must be clearly stated here.
Revised BGO Memo	p.11/80	Springflow Objectives; LOESS statistics	Jack Sharp	LOESS should either be very briefly defined in the caption or cite the appropriate reference (perhaps Cleveland and Devlin, 1988), so that any reader can find out what it is and why it issued here.
Revised BGO Memo	p. 15/80	need San Marcos map	Jack Sharp	these locations should be shown on the first San Marcos Figure (see note on p. 5&6 above).
Revised BGO Memo	p. 19/80	LOESS statistics explaination	Jack Sharp	be consistent – use LOESS in the caption.
Revised BGO Memo	p. 21, Fig 9	Figure 9; CSRB	Jack Sharp	a table or reference to an Appendix is needed.
Revised BGO Memo: Attachment 1 Comment Response	p. 24 and p. 16 of 19	SM Salamander Diversion Springs	Jack Sharp	Comments Response, Diversion Springs are listed, but aren't shown on any figure. Put their location on Fig 8 (?) and/or a new Figure (after Fig. 1 - see comment above).
Revised BGO Memo	p. 27	Figure 12; need San Marcos map	Jack Sharp	this figure has no number or caption. Also, Sewell Park and Hopkins could be shown on Fig 8 or (?) and/or a new Figure (after Fig. 1 - see comment above) and/or the caption could refer to Fig.13.
Revised BGO Memo	p.44, Figure 1	Objective 1.1; Figure 1	Jack Sharp	the goal is to maintain specified flows at #08168710, again this gage location needs is shown on the appropriate figures.
Revised BGO Memo	p. 45	Objective 4.1; Monitoring Revisions	Jack Sharp	why must the biological monitoring program be revised? Add a few sentences on why the revision is needed and how it is planned to be revised.
Revised BGO Memo: Attachment 1 Comment Response	p. 10 of 19	Springflow	Jack Sharp	it would seem that if there was a significant non springflow component to the waters in Landa Lake or Spring Lake then faunas other than the fountain darter might be affected.

Document: EAHCP Science Committee Commentary on the Proposed Biological Goals and Objectives Under Consideration for Permit Renewal.

Science Committee Member: Conrad Lamon

Document	Page # or Section	Line # or Subject	Science Committee Member	Reviewer Comment
SC BGO Response Memo	p.2/3; Data Collection	6-10	Conrad Lamon	I believe there needs to be a clear definition of the conditions and procedures that are used to determine “attainment” and “non-attainment” of the Biological Objectives proposed in the memo.
Revised BGO Memo	p.7/80	Table 1	Conrad Lamon	Table 1 - The authors state that z-transformation of the 30 day average predictor values was done to aid in interpretation of coefficients. These coefficients cannot be used with the predictor values showed in figure 2. Show transformed predictors on graph or transform the coefficients for presentation, and interpretation. Think about the units of the coefficients. If you only centered and don't z-transform, the units are cfs spring per cfs gauge. The values used in the transformation would be useful in order to use the coefficients of table 1 to make predictions. For instance, from the graphs in Figure 2, if one wishes to calculate the predicted value of Station discharge given a 30 day spring flow average of about 220 cfs at Upper Spring Run : 13.43+ 10.20 (220 cfs) is not equal to about 13 cfs. A last word on the coefficients: Show coefficient uncertainty with a 95%CI, not +/-1sd, and definitely not at all as in the 3 9 draft, so we may then interpret the coefficients.
Revised BGO Memo	p.7/80	Table 1	Conrad Lamon	Also show table of summary statistics for the predictors and response, including sample sizes , for each “station” and overall. For both the “training” and “test” data used here.
Revised BGO Memo	p.7/80	Table 1	Conrad Lamon	I'm not sure that a RMSE of ~5 (units are cfs) fully qualifies as “High performance” (page 4).
Revised BGO Memo	p.7/80	Table 1	Conrad Lamon	Using +/- 1 standard error is not standard practice. Why not build a confidence interval? Why not 90 or 95 % CI? Why not show confidence intervals for coefficients presented, which is also generally considered standard practice.
Revised BGO Memo	p.7/80	Table 1	Conrad Lamon	Unclear why a 3 year moving average was used, and exactly how it was used. The predictor variables needed to use the model today won't be available until 18 months from now, when the second half of the three year window of flow data is realized.
Revised BGO Memo	p.9/80	Table 2	Conrad Lamon	Why are there no uncertainty bounds presented for the 0.00 (2 significant digits?) value reported as “Predicted Values (+/- 1 sd)” for Upper Spring Run , Spring Runs 1 and 2? Is it because these predictions are out of the range of observed data? Why not present a tabular summary of the data used, including sample sizes by location (station)? Since the authors persist in this extrapolation of a linear model, it may behoove us to see data plotted as points on the Figure 2 plots, to determine just how far we are extrapolating, and to allow for detection of systematic lack of fit, that may indicate nonlinearity of the relationship near zero station discharge.
Revised BGO Memo	p.22/80	Table 4; "trends"	Conrad Lamon	Table 4 – is discussed in the text and caption as depicting “trends”, when actually it depicts a default window width LOESS fit to the annual average data. Not sure who needs to hear this again from me, but “default loess fitting is not a trend assessment.” As stated in reference to Figure 4 (and others) from my original written comments :“All these figures claim to show trends, but trend assessment was not performed in any formal way. These figures do not show trends, but fitted LOESS smooth functions of the data, after the daily data have already been aggregated once by year. As such, they will invite a good deal of “bump hunting” from the reader, a purpose for which they are not well suited, due to lack of a “universal” error estimate. For this reason it is a good idea to include the “pointwise” uncertainty estimates associated with the loess estimates on the plots, so the reader does not “see” bumps that are highly uncertain. Edge effects are also a known feature of smoothers, and loess is no exception. Inclusion of uncertainty bounds would show this added uncertainty near the edges, which is often the portion of the graph that holds the most interest to managers. Are these Loess curves with default settings for the window width (“span” in loess terminology)? The span or window width is the most important feature of non parametric smoothers, and indeed it's adjustment leads to a family of smoothes. Need to justify the choice of span.”
Revised BGO Memo	Overall	Tables 3, 4, 6; Use of Mu and Sigma	Conrad Lamon	These are not parameters from a normal distribution. The mean and Sd are sample quantities. The distribution of CSRB abundance is not nearly normal. Mu and sigma are population parameters and are therefore unknown (unknowable by frequentist rules), use our estimates of the true parameters, xbar and s.
Revised BGO Memo	p.59/80	Comal Springs Objective	Conrad Lamon	If “...the main goal is modeling for prediction.” (page 50), then centering should be enough, because z transformation was done, at least in part, to facilitate “ interpretation of model coefficients (Gelman and Hill)”. I notice convergence was also raised as an issue, which may be due model mis-specification, software specific issues, small sample sizes. I would like to know about model convergence, since the authors mention it. Seeing the model equations, declaration of software used, and data summary tables by station and overall would go a long way to determine the source of the convergence issued, the the exclusion of the Old Channel station makes me favor model mis-specification, when combined with the authors reference to a varying intercept model as the “null”. The null model here is the constant intercept model. Providing AIC for the null and Models 1-3 would facilitate a model comparison.without AIC on null Models 1-3
Revised BGO Memo	p.59/80	Comal Springs Objective	Conrad Lamon	While it may be that the level of detail needed to answer my questions is beyond the scope of the memo, fine. But my questions have answers and I would like to know what they are and when the could be made available to me. I was quite surprised that not even a summary of data was provided to improve the presentation in the new draft.
Revised BGO Memo	p.59/80	Comal Springs Objective	Conrad Lamon	The current draft gives short shrift to extrapolation involved in the application of a linear model. Inclusion of partial residuals on the prediction plots (data) of Figure 2 would provide an idea of how far the extrapolation goes for each station, and allow for detection of systematic lack of fit that may occur as station discharge approached zero.

Revised BGO Memo	p.59/80	Comal Springs Objective	Conrad Lamon	I appreciate the attempt at model comparison (1,2,3) and clarification for my benefit in section 3.2 , however, a) there are still no sample sizes, b) fit statistics for only the best fitting model is not a model comparison, and in fact the AIC only has meaning when compared to that of competing models. Table-ize fit stats for true null model and the models 1-3, in fact, adding all the combinations (for instance, varying intercept, fixed slope?) would be in the full spirit of a model search. c) The claim the the selected mlm is " reliable for predicting station-level discharge" is too broad, and should be qualified, as the fit statistics are only applicable within the range of the data used to fit the model, and, d) the used of the terms training and test are not quite as I have understood them in the past. A true test dataset is comprised of observations withheld from the (training) data used to fit the model, not selected as a random sample from the training data. This is likely the reason that the RMSE's are so close, as my experience with other studies leads me to think that a doubling in RMSE would not be unlikely
Original and Revised BGO Memo	Overall	30 day rolling average	Conrad Lamon	Is the "30 day rolling average" centered on the "monitoring events"? Describe and summarize the data used in text, table and graphical form. For use in a predictive model (later comments), you would want a 30 day period prior to "monitoring event" because you can't predict using a 30 day average centered on today, as only half of the data have been observed. A better explanation is needed to justify the use of a the "rolling average" in lieu of instantaneous measurements.
Original and Revised BGO Memo	Overall	Model formula	Conrad Lamon	Show model form (formula), define units for station discharge (and describe the sampling involved in previous paragraph), provide sample sizes by location and most will be answered. Was the Old Channel station taken as a reference station? Model formula(e) would let us know.
Original and Revised BGO Memo	Overall	Statistics: extrapolation	Conrad Lamon	Extrapolation is to be avoided with regression models. This is the reason we should always summarize the data used to fit the models, to avoid their use outside of this range. Use of the historical record could serve to increase the sample size and include observations in the range of interest. the range needed.

Appendix M8 | **Comal Springs Riffle Beetle Work Group**

EAHCP STAFF December 4, 2024

NOTICE OF OPEN MEETING

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. A meeting of this Work Group for the EAHCP is scheduled for **December 4th, 2024, at 10:00 a.m. at the Meadows Center for Water and the Environment, Conference Room, 211 San Marcos Springs Dr., San Marcos, TX 78666.** The meeting will be available online as well. Lunch will be provided. Please RSVP to cfurl@edwardsaquifer.org.

1. Call to order--Establish that all Work Group members are present.
2. Public comment.
3. Review CSRB Work Group charge.
4. Receive report on the CSRB abundance and distribution study.
5. Receive report on the CSRB genetics study.
6. Questions from the public.
7. Adjourn.

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