

Appendix I

Agendas, Minutes and Reports of EAHCP Committees for 2015

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Appendix II

Implementing Committee – 2015 Activities

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NOTICE OF OPEN MEETING

Available at eahcp.org

As required by 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), a meeting of the **Implementing Committee** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **9:00 am on Thursday, January 15, 2015 at the New Braunfels Civic Center, 375 S. Castell Ave., New Braunfels, TX**. Lunch will not be provided.

Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA). At this meeting, the following business may be considered and recommended for committee action:

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Approval of minutes from the November 20th Implementing Committee meeting and December 18th Joint Committee meeting. (Attachments 1 and 2).
4. Election of Implementing Committee officers for 2015.
Purpose: To provide the Implementing Committee the opportunity to elect new officers for 2015.
Action: To nominate and elect officers for 2015.
5. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Budget Update (Attachment 3)
 - Refugia Amendment
 - Newsletter Distribution
 - EAA ASR leasing update
 - ASR Operations by SAWS
 - Springflows and Index Well Levels.
6. Presentation and possible action authorizing the Program Manager to conduct hydrological modeling with HDR, Inc.
Purpose: To present a modeling proposal to the Implementing Committee and discuss possible next steps.
Action: To authorize the Program Manager to conduct hydrological modeling with HDR, Inc.
7. Discussion of the adoption process for, and presentation of, the 2014 Net Disturbance and Take Estimate report. (Attachment 4).

Purpose: Discussion of the adoption process for and presentation of the 2014 Net Disturbance and Take Estimate report.

Action: None required.

8. Presentation and possible action to approve the amended 2015 Program Management Work Plan, 2015 EAA Regional Water Conservation Program (RWCP) Work Plan, and the 2015 EAA Funding Application. (Attachments 5-7).

Purpose: To provide the Implementing Committee the opportunity to review the amended 2015 Work Plans and Funding Application.

Action: To consider possible approval of the amended 2015 Program Management Work Plan, and 2015 EAA RWCP Work Plan; and approve submittal of the 2015 EAA amended Funding Application to the EAA Board.

9. Presentation of the Regional Water Conservation Program Work Group report and possible action to recommend the report to the EAA for implementation consideration. (Attachment 8).

Purpose: To provide the Implementing Committee an opportunity to comment on suite of recommendations from the Work Group and recommend for EAA consideration.

Action: To recommend the Regional Water Conservation Program Work Group report to the EAA for implementation consideration.

10. Presentation of and possible action to adopt the process and timeline for implementation of the National Academy of Sciences report (Attachment 9 and 10).

Purpose: To present and discuss the process and timeline for implementation of the National Academy of Sciences report.

Action: To adopt the proposed process and timeline for implementation of the National Academy of Sciences report.

11. Presentation of the first draft of the EAHCP 2014 Annual Report and discussion of the submission of comments. (Attachment 11 and 12).

Purpose: To present the Implementing Committee the first draft of the EAHCP 2014 Annual Report and provide details on submission of comments and edits.

Action: None required.

12. Consider future meetings, dates, locations, and agendas.

- Next Implementing Committee meeting is scheduled for Thursday, February 19th at the New Braunfels Civic Center.

13. Questions from the public.

14. Adjourn.



MEETING MINUTES
January 15, 2015

1. **Call to order**--Established that all Committee members were present or represented- 9:10 am.
Members present included: Tom Taggart (San Marcos), Roland Ruiz (Edwards Aquifer Authority (EAA)), Steve Ramsey (New Braunfels), Chuck Ahrens (San Antonio Water System, (SAWS)), Andrew Sansom (Texas State University), and Todd Votteler (Guadalupe-Blanco River Authority).

At this meeting, the following business may be considered and recommended for committee action:

2. **Public Comment.**
No public comment.
3. **Approval of minutes from the November 20th Implementing Committee meeting and December 18th Joint Committee meeting.**
Chuck Ahrens moved to approve the minutes for November 20th and December 18th. Andrew Sansom seconded. There was no objection.
4. **Election of Implementing Committee officers for 2015.**
Andy Sansom nominated, and moved to maintain the current slate of officers. Chuck Ahrens seconded. There was no objection.
5. **Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.**
Nathan Pence, EAHCP Program Manager, provided a quick update and various aspects of the program.
 - **Budget Update.**
The committee had no comments on the update.
 - **Refugia Amendment.**
Mr. Pence introduced Adam Zerrenner, USFWS, who gave a status update on the Refugia Amendment request and the USFWS's general response. He did not provide a specific timeline for USFWS's official response.
 - **Newsletter Distribution.**
Alicia Reinmund-Martinez, EAHCP Director, gave a short update on the new EAHCP electronic Newsletter. She requested the Committee provide her names of people they would like included in the distribution.
 - **EAA ASR leasing update.**
Mr. Pence gave a short update on where EAHCP water is enrolled in the ASR and how EAA is in the process of rolling-out a Tier 2 structure as well as the "pooling" recommendation submitted through the ASR/VISPO Work Group. Roland Ruiz mentioned that the "pooling" recommendation is in the vetting process through the EAA Board.
 - **ASR Operations by SAWS.**
Chuck Ahrens provided the status on the following: current storage at about 73,700 acre-feet, currently recovery of 30 million-gallons a day; for 2015, EAA has made available 3,031 acre-feet of EAHCP water. In 2014, SAWS stored approximately 700 acre-feet of their own water at the end of the year in addition to 4,031 acre-feet of EAHCP water. In 2014, SAWS recovered about 28,600 acre-feet out of the ASR.
 - **Springflows and Index Well Levels.**
Mr. Pence presented the current well levels and springflows. The J-17 median forecast was presented.

6. Presentation and possible action authorizing the Program Manager to conduct hydrological modeling with HDR, Inc.

Mr. Pence presented an update on the HDR Modeling Proposal. He mentioned that EAA and SAWS met to discuss options about moving forward with this project. Discussed were modelling various triggers. No agreement on triggers was reached other than the original 10-year rolling average trigger. Only the primary modeling exercise (the ASR/VISPO trade-off) proposed was agreed upon.

Chuck Ahrens mentioned that a priority might be the Refugia program and exploring various options in ASR may not be as necessary at this time.

Chuck Ahrens moved to conduct the primary modeling proposed. Tom Taggart seconded. There were no objections.

Modeling proposal can be found on the eahcp.org website.

7. Discussion of the adoption process for, and presentation of, the 2014 Net Disturbance and Take Estimate report.

Mr. Pence introduced the process for officially approving the 2014 Net Disturbance and Take Estimate, which will be included in the 2014 Annual Report.

Ed Oborny, BIO-WEST Inc., presented the 2014 Net Disturbance and Take Estimate Report. Presentations can be found on the eahcp.org website.

8. Presentation and possible action to approve the amended 2015 Program Management Work Plan, 2015 EAA Regional Water Conservation Program (RWCP) Work Plan, and the 2015 EAA Funding Application.

Roland Ruiz described the rational and proposed the next steps and presented the amended Work Plans and amended Funding Application. Discussion followed pertaining to the direction of the RWCP and increasing the Program Management budget for 2015. Andy Sansom mentioned the EAHCP should not lose focus on the RWCP because of its critical nature to the HCP's success.

Chuck Ahrens moved to approve the proposed amended RWCP Work Plan, the Program Manager Work Plan, and the amended 2015 Funding Application. Andy Sansom seconded. There was no objection.

Calvin Finch, of Texas A&M Agrilife Extension Agency, was allowed an opportunity to make a comment about the termination of their contract with the EAA and AgriLife's interest in a continued partnership in this process.

Tyson Broad mentioned to the Implementing Committee about a concern pertaining to using HCP funds for additional Program Management staff. Mr. Pence responded with a short clarification about the continued support of the RWCP.

The motion approved was maintained by the committee.

The amended work plans and funding application can be found on the eahcp.org website.

9. Presentation of the Regional Water Conservation Program Work Group report and possible action to recommend the report to the EAA for implementation consideration.

Ms. Reinmund-Martinez presented Colette Barron Bradsby, Chairman of the RWCP Work Group, to present the Work Group report. Ms. Barron Bradsby described the charge and overall challenges described in the RWCP Work Group Report. Each recommendation was briefly described to show the overall goal described in the report.

Tom Taggart asked about the path forward with EAA in identifying or implementing the recommendations identified in this report. Discussion followed.

Chuck Ahrens motioned to recommend the report to be considered by the EAA. Tom Taggart seconded. There were no objections.

Presentation of the Work Group report is available on the eahcp.org website.

10. Presentation of and possible action to adopt the process and timeline for implementation of the National Academy of Sciences report.

Mr. Pence began the discussion by giving the Implementing Committee a background of the contract and deliverables expected by National Academy of Sciences (NAS). Additionally, the Committee received a short description of EAHCP's expectations from the first NAS report.

Ms. Reinmund-Martinez presented the information gathered from various organizations who also have experienced NAS reviews. EAHCP staff obtained recommendations from these organizations, such as the St. John's River Management Authority, and the process each took to implement their NAS report.

Mr. Pence presented the process proposed by EAHCP staff to the Implementing Committee to analyze the first NAS Report and the recommendation it holds.

Discussion followed. A few edits to the process was mentioned. Andy Sansom moved to approve the NAS process as amended by the committee. Tom Taggart seconded. There were no objections.

This presentation is available on the eahcp.org website.

11. Presentation of the first draft of the EAHCP 2014 Annual Report and discussion of the submission of comments.

Cliff Ladd, Blanton and Associates, gave a presentation on the Annual Report status and the process to submit comments and edits.

This presentation is available on the eahcp.org website.

12. Consider future meetings, dates, locations, and agendas.

- Next Implementing Committee meeting is scheduled for Thursday, February 19th at the New Braunfels Civic Center.
- Take Report Adoption.
- ASR Work Group Recommendation #4 – "Long Term Lease Escalator" and Reserve Budget.
- 2nd Draft of the 2014 Annual Report.


Andy Sansom mentioned a potential issue with the Spring Lake Dam and maintaining compliance and protecting habitat. Dr. Sansom asked for this item to be added to the next Implementing Committee Agenda. There was no objection to adding this item to the February 19th agenda.

13. Questions from the public.

Dianne Wassenich provided comment on the HDR modeling proposal and made the point that the EAHCP may want to shift focus onto more forbearance programs, such as VISPO and RWCP.

Carol Patterson mentioned the concern of additional recharge and looking at adding additional supply (recharge) in addition to reducing demand.

14. Adjourn. 12:10 pm


Tom Taggart, Chair


Date

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Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA). At this meeting, the following business may be considered and recommended for committee action:

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Approval of minutes from the January 15th Implementing Committee meeting (Attachments 1).
4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Budget Update (Attachment 2)
 - EAA ASR leasing update
 - ASR Operations by SAWS
 - Springflows and Index Well Levels
 - Refugia Amendment Response from USFWS (Attachment 3)
 - Final NAS Process (Attachment 4)
 - HDR Modeling Update
5. Discussion and presentation of the budget analysis of ASR Work Group recommendation to increase prices for ASR leases.
Purpose: To discuss the budget analysis of the ASR Work Group recommendation #4.
Action: None required.
6. Presentation and possible action to approve the Net Disturbance and Take Estimate Report for official adoption as recommended by the Science Committee (Attachment 5).
Purpose: To provide the Implementing Committee the opportunity to review and adopt the final Net Disturbance and Take Estimate Report.
Action: To consider approval of the Net Disturbance and Take Estimate Report for official adoption.
7. Presentation and possible action to approve the amended 2015 City of New Braunfels Old Channel Restoration Work Plan (Attachment 6).

Purpose: To provide the Implementing Committee the opportunity to review and approve the proposed amendment to the City of New Braunfels 2015 Old Channel Restoration Work Plan.

Action: To consider approval of the amended City of New Braunfels' 2015 Old Channel Restoration Work Plan.

8. Permittee Briefing: Spring Lake Dam.

Purpose: To allow Texas State University to present information on Spring Lake Dam.

Action: None required.

9. Discussion and presentation of the second draft of the 2014 Annual Report and first round of comments (Attachment 7 & 8).

Purpose: To discuss the second draft of the 2014 Annual Report and the process for providing additional comments.

Action: None required.

10. Consider future meetings, dates, locations, and agendas.

- 2014 Final Budget
- Ecological Modeling Scope of Work

11. Questions from the public.

12. Adjourn.



MEETING MINUTES
February 19th, 2015
Available at eahcp.org

1. Call to order- 9:05 am.

Members present were Tom Taggart (San Marcos), Roland Ruiz (Edwards Aquifer Authority (EAA)), Steve Ramsey (New Braunfels), Chuck Ahrens (San Antonio Water System (SAWS)), and Andrew Sansom (Texas State University). Todd Votteler, Guadalupe Blanco River Authority (GBRA), was not present; GBRA was not represented.

2. Public Comment.

No comment.

3. Approval of minutes from the January 15th Implementing Committee meeting.

Chuck Ahrens made specific edits to the section "ASR Operations by SAWS." There were no objections to approving the minutes as amended by Mr. Ahrens.

Revised minutes can be found at eahcp.org.

4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.

Nathan Pence, Program Manager, provided the committee with various updates on the Edwards Aquifer Habitat Conservation Plan (EAHCP) program. Mr. Pence indicated the Voluntary Irrigation Suspension Program Option (VISPO) checks were mailed out last week.

- **Budget Update**
Mr. Pence mentioned EAA Staff, Shelly Hendrix, will be presenting information regarding 2014 overall budget and EAHCP reserves at the March 19th Implementing Committee meeting.
- **Springflows and Index Well Levels**
As a standing item for the Committee, Mr. Pence presented information on springflow.
- **Refugia Amendment Response from the United States Fish and Wildlife Service (USFWS)**
Mr. Pence provided an update on the positive response letter from USFWS regarding the minor amendment request relating to the Refugia. Darcy Frownfelter, General Counsel, mentioned he expects the response from the Texas Attorney General Office, related to Refugia contracting by EAA with USFWS, in early March.
- **Final NAS Process**
Mr. Pence mentioned EAHCP staff is expecting to receive the first National Academy of Sciences (NAS) report in the next couple of weeks. A presentation by the Chairman of the NAS National Research Council, Danny Reible, will be given at the March 19th Implementing Committee meeting.
- **Modeling Update**
A letter agreement has been executed with HDR, Inc. and modeling has begun to examine options pertaining to VISPO and Aquifer Storage and Recovery (ASR) springflow benefits.

A letter agreement has been executed with HDR, Inc. and modeling has begun to examine options pertaining to VISPO and Aquifer Storage and Recovery (ASR) springflow benefits. This agreement will address how every acre-foot not leased through the ASR program translates into additional acre-feet needed to be enrolled in VISPO.

- SWCA has successfully obtained the first stormwater sampling event for 2015.

- ASR Operations by SAWS.

Chuck Ahrens, SAWS, provided an update to the committee on SAWS' ASR operations. SAWS' daily capacity is 20 million-gallons a day (10 acre-feet stored Edwards, and 10 acre-feet local Carrizo). There is 3,031 acre-feet of HCP water planned for storage in 2015.

- EAA ASR leasing update.

Roland Ruiz, EAA, presented an update on EAA's ASR leasing. Mr. Ruiz explained how various changes have been made and/or developed over the past few months. This includes the 'pooling' recommendation from the EAHCP ASR Work Group, the discontinuation of the rebate program, and the termination of the leasing contract with the San Antonio River Authority.

5. Discussion and presentation of the budget analysis of ASR Work Group recommendation to increase prices for ASR leases.

Mr. Pence presented an analysis of the potential increase of ASR leasing prices. Presentation can be found on eahcp.org.

The committee discussed the possibility of a price escalator option rather than increasing prices across the board. The committee communicated that they are interested in pursuing increased prices for ASR leases that stay within the budget in Table 7.1 of the EAHCP. Discussion followed.

Both Tom Taggart and Steve Ramsey support a conservative approach, potentially scenario 3, and explained that pursuing a retroactive payment structure for those currently enrolled seemed reasonable. Chuck Ahrens mentioned that changes do not indicate a failed effort and that some options may continue to be discussed.

6. Presentation and possible action to approve the Net Disturbance and Take Estimate Report for official adoption as recommended by the Science Committee.

Mr. Pence presented the Net Disturbance and Take Assessment numbers identified in the 2014 Report from BIO-WEST Inc. and recommended for adoption by the Science Committee.

Andy Sansom moved to adopt the Net Disturbance and Take Assessment Report for official adoption. Steve Ramsey seconded. There was no objection.

7. Presentation and possible action to approve the amended 2015 City of New Braunfels Old Channel Restoration Work Plan.

Chuck Ahrens moved to approve the amended 2015 Work Plan. Andy Sansom seconded. There was no objection.

Chuck Ahrens had to leave the meeting after the motion was made. A quorum of the committee was not present for the rest of the meeting.

Mr. Pence briefly presented the rationale to the amended City of New Braunfels Work Plan. The Work Plan can be found on eahcp.org.

8. Permittee Briefing: Spring Lake Dam.

Mr. Pence briefly presented the rationale to the amended City of New Braunfels Work Plan. The Work Plan can be found on eahcp.org.

8. Permittee Briefing: Spring Lake Dam.

Mr. Pence introduced Juan Guerra of Texas State University to present information about the Spring Lake Dam. Presentation can be found on eahcp.org.

There was discussion pertaining to the future planning process in dealing with the issues with Spring Lake Dam. Various points were brought-up by the committee and the public about importance of this dam being repaired responsibly and quickly.

9. Discussion and presentation of the second draft of the 2014 Annual Report and first round of comments.

Alicia Reinmund-Martinez, EAHCP Director, introduced Cliff Ladd of Blanton and Associates to present the progress report of the 2014 Annual Report drafting. Presentation can be found on eahcp.org.

10. Consider future meetings, dates, locations, and agendas.

- 2014 Final Budget
- Ecological Modeling Scope of Work

Additional items include:

- Danny Reible for NAS Report summary
- Attorney General Opinion
- Technical and procedural information regarding the Potential effects of Electro Purification drilling wells in the region.

11. Questions from the public.

Dianne Wassenich mentioned a public meeting about the Electro Purification (EP) well field and its effects of the Trinity Aquifer.

Ron Walton, District 9 representative of Comal County on the EAA Board, mentioned the issues of EP and Trinity Aquifer.

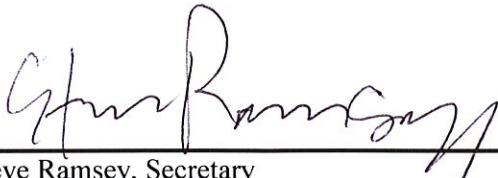
Carol Patterson, EAA Board Member, asked specific questions about the ASR financial estimates given earlier in the meeting and analyzing pumping in specific areas and its effects on springflows.

Dianne Wassenich reminded the committee about Regional Water Conservation Program Work Group meetings.

Mr. Pence introduced Debbie McPheeters with the City of New Braunfels and presented her with an official recognition for helping with the meeting arrangements throughout 2014.

Chairman Taggart took the opportunity to thank USFWS for the timely response to the minor amendment relating to the Refugia.

12. Adjourn. 11:50 am

A handwritten signature in dark ink, appearing to read "Steve Ramsey". The signature is written in a cursive, flowing style. A horizontal line is drawn across the page, passing through the middle of the signature.

Steve Ramsey, Secretary



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Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA). At this meeting, the following business may be considered and recommended for committee action:

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Approval of minutes from the February 19th Implementing Committee meeting (Attachments 1).
4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Springflows and Index Well Levels
 - Rainfall Deficit (Attachment 2)
 - February 2015 Budget Report (Attachment 3)
 - Attorney General Opinion - Refugia Contracting (Attachment 4)
 - Electro Purification Wells Briefing
 - 2016 Work Plans
 - ASR Operations by SAWS
 - ASR Pricing Update (Attachment 5)
 - Spring Lake Dam Update
5. Consider authorizing the Program Manager to expend Program Administration funds for the publication by Texas A&M Press of the book authored by Robert Gulley entitled, *"Heads Above Water: The Inside Story of the Edwards Aquifer Recovery Implementation Program"*.
Purpose: To allow the Implementing Committee to consider the expenditure of funds.
Action: To consider authorization of Program Administration funding.
6. Staff Report: Presentation of the 2014 EAHCP Budget and Reserves Projection (Attachment 6).
Purpose: To present the 2014 Final Budget Report to the Implementing Committee.
Action: None required.

7. Presentation and possible action to approve the 2015/2016 Ecological Model Scope of Work as recommended by the Science Committee and presentation on capabilities of the Ecological Model (Attachment 7).
Purpose: To provide the Implementing Committee the opportunity to review the Scope of Work and capabilities of the Ecological Model Scope of Work.
Action: To consider possible approval of the 2015/2016 Ecological Modeling Scope of Work.
8. Presentation and possible action to approve the 2014 Annual Report for submittal to USFWS (Attachment 8).
Purpose: To provide the Implementing Committee the opportunity to review and approve the 2014 Annual Report.
Action: To consider possible approval of the 2014 Annual Report for submittal to the U.S. Fish and Wildlife Service.
9. Discussion and possible action for creation of a Report 1 Recommendations Review Work Group.
Purpose: To provide an opportunity for the Implementing Committee to create a Work Group to review the recommendations found in the first NAS report.
Action: To consider creation of a Report 1 Recommendations Review Work Group.
10. Presentation of the “*Review of the Edwards Aquifer Habitat Conservation Plan: Report 1*” by Chairman Danny Reible.
Purpose: To provide the Implementing Committee an opportunity to receive details and comment on the first NAS Report.
Action: None required.
11. Consider future meetings, dates, locations, and agendas.
 - Rainfall Deficit Presentation
 - Permitting Oversight Update
 - 2016 EAA Work Plans
12. Questions from the public.
13. Adjourn.



MEETING MINUTES
Available at eahcp.org

1. **Call to order—Establish that all Committee members are present or represented- 9:05 am.**
Members present were Tom Taggart (San Marcos), Roland Ruiz (Edwards Aquifer Authority (EAA)), Steve Ramsey (New Braunfels), Chuck Ahrens (San Antonio Water System (SAWS)), Andrew Sansom (Texas State University), and Todd Votteler, (Guadalupe Blanco River Authority (GBRA)).
2. **Public Comment.**
Jenna Cantwell with SWCA Environmental Consultants mentioned that the Edwards Aquifer Habitat Conservation Plan (EAHCP) had recently marked its 2nd anniversary.
3. **Approval of minutes from the February 19th Implementing Committee meeting.**
Chuck Ahrens recommended striking the language “ultimately no decision was made” to Item #5 in the minutes. With that change Mr. Ahrens moved to approve. Roland Ruiz seconded. There was no objection.
4. **Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.**
 - **Springflows and Index Well Levels**
Nathan Pence, EAHCP Program Manager, provided the committee an update on the J-17 index well levels and springflows. The Committee provided some comments and had questions about the effects on the aquifer from the recent rains, Voluntary Irrigation Suspension Program (VISPO), and the changes in irrigation practices.
 - **Rainfall Deficit**
Mr. Pence presented the rainfall deficit model developed by the EAA. The image can be seen at eahcp.org.
 - **February 2015 Budget Report – The Committee had no comments.**
 - **Attorney General Opinion - Refugia Contracting**
Roland Ruiz presented the opinion received by the Attorney General of Texas which stated the EAA is able to contract with United States Fish and Wildlife Service (USFWS) to implement a refugia program. Mr. Ruiz also stated the EAA is pursuing a competitive Request for Proposal (RFP) process rather than a sole source contracting process for the refugia program.

Chuck Ahrens asked about the timeline expected for the refugia program. Mr. Pence stated he hopes to have an RFP for the long-term refugia program out by July and contract executed in January 2016. Adam Zerrenner, USFWS, asked about the “stop-gap” refugia timeline. Mr. Pence stated the EAHCP will have a salvage refugia program in place this summer if necessary.
 - **Electro Purification Wells Briefing**
Mr. Ruiz briefly summarized the issues with the Electro Purification well fields proposed in Hays County and the existing Groundwater Conservation Districts in the area. He stated the

Hamilton, EAA Executive Director of Aquifer Management Services, expanded on the purpose and goals of assisting in data collection in this area of the Edwards Aquifer to better understand the Edwards and Trinity Aquifers interconnectivity.

- **2016 Work Plans**
Mr. Pence stated draft Work Plans are due to EAHCP on April 15th. The Implementing Committee will review all Work Plans at the May meeting and consider approval at the June meeting.
- **Aquifer Storage and Recovery (ASR) Operations by SAWS**
Chuck Ahrens, SAWS, presented an update on SAWS' ASR operations. Current storage is approximately 36,000 acre-feet, with SAWS currently using about 20 million gallons per day from the ASR. In 2015, the EAA provided 3,103.7 acre-feet to SAWS for ASR storage on behalf of the EAHCP. Mr. Ahrens mentioned current municipal demand could be the lowest average monthly consumption recorded.
- **ASR Pricing Update**
Mr. Pence presented background information on the increase in rates for ASR. Mr. Ruiz expanded on the details and changes starting this year. Rates are available on eahcp.org.
- **Spring Lake Dam Update**
Mr. Pence provided a brief update on the work to be done on Texas State University's Spring Lake Dam. Updates will be presented as necessary.
- **Applied Research**
All committee members are being asked to provide ideas for future projects.
- **Open staff position-** Mr. Pence announced the current opening of a Coordinator on the EAHCP team.

5. **Consider authorizing the Program Manager to expend Program Administration funds for the publication by Texas A&M Press of the book authored by Robert Gulley entitled, "*Heads Above Water: The Inside Story of the Edwards Aquifer Recovery Implementation Program*".**

After Mr. Pence stated that this item was not an action item, Andrew Sansom, Texas State University, gave a brief informational update on the book authored by Dr. Robert Gully.

6. **Staff Report: Presentation of the 2014 EAHCP Budget and Reserves Projection.**

Shelly Hendrix, EAA staff, provided the committee an update on the EAHCP Reserves and 2014 overall budget. Specific numbers can be found on eahcp.org.

7. **Presentation and possible action to approve the 2015/2016 Ecological Model Scope of Work as recommended by the Science Committee and presentation on capabilities of the Ecological Model.**

Ed Oborny, BIO-WEST Inc., presented a summary on the Ecological Modeling Scope of Work. His presentation was focused on the features of the Ecological Model. The presentation can be found on eahcp.org. The Committee had questions pertaining to the training required to use the model and the verification of the accuracy of results. Discussion followed. Mr. Oborny briefly described the timeline through 2015 and 2016 for the Ecological Model.

Andrew Sansom moved to approve. Steve Ramsey seconded. There was no objection.

8. **Presentation and possible action to approve the 2014 Annual Report for submittal to USFWS.**

Velma Danielson, Blanton and Associates, and Alicia Reinmund-Martinez, EAHCP, presented the final version of the 2014 Annual Report to be considered for approval.

Tom Taggart motioned to approve EAHCP staff submittal of the 2014 Annual Report to USFWS. Chuck Ahrens seconded. There was no objection.

9. Discussion and possible action for creation of a Report 1 Recommendations Review Work Group.

The National Academy of Sciences/National Research Council Committee has reviewed the EAHCP, and completed their first report – *“Review of the EAHCP: Report 1”*. The Implementing Committee needs to review the report and Mr. Pence explained the timeline and process previously approved for review. A work group was proposed to accomplish initial review and their formal charge will be brought back to the Implementing Committee as soon as possible.

Andrew Sansom motioned to begin planning and setting up a Work Group. Tom Taggart seconded. There was no objection.

Proposed Work Group members include:

Cindy Loeffler, TPWD

Melani Howard, City of San Marcos, and Texas State University

Rodger Biggers, NBU

Darren Thompson, SAWS

Mark Hamilton, EAA

Chuck Ahrens moved to approve the proposed Work Group members. Tom Taggart seconded. There was no objection.

10. Presentation of the “Review of the Edwards Aquifer Habitat Conservation Plan: Report 1” by Chairman Danny Reible.

Dr. Danny Reible, Chair of the National Academy of Sciences/National Research Council Committee to review the EAHCP, presented the overview of the Committee’s first report – *“Review of the EAHCP: Report 1”*. Presentation can be found on the eahcp.org.

The Committee and the audience asked specific questions pertaining to budget impacts of implementation and details about various aspects of the report. Discussion followed.


11. Consider future meetings, dates, locations, and agendas.

- Rainfall Deficit Presentation
- Permitting Oversight Update
- 2016 EAA Work Plans

12. Questions from the public.

No comment.

13. Adjourn.- 12:05 pm



Steve Ramsey
Secretary



NOTICE OF OPEN MEETING
Available at eahcp.org

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Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA). At this meeting, the following business may be considered and recommended for committee action:

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Approval of minutes from the March 19, 2015 Implementing Committee meeting (Attachment 1).
4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Springflows and Index Well Levels
 - March 2015 Budget Update (Attachment 2)
 - ASR Operations by SAWS
 - ASR/VISPO Modeling
 - Refugia Update – Salvage Stock RFP, Technical Assistance Contract, and 2015 Research activities
 - Region L Policy Work Group
 - Biological Monitoring – Spring schedule
 - Submittal of 2016 Work Plans
 - NAS Report 2
5. Presentation of the Rainfall Deficits Across the Edwards Aquifer Region and discussion of the 2014 USGS Recharge Estimate (Attachment 3).

Purpose: To present a summary of the rainfall deficits across the Edwards Aquifer region from 2003 to 2013 to the Implementing Committee and the 2014 Recharge Estimate.

Action: None required.
6. Presentation and possible action to approve the charge of the NAS Review Recommendation Work Group: Report 1 (Attachment 4).

Purpose: To present and provide the Implementing Committee the opportunity to review and approve the specific charge of the Review Recommendation Work Group: Report 1.

Action: To consider possible approval of the Charge of the Recommendations Review Work Group: Report 1.

7. Presentation and discussion of the Staff Analysis of the National Academy of Sciences (NAS) Recommendations from Report #1 (Attachment 5).

Purpose: To provide the Implementing Committee an opportunity to review and comment on NAS Recommendations from Report #1 Matrix.

Action: To provide input and/or modify the matrix per the concerns of the committee.

8. Consider future meetings, dates, locations, and agendas. – May 21, 2015, New Braunfels Civic Center

- Summary of Stakeholder/Science Committees NAS Workshop
- Draft NAS Implementation Plan
- Presentation on EAA, City of San Marcos/Texas State and City of New Braunfels Work Plans
- Presentation on the Refugia Technical Assistance Report

9. Questions from the public.

10. Adjourn.



MEETING MINUTES

April 16, 2015

1. **Call to order-- 9:06 am.**

Members of this committee present included: Jan Klein for Tom Taggart (City of San Marcos), Roland Ruiz (Edwards Aquifer Authority), Steve Ramsey (City of New Braunfels), Chuck Ahrens (San Antonio Water System), Juan Guerra for Andrew Sansom (Texas State University), and Todd Votteler (Guadalupe Blanco River Authority).

2. **Public Comment.**

No comment.

3. **Approval of minutes from the March 19, 2015 Implementing Committee meeting.**

Roland Ruiz requested Page 2 be edited to state that the Edwards Aquifer Authority (EAA) is unable to "regulate withdrawals", instead of "inhibit withdrawals" of the Trinity Aquifer. Additionally, for Item 5 on Page 2, Mr. Ruiz requested the text be changed to state that "this item was not intended to be an action item."

Chuck Ahrens moved to approve the March 19, 2015 Meeting Minutes with the edits noted. Juan Guerra seconded. There were no objections.

4. **Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.**

- **Springflows and Index Well Levels**
Shaun Payne, EAHCP Coordinator, presented the current springflow and index well levels. Presentation is available on eahcp.org.
- **March 2015 Budget Update.** There were no questions.
- **Aquifer Storage and Recovery (ASR) Operations by San Antonio Water System (SAWS)**
Chuck Ahrens gave a brief update on SAWS' ASR operations. He indicated there was 68,893 acre-feet total storage, SAWS was still recovering 20 million gallons a day and had 3,103.7 acre-feet of EAHCP groundwater storage available.

Nathan Pence, Program Manager, updated the committee on recent ASR program changes, including the increase in ASR leasing rates. Mr. Pence stated that as a result, there has been an increase in interest in the ASR program.

ASR/VISPO Modeling

Mr. Pence mentioned that May 15th is the deadline for the modeling deliverable from HDR. He said they are on track and plan to have results available to the Implementing Committee in May.

- **Refugia Update – Salvage Stock Request for Proposals (RFP), Technical Assistance Contract, and 2015 Research activities**

Mr. Pence informed the committee the EAA was not going to be able to contact with the Texas State University's for a Salvage Stock operation. As a result, a Request for Proposals (RFP) is currently open for submittals and will close on April 22. Mr. Pence stated he expects to have an executed contract for Salvage Stock refugia by early June.

Additionally, Mr. Pence stated that Dr. Weston Nowlin, Texas State University, has started the Refugia Research effort.

For the long-term Refugia operations, Mr. Pence stated EAA expects to have a RFP posted in June or July. EAA expects to execute a contract by 2016.

- **Region L Policy Work Group**
Mr. Ruiz summarized the EAHCP discussion at a recent Region L meeting regarding the Region L Policy Work Group's recognition of the goals in the EAHCP relating to the spring flow necessary for the protection of the endangered species. Discussion followed.
- **Biological Monitoring – Spring schedule**
Mr. Pence mentioned that BIO-WEST is in San Marcos Springs system now and will be in the Comal Springs system later in April in order to collect Annual Biological Monitoring data.
- **Submittal of 2016 Work Plans – Mr. Pence stated that all work plans have been submitted.**
- **NAS Report 2**
Mr. Pence reminded the Committee that the process for the second National Academy of Sciences (NAS) report has begun and the first meeting will be held in June or July. Todd Votteler asked about the NAS committee and if all members involved with the first report will remain. Mr. Pence mentioned he anticipated they will be losing one member who will be replaced with another modeling expert. He stated to his knowledge most members will remain on the panel.

5. Presentation of the Rainfall Deficits Across the Edwards Aquifer Region and discussion of the 2014 USGS Recharge Estimate.

Mark Hamilton, EAA, presented information regarding regional rainfall deficits. Presentation is available on eahcp.org. Mr. Pence concluded the presentation with a summary of what the information means in terms of the EAHCP effort, specifically Aquifer Storage and Recovery (ASR).

Some Committee members asked questions pertaining to the ASR triggers. Discussion followed.

6. Presentation and possible action to approve the charge of the NAS Review Recommendation Work Group: Report 1.

Mr. Pence presented the draft charge for the NAS Review Recommendation Work Group to the committee for official approval. Mr. Ruiz discussed the funding mechanisms and the official approval process will remain the same as other programs.

Juan Guerra moved to approve the Work Group charge. Chuck Ahrens seconded. There were no objections.

7. Presentation and discussion of the Staff Analysis of the National Academy of Sciences (NAS) Recommendations from Report #1.

Mr. Pence presented the current steps taken to review the recommendations in the NAS report. Presentation is available on eahcp.org.

Some discussion about various ways of organizing the Implementation Matrix complied by EAHCP Staff. Discussion followed.


8. Consider future meetings, dates, locations, and agendas. – May 21, 2015, New Braunfels Civic Center

- Summary of Stakeholder/Science Committees NAS Workshop
- Draft NAS Implementation Plan
- Presentation on EAA, City of San Marcos/Texas State and City of New Braunfels Work Plans
- Presentation on the Refugia Technical Assistance Report

9. Questions from the public.

Dianne Wassenich commented about the NAS Workshop. Additionally, she commented on Electro-Purification wells and EAA's studies of the Trinity-Edwards interconnectivity in conjunction with the localized groundwater draw-down.

10. Adjourn. 11:27 am



Steve Ramsey
Secretary

**NOTICE OF OPEN MEETING****Available at eahcp.org**

As required by 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), a meeting of the **Implementing Committee** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **9:00 am on Thursday, May 21, 2015 at the New Braunfels Civic Center, 375 S. Castell Ave., New Braunfels, TX**. Lunch will not be provided.

Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA). At this meeting, the following business may be considered and recommended for committee action:

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Approval of minutes from the April 16, 2015 Implementing Committee meeting (Attachment 1).
4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Springflows and Index Well Levels
 - J-17 Forecast Update (Attachment 2)
 - March 2015 Budget Update (Attachment 3)
 - ASR Operations by SAWS
 - ASR Leasing Update (Attachment 4)
 - ASR/VISPO Modeling (Attachment 5)
 - Refugia Update
 - Official 2014 Pumping Numbers (Attachment 6)
 - NAS Statement of Task for Report 2 (Attachment 7)
5. Presentation of the Report on the Stakeholders and Science Committee Workshop on the National Academy of Sciences (NAS) Report 1 (Attachment 8).

Purpose: To provide the Implementing Committee with a summary and analysis of the comments collected at the NAS Workshop, held on April 22, 2015.

Action: No action required.
6. Presentation and discussion of the draft Implementation Plan for the NAS Report 1 (Attachment 9).

Purpose: To provide the Implementing Committee an overview of the Report 1 Implementation Plan.

Action: To provide input and give directive to Program Manager.

7. Staff Report: 2016 Work Plan approval process (Attachment 10 & 11).
Purpose: To present to the Implementing Committee the process for review of the 2016 Work Plans and Budget.
Action: No action required
8. Presentation of the Edwards Aquifer Authority 2016 Work Plans (Attachment 12).
Purpose: To provide the Implementing Committee the opportunity to review and comment on aspects of the Edwards Aquifer Authority 2016 Work Plan.
Action: No action required.
9. Presentation of the Texas State University and City of San Marcos' 2016 Work Plans (Attachment 13).
Purpose: To provide the Implementing Committee the opportunity to review and comment on aspects of the City of San Marcos' 2016 Work Plan.
Action: No action required.
10. Presentation of the design plans for the Comal Springs Conservation Center by New Braunfels Utilities.
Purpose: To provide the Implementing Committee with details about the work to be done in the Comal System.
Action: No action required
11. Presentation of the City of New Braunfels' 2016 Work Plans (Attachment 14).
Purpose: To provide the Implementing Committee the opportunity to review and comment on aspects of the City of New Braunfels' 2016 Work Plan.
Action: No action required.
12. Consider future meetings, dates, locations, and agendas. – June 18, 2015, New Braunfels Civic Center
13. Questions from the public.
14. Adjourn.

**MEETING MINUTES****May 21, 2015**

1. **Call to order--Establish that all Committee members are present or represented- 9:07 am.**
Members present included: Tom Taggart (San Marcos), Roland Ruiz (Edwards Aquifer Authority (EAA)), Steve Ramsey (New Braunfels), Darren Thompson for Chuck Ahrens (San Antonio Water System (SAWS)), Andrew Sansom (Texas State University), and Todd Votteler (Guadalupe Blanco River Authority).
2. **Public Comment.**
No comment
3. **Approval of minutes from the April 16, 2015 Implementing Committee meeting.**
Andy Sansom moved for approval. Roland Ruiz seconded. There was no objection.
4. **Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.**
 - **Springflows and Index Well Levels**
Shaun Payne, EAHCP Coordinator, gave an update of the recent springflow and index well levels.
 - **J-17 Forecast Update**
Nathan Pence, EAHCP Program Manager, provided an updated forecast for J-17. There were comments about the effect of low aquifer levels in the Uvalde Pool (J-27).
 - **March 2015 Budget Update.** No comment.
 - **Aquifer Storage Recovery (ASR) Operations by SAWS**
Darren Thompson, SAWS, reported approximately 20 million gallons per day of storage into their ASR facility.
 - **ASR Leasing Update**
Rick Illgner, EAA, presented total ASR enrollment since the increase in the rate structure. The full presentation is available at eahcp.org.
 - **ASR/Voluntary Irrigation Suspension Program Option (VISPO) Modeling**
Mr. Pence presented a summary of the recent modeling exercise conducted by HDR about ASR and VISPO. HDR Inc. will be presenting a full presentation in the June Implementing Committee meeting.
 - **Refugia Update**
Roland Ruiz, EAA, updated the committee on Refugia contracting status. Long-term Refugia should be under contract by the end of 2015. Salvage Refugia contract will be presented to the EAA board in June for final approval.
 - **Official 2014 Pumping Numbers**
Earl Parker, EAA, presented the official 2014 Edwards pumping numbers.
 - **National Academy of Sciences (NAS) Statement of Task for Report 2**

Mr. Pence mentioned staff has begun planning for the NAS Report 2 which will focus on the EAHCP Conservation Measures and whether they meet the Biological Goals.

- American Society of Civil Engineers (ASCE)

Mr. Pence summarized the presentations on the EAHCP given at a recent ASCE conference in Austin.

5. Presentation of the Report on the Stakeholders and Science Committee Workshop on the National Academy of Sciences (NAS) Report 1.

Suzanne Schwartz, University of Texas Center for Public Policy Dispute Resolution, presented a summary of the NAS Workshop Report. The full presentation is available at eahcp.org.

Carol Patterson, EAA Board Member, briefly commented on the workshop.

6. Presentation and discussion of the draft Implementation Plan for the NAS Report 1.

Mr. Pence presented the draft Implementation Plan for the first NAS Report. Hard copy of the draft matrix was provided to the committee and is available at eahcp.org.

There was discussion about cost-benefit of certain recommendations found in the NAS Report.

7. Staff Report: 2016 Work Plan approval process.

Alicia Reinmund-Martinez, EAHCP Director, presented the 2016 Work Plan Approval Timeline as well as the budget table provided. Timeline and budget can be found at eahcp.org.

8. Presentation of the Edwards Aquifer Authority 2016 Work Plans.

Rick Illgner, EAA, presented the 2016 Work Plan to the committee. The full presentation is available at eahcp.org.

9. Presentation of the Texas State University and City of San Marcos' 2016 Work Plans.

Melani Howard, City of San Marcos and Texas State University, presented the 2016 Work Plan to the committee. The full presentation is available at eahcp.org.

There was a discussion pertaining to the multi-year budget and how each conservation measure compares to Table 7.1 in the long-term. The Committee requested a presentation of a summary of the yearly budget in comparison to Table 7.1.

10. Presentation of the design plans for the Comal Springs Conservation Center by New Braunfels Utilities.

Rodger Biggers, New Braunfels Utilities, presented the plans for the Comal Springs Conservation Center to the committee. The full presentation is available at eahcp.org.

11. Presentation of the City of New Braunfels' 2016 Work Plans.


Zac Martin, City of New Braunfels, presented the 2016 Work Plan to the committee. The full presentation is available at eahcp.org.

12. Consider future meetings, dates, locations, and agendas. – June 18, 2015, New Braunfels Civic Center.

13. Questions from the public.

Dr. Thom Hardy mentioned his appreciation of the Implementing Committee's consideration of Table 7.1 and the need to reach the HCP's biological goals.

14. Adjourn.- 12:57 pm



Steve Ramsey, Secretary



NOTICE OF OPEN MEETING
Available at eahcp.org

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Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA). At this meeting, the following business may be considered and recommended for committee action:

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Approval of minutes from the May 21, 2015 Implementing Committee meeting (Attachment 1).
4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Springflows and Index Well Levels
 - Impacts of Recent Rainfall
 - Water Quality Monitoring Update
 - March 2015 Budget Update (Attachment 2)
 - EAA Table 7.1 Budget Memo (Attachment 3)
 - Permittee Update
 - Comal Springs Conservation Center (Attachment 4)
 - ASR Operations by SAWS
 - ASR Leasing Update (Attachment 5)
 - Refugia Update
5. Presentation of the Scope of Work in the EAA Salvage Refugia contract with SWCA (Attachment 6).
Purpose: To provide the Implementing Committee with a summary of the Salvage Refugia contract.
Action: No action required.
6. Presentation of the Refugia Technical Report "Refugia Review" (Attachment 7).
Purpose: To provide the Implementing Committee an overview of the physical and fiscal resources needed for a Refugia.
Action: No action required.

7. Presentation of the Technical Memorandum regarding ASR/VISPO Modeling efforts by HDR Inc. (Attachment 8).
Purpose: To present the results of the modeling exercise to determine springflow tradeoffs for ASR and VISPO.
Action: No action required.
8. Program Manager Report: Report on EAHCP Staffing.
Purpose: To present to the Implementing Committee with an overview of EAHCP Staff organization.
Action: No action required.
9. Staff Report: Presentation of the EAHCP Budget Forecast (Attachment 9).
Purpose: To provide the Implementing Committee a summary of the forecasted comparison between the realized implementation budget and Table 7.1 of the EAHCP.
Action: No action required.
10. Possible approval of the City of New Braunfels Work Plans (Attachment 10 and 11).
Purpose: To provide the opportunity for the Implementing Committee to approve the 2016 Work Plan for the City of New Braunfels.
Action: Consider approval of the Work Plan as presented.
11. Possible approval of the 2016 EAA Work Plans (Attachment 12 and 13).
Purpose: To provide the opportunity for the Implementing Committee to approve the 2016 Work Plan for the Edwards Aquifer Authority.
Action: Consider approval of the Work Plan as presented.
12. Possible approval of the City of San Marcos/Texas State University Work Plans (Attachment 14 and 15).
Purpose: To provide the opportunity for the Implementing Committee to approve the 2016 Work Plan for the City of San Marcos/Texas State University.
Action: Consider approval of the Work Plan as presented.
13. Consider future meetings, dates, locations, and agendas. – July 16, 2015, San Antonio Water System.
14. Questions from the public.
15. Adjourn.



**IMPLEMENTING COMMITTEE
MEETING MINUTES
June 18, 2015**

1. **Call to order--Establish that all Committee members are present or represented-** 9:00 am.

Members of this committee include: Tom Taggart (City of San Marcos), Roland Ruiz (Edwards Aquifer Authority, (EAA)), Steve Ramsey (City of New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (Guadalupe Blanco River Authority, (GBRA)).

Juan Guerra was present for Andy Sansom.

2. **Public Comment.**

No comment.

3. **Approval of minutes from the May 21, 2015 Implementing Committee meeting.**

Roland Ruiz moved to approve the minutes. Chuck Ahrens seconded. There was no objection.

4. **Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.**

- **Springflows and Index Well Levels**

Shaun Payne, EAHCP Coordinator, presented the recent springflow and index well levels. Nathan Pence, EAHCP Program Manager, presented J-27 aquifer levels as well as J-17 forecasts. Presentation can be found at eahcp.org.

- **Impacts of Recent Rainfall**

Melani Howard, City of San Marcos and Texas State University, presented the status of the San Marcos springs system. Mr. Pence mentioned the Edwards Aquifer Authority (EAA) has authorized the Biological Monitoring Program to conduct Critical Period Sampling in the San Marcos system.

- **Water Quality Monitoring Update**

Mr. Pence explained the status of the stormwater sampling effort.

- **March 2015 Budget Update – There was no comment.**

- **EAA Table 7.1 Budget Memo**

Roland Ruiz, EAA, explained the rationale of his memo (Attachment 3) regarding the EAHCP budget and planning within the EAHCP Table 7.1. The purpose of the memo was to state the importance of maintaining trust with the public while budgets are prepared.

- **Permittee Update**
Zac Martin, City of New Braunfels, provided the Implementing Committee with an update on the projects underway in the Comal Springs system. Mrs. Howard, City of San Marcos/TXSTATE, provided the Implementing Committee with an update on the efforts underway in the San Marcos Springs system. Additionally, she presented the award they received from **Keep Texas Beautiful**.
 - **Comal Springs Conservation Center** – There was no comment on the Committee's letter of support.
 - **ASR Operations by SAWS**
Chuck Ahrens, SAWS, presented an update on their ASR operations. They currently have 71,000 acre-feet stored in ASR. SAWS is currently not recovering or storing.
 - **ASR Leasing Update**
Rick Illgner, EAA, presented an update on the EAHCP ASR Leasing effort. Presentation can be found at eahcp.org. There were comments and questions about ASR leasing terms and the current conditions of the Edwards Aquifer.
 - **Refugia Update**
Mr. Pence presented an update on the status of the Salvage Refugia contract recently approved by the EAA Board of Directors. Full presentation can be found at eahcp.org.
5. **Presentation of the Scope of Work in the EAA Salvage Refugia Contract with SWCA.**
Mr. Pence presented some background information about Salvage Refugia. He introduced Phil Pearce, SWCA, and Dante Fenolio, San Antonio Zoo, to present the details about their contract with the EAA. Full presentation can be found at eahcp.org.
6. **Presentation of the Refugia Technical Report, "Refugia Review."**
Mr. Pence summarized the Technical Report by HDR, Inc. and introduced Ken Ferjancic, HDR, who presented the details of the report. Full presentation can be found at eahcp.org. Discussion regarding the details of the Refugia Technical report followed.
7. **Presentation of the Technical Memorandum regarding ASR/VISPO Modeling efforts by HDR Inc.**
Mr. Pence introduced Sam Vaughn from HDR, Inc. Mr. Vaughn presented the results of an ASR/VISPO modeling exercise to determine the tradeoff between the two enrollment opportunities. Full presentation can be found at eahcp.org. Discussion followed regarding tradeoff in terms of financial impacts compared to increased VISPO enrollment.
- Tom Taggart, City of San Marcos, requested further research to understand the financial implications as well as the administrative burden for amending the EAHCP.
8. **Program Manager Report: Report on EAHCP Staffing.**
Mr. Pence presented the summary of EAHCP staff and program responsibilities. Full presentation can be found at eahcp.org.

9. Staff Report: Presentation of the EAHCP Budget Forecast.

Mr. Pence presented the budget forecast developed by EAHCP staff. There was discussion about the proper interpretation of the 2% escalator included in the budget forecast (Table 7.2).

10. Possible approval of the City of New Braunfels Work Plan.

Alicia Reinmund-Martinez introduced the 2016 City of New Braunfels Work Plan and the comments matrix provided to the committee as an attachment.

Chuck Ahrens moved to approve the Work Plan as presented. Roland Ruiz seconded. There were no objections.

11. Possible approval of the 2016 EAA Work Plan.

Mrs. Reinmund-Martinez introduced the 2016 EAA Work Plan and the comments matrix attached.

Steve Ramsey moved to approve the Work Plan as presented. Tom Taggart seconded. There were no objections.

12. Possible approval of the City of San Marcos/Texas State University Work Plan.

Mrs. Reinmund-Martinez introduced the 2016 City of San Marcos/Texas State University Work Plan and the comments matrix. Additionally, Mrs. Reinmund-Martinez communicated the offline conversation EAHCP Staff, and City of San Marcos/Texas State University had with SAWS concerning their submitted comments. The comments matrix was provided to the committee as an attachment.

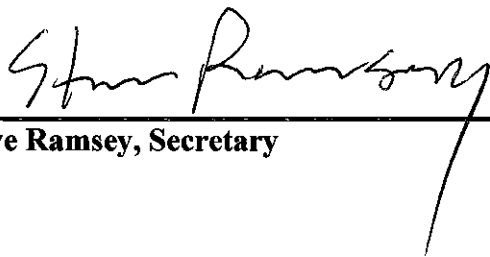
Chuck Ahrens moved to approve the Work Plan as presented. Tom Taggart seconded. There were no objections.

13. Consider future meetings, dates, locations, and agendas. – July 16, 2015, Location to be announced.

14. Questions from the public.

No comments.

15. Adjourn. – 12:11 pm



Steve Ramsey, Secretary



NOTICE OF OPEN MEETING
Available at eahcp.org

As required by 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), a meeting of the **Implementing Committee** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **9:00 am on Thursday, August 20, 2015 at the New Braunfels Civic Center, 375 Castell Ave., New Braunfels, TX**. Lunch will not be provided.

Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA). At this meeting, the following business may be considered and recommended for committee action:

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Approval of minutes from the June 18, 2015 Implementing Committee meeting (Attachment 1).
4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Springflows and Index Well Levels
 - Budget Update (Attachment 2 & 3)
 - ASR Operations by SAWS
 - ASR Leasing Update (Attachment 4)
 - Refugia Update
 - Permittee Update
 - Conservation Measure Showcase - City of New Braunfels: Non-native species removal
 - 2016 Work Plans (Attachment 5)
 - EAA Groundwater Model Uncertainty Analysis
 - Letter and Errata Sheet for 2014 Annual Report (Attachment 6)
5. Presentation and discussion pertaining to Phase II Strategic Adaptive Management Decision Making.
Purpose: To provide information regarding Phase II Strategic Adaptive Management to the Implementing Committee.
Action: No action required.
6. Presentation and possible action to adopt for implementation the *National Academy of Sciences - Review of the Edwards Aquifer Habitat Conservation Plan: Report 1 Implementation Plan* recommended by the NAS Recommendations Review Work Group (RRWG) (Attachment 7).

Purpose: To present the recommendations from the NAS RRWG Report.

Action: To approve the prioritized Implementation Plan recommended by the NAS RRWG.

7. Discussion and possible action to create an Applied Research Work Group, possible appointment of members, and approval of a Work Group charge. (Attachment 8 & 9).

Purpose: To provide the Implementing Committee the opportunity to create a Work Group to develop an Applied Research Project Schedule for 2016-2019.

Action: To consider creation of an Applied Research Work Group, the appointment of members, and approval of a charge.

8. Presentation and possible action to consider amending the 2015 City of San Marcos/Texas State University (COSM/TXSTATE) Permanent Access Points/Bank Stabilization Work Plan (Attachment 10).

Purpose: To request approval for an amendment to the 2015 COSM/TXSTATE Work Plan.

Action: To approve the request for an amendment to the 2015 COSM/TXSTATE Work Plan.

9. Presentation and discussion of the San Marcos Watershed Initiative (Attachment 11).

Purpose: To inform the Implementing Committee on the San Marcos Watershed Initiative.

Action: No action required

10. Consider future meetings, dates, locations, and agendas. – September 17, 2015 at the Guadalupe-Blanco River Authority Annex.

11. Questions from the public.

12. Adjourn.



MEETING MINUTES

August 20, 2015

1. **Call to order--Establish that all Committee members are present or represented - 9:00 am.**

Members of this committee include: Tom Taggart (City of San Marcos), Roland Ruiz (Edwards Aquifer Authority, (EAA)), Steve Ramsey (City of New Braunfels), Chuck Ahrens (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (Guadalupe Blanco River Authority, (GBRA)).

Mr. Juan Guerra was present for Andy Sansom and Mr. Brock Curry was present for Roland Ruiz.

2. **Public Comment.**

No Comment.

3. **Approval of minutes from the June 18, 2015 Implementing Committee meeting.**

Chuck Ahrens moved for approval. Juan Guerra seconded. There was no objection.

4. **Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.**

- **Springflows and Index Well Levels**
Shaun Payne, HCP Coordinator, provided the committee an update on the springflows and index well levels.
- **Budget Update.** The Committee had no questions or comments.
- **ASR Operations by SAWS**
Chuck Ahrens updated the Committee on the SAWS ASR operations. There is currently 75,000 acre-feet in storage which is being stored at a rate of 31 million gallons a day. SAWS is expecting to store all HCP water made available for this year.
- **ASR Leasing Update**
Rick Illgner, EAA, presented the ASR Leasing numbers. EAA expects to end the year with 14,650 acre-feet of leases enrolled.
- **Refugia Update**
Nathan Pence, EAHCP Program Manager, explained the details of the Refugia Program. Facilities for Salvage Refugia are in the process of being put together and research will start soon. The Long-term Refugia contract is on schedule to have an executed contract by January 1st, 2016. Coordination with USFWS has been very productive and the HDR Inc. report was sent for peer review to the editorial board of the American Fisheries Society Aquaculture Journal. They offered helpful comments for moving forward and an overall positive response. Brock Curry, EAA, mentioned the EAA Board of Directors has approved the creation of a new position within the HCP team for Refugia and Covered Species programs. This position will be funded fully by EAA.
- **Permittee Update**

- Melani Howard, City of San Marcos/Texas State University, presented information regarding the Riparian and Littoral Restoration activities. Presentation is available on eahcp.org.
- **Conservation Measure Showcase - City of New Braunfels: Non-native species removal.**
Chris Abernathy, HCP Senior Coordinator, introduced Mark Enders, City of New Braunfels, who presented information regarding their Non-native Animal Species Removal activities by SWCA. The City indicated that due to the size and numbers of species removed, significant benefit to the Comal system should be realized. Presentation can be found on eahcp.org.
 - **2016 Work Plans.** Nathan Pence updated the Committee on the submission of the 2016 Work Plans to the EAA General Manager.
 - **EAA Groundwater Model Uncertainty Analysis**
Mark Hamilton, EAA, provided the Committee an update on the development of the Hydrologic Modeling Uncertainty Analysis
 - **Letter and Errata Sheet for 2014 Annual Report**
Alicia Reinmund-Martinez, HCP Director, updated the Committee on the submission of the 2014 Annual Report Errata Sheet to USFWS.
5. **Presentation and discussion pertaining to Phase II Strategic Adaptive Management Decision Making.**
Mr. Pence presented the information regarding details for the Phase II Adaptive Management process. Presentation can be found on eahcp.org.
6. **Presentation and possible action to adopt for implementation the *National Academy of Sciences - Review of the Edwards Aquifer Habitat Conservation Plan: Report 1 Implementation Plan recommended by the NAS Recommendations Review Work Group (RRWG)*.**
Mr. Pence presented the details of the NAS RRWG Implementation Plan in order to provide a better understanding of the work performed by the Work Group. Chuck Ahrens moved to adopt the plan as presented. Brock Curry seconded. There was no objection.
7. **Discussion and possible action to create an Applied Research Work Group, possible appointment of members, and approval of a Work Group charge.**
Mrs. Reinmund-Martinez presented the Applied Research Work Group charge and selected slate of members for the Implementing Committee's review. Tom Taggart moved to accept the Work Group charge and membership as presented. Brock Curry seconded. There was no objection.
8. **Presentation and possible action to consider amending the 2015 City of San Marcos/Texas State University (COSM/TXSTATE) Permanent Access Points/Bank Stabilization Work Plan.**
Mrs. Reinmund-Martinez presented the amendment to the 2015 COSM/TXSTATE Work Plan to include development of engineering plans for the Permanent Access Points. Steve Ramsey moved to approve the amended Work Plan. Tom Taggart seconded. There was no objection.
9. **Presentation and discussion of the San Marcos Watershed Initiative (SMWI).**
Tom Taggart introduced Dianne Wassenich from the San Marcos River Foundation for a brief presentation on the SMWI.
10. **Consider future meetings, dates, locations, and agendas. – September 17, 2015 at the Guadalupe-Blanco River Authority Annex.**
11. **Questions from the public.**
No questions were asked.

12. **Adjourn-** 11:47 am

A handwritten signature in black ink, appearing to read "Steve Ramsey", is written over a horizontal line.

Steve Ramsey, Secretary

**NOTICE OF OPEN MEETING****Available at eahcp.org**

As required by 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), a meeting of the **Implementing Committee** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **9:00 am on Thursday, October 15, 2015 at the Guadalupe-Blanco River Authority Annex Building, 905 Nolan, Seguin, TX**. Lunch will not be provided.

Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Darren Thompson (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA). At this meeting, the following business may be considered and recommended for committee action:

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Approval of minutes from the August 20, 2015 Implementing Committee meeting (Attachment 1).
4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Springflows and Index Well Levels
 - Budget Update (Attachment 2-3)
 - ASR Operations by SAWS
 - ASR Leasing Update (Attachment 4)
 - Refugia Update
 - NAS Update
 - City of New Braunfels Permittee Update
 - City of San Marcos and Texas State University Permittee Showcase
 - Applied Research Work Group
5. Staff Report: Presentation of the EAA's Hydrologic Modeling.
Purpose: To update the Implementing Committee on the status of the development of the Hydrologic Models and the EAA 5-year Modeling Plan.
Action: No action required.
6. Discussion and possible action to adopt a proposed succession plan for the Implementing Committee Officers (Attachment 5).
Purpose: To provide an opportunity for the Implementing Committee to adopt a succession plan.
Action: To adopt an officer succession plan for 2017-2028.

7. Presentation and discussion of 2016 Meeting Schedule (Attachment 6).
Purpose: To provide an opportunity for the Implementing Committee to discuss and formalize the 2016 Meeting Schedule.
Action: To approve the 2016 meeting schedule.
8. Presentation and possible action to approve the amended 2016 EAA Work Plan (Attachment 7-9).
Purpose: To provide an opportunity for the Implementing Committee to review the proposed amendments to the 2016 EAA Work Plan.
Action: To approve the proposed amendments to the 2016 EAA Work Plan.
9. Presentation and possible action to approve the amended 2016 City of New Braunfels Work Plan (Attachment 10).
Purpose: To provide an opportunity for the Implementing Committee to review the proposed amendments to the 2016 City of New Braunfels Work Plan.
Action: To approve the proposed amendments to the 2016 City of New Braunfels Work Plan.
10. Presentation and possible action to approve the amended 2016 City of San Marcos/Texas State University Work Plan (Attachment 11).
Purpose: To provide an opportunity for the Implementing Committee to review the proposed amendments to the 2016 City of San Marcos/Texas State University Work Plan.
Action: To approve the proposed amendments to the 2016 City of San Marcos/Texas State University Work Plan.
11. Presentation and possible action to approve the 2016 Funding Applications to be submitted to the EAA Board (Attachment 12-15).
Purpose: To provide the Implementing Committee the opportunity to review and discuss the 2016 EAHCP Funding Applications.
Action: To consider possible approval to submit the 2016 Funding Applications to the EAA Board.
12. Consider future meetings, dates, locations, and agendas. – November 19, 2015.
13. Questions/Comments from the public.
14. Adjourn.

**MEETING MINUTES****October 15, 2015**

REVISED 11/19/2015

1. Call to order--Establish that all Committee members are present or represented.
9:22 a.m.

Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Darren Thompson (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA).

Melani Howard was to represent Texas State as an alternate for Andrew Sansom; however, Melani called in sick the morning of the meeting. To establish quorum, Dianne Wassenich participated in Melani's place, with the prior approval of Melani and Andrew.

2. Public Comment.
None.
3. Approval of minutes from the August 20, 2015 Implementing Committee meeting.
Approved.
4. Received report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Springflows and Index Well Levels
Nathan Pence presented springflows and index well levels.
 - Budget Update
Nathan Pence provided the EAHCP budget update.
 - ASR Operations by SAWS
Darren Thompson presented the latest information on ASR operations. There is 11,750 AF of water stored for the HCP.
 - ASR Leasing Update
Rick Illgner provided an update on ASR leasing.
 - Refugia Update
Nathan Pence provided an update on EAHCP Refugia activities.
 - NAS Update
Nathan Pence updated the Committee concerning the upcoming NAS meetings, October 28-30, 2015.
 - City of New Braunfels Permittee Update
Mark Enders presented the Permittee Update for the City of New Braunfels. Mr. Enders mentioned that the City has removed substantially all of Hygrophila that was in the Comal system.
 - City of San Marcos and Texas State University Permittee Showcase
The Permittee Showcase was postponed as Melani Howard was unable to make it to this meeting.
 - Applied Research Work Group

- The Permittee Showcase was postponed as Melani Howard was unable to make it to this meeting.*
- **Applied Research Work Group**
Alicia Reinmund-Martinez updated the Implementing Committee concerning the latest progress of the Applied Research Work Group, which finished its last meeting on October 16, 2015.
5. **Staff Report: Presentation of the EAA's Hydrologic Modeling.**
Jim Winterle presented on the EAA's hydrologic modeling program. Discussion followed.
 6. **Discussion and possible action to adopt a proposed succession plan for the Implementing Committee Officers.**
Steve Ramsey suggested adopting the proposed succession plan however renaming it to "succession agenda" and requiring an annual ratification process for renaming officers to provide flexibility in instances when the next office appointment falls on someone who may not have sufficient experience to chair the committee. Tom Taggart made the motion and seconded by Steve Ramsey. Motion was approved.
 7. **Presentation and discussion of 2016 Meeting Schedule.**
Nathan Pence presented the 2016 Meeting Schedule. Darren Thompson asked whether SAWS would host future meetings, and Texas State was mentioned as well. Nathan agreed that staff would be reaching out to Permittees to schedule additional meeting locations as indicated.
 8. **Presentation and possible action to approve the amended 2016 EAA Work Plan.**
Darren Thompson motioned to accept the table with three changes renaming "PCS – Miscellaneous" as "Unallocated contingency," subsuming "PCS – NAS Implementation" within the aforementioned category, and labeling the fact the Refugia Director would be paid through EAA on the HCP organization plan chart. The motion was seconded by Tom Taggart and approved.
 9. **Presentation and possible action to approve the amended 2016 City of New Braunfels Work Plan.**
Mark Enders presented the changes to the City of New Braunfels work plan and budget. Those changes included the need to use current and future funding for the bank stabilization project. Roland Ruiz requested that the Implementing Committee receive a mid-year work plan and budget update to learn of delayed projects.

Chairman Taggart moved to adopt the amended Work Plan as presented, on the condition that upon receipt of bids, that the City of New Braunfels would report back to the Implementing Committee the received cost amounts for the Project. In the event that this cost deviates from that presented in the amended Work Plan, the City of New Braunfels would be required to resubmit a revised Work Plan and Funding Application to reflect the new amounts. The motion was seconded Roland Ruiz and approved.
 10. **Presentation and possible action to approve the amended 2016 City of San Marcos/Texas State University Work Plan.**
Steve Ramsey moved to approve the amended City of San Marcos/Texas State University Work Plan and was seconded by Roland Ruiz and approved by the Committee.
 11. **Presentation and possible action to approve the 2016 Funding Applications to be submitted to the EAA Board.**
The 2016 Funding Applications were approved as presented by the Committee.

Tom Arsuffi discussed his concern over the possibility that San Marcos Aquatic Resource Center would not be involved with the long-term refugia project given that their scientific expertise with working with the Covered Species would be lost. Copies of a resolution to this effect were distributed to the Implementing Committee.

14. Adjourn.
11:42 a.m.

A handwritten signature in black ink, appearing to read "Steve Ramsey". The signature is written in a cursive, flowing style. A long, thin vertical line extends downwards from the bottom of the signature, crossing the horizontal line that separates the signature from the printed name.

Steve Ramsey, Secretary



NOTICE OF OPEN MEETING
Available at eahcp.org

As required by 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), a meeting of the **Implementing Committee** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **9 a.m. on Thursday, November 19, 2015 at the Edwards Aquifer Authority (Recharge Room), 900 E. Quincy, San Antonio, Texas, 78215**. Lunch will not be provided.

Members of this committee include: Tom Taggart (San Marcos), Roland Ruiz (EAA), Steve Ramsey (New Braunfels), Darren Thompson (SAWS), Andrew Sansom (Texas State University), and Todd Votteler (GBRA).

At this meeting, the following business may be considered and recommended for committee action:

1. Call to order: Establish that all Committee members are present or represented.
2. Public comment.
3. Approval of October 15, 2015 Implementing Committee meeting minutes (Attachment 1).
4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.
 - Summary of Flood Impacts to EAHCP Restoration in the Comal and San Marcos springs systems.
 - ASR Operations by SAWS
 - Budget Update (Attachment 2)
 - National Academy of Sciences October 2015 Meeting Summary
 - 2015 EAHCP Annual Report Timeline (Attachment 3)
5. Presentation and discussion on an EAA summary of well permitting and pumping history from 2008 to 2014.

Purpose: To inform the Implementing Committee about compliance in well permitting from 2008 to 2014.

Action: No action required.

6. Presentation and possible approval of a proposed Scope of Work (SOW) to evaluate methodologies and develop timelines for the EAHCP restoration of native vegetation in the San Marcos and Comal ecosystems as it pertains to achieving the Biological Goals (Attachment 4).
Purpose: To provide an opportunity for the Implementing Committee to approve a proposed SOW.
Action: To possibly approve the proposed SOW.
7. Presentation of and possible approval authorizing the EAHCP Program Manager to submit a letter to USFWS informing them about operational issues and future plans related to: 1) the evaluation of native aquatic vegetation restoration, 2) the source of data for calculating the compliance of Texas Wild-rice coverage, and 3) the delay in implementing the flow manipulation in the Old Channel of the Comal River. (Attachment 5).
Purpose: To provide the Implementing Committee with a draft letter to be considered for submission to the USFWS.
Action: To approve authorizing the EAHCP Program Manager to submit a letter to USFWS regarding 1) the evaluation of native aquatic vegetation restoration, 2) the source of data for calculating the compliance of Texas Wild-rice coverage, and 3) the delay in implementing the flow manipulation in the Old Channel of the Comal River.
8. Presentation and discussion about a strategic approach for optimizing EAHCP research programs.
Purpose: To inform the Implementing Committee about a strategic approach to all EAHCP research programs that maximizes resources in support of accomplishing the EAHCP Biological Goals and Objectives.
Action: No action required.
9. Presentation and possible adoption of the *Report of the 2015 Applied Research Work Group* for implementation.
Purpose: To provide an opportunity for the Implementing Committee to approve and adopt the final deliverable of the Applied Research Work Group for implementation.
Action: To adopt the *Report of the 2015 Applied Research Work Group*.
10. Presentation and possible direction authorizing the EAHCP Program Manager to initiate a phased approach for procuring a database for EAHCP data and for conducting a statistical analysis of EAHCP data.
Purpose: To present the concept for a phased approach to a data management system and data analysis process that will assist in accomplishing the EAHCP Biological Goals and Objectives.
Action: To approve authorizing the EAHCP Program Manager to initiate a process to procure a database for EAHCP data and for conducting a statistical analysis of EAHCP data.
11. Presentation and possible action to approve the amended 2015 EAA Funding Application to be submitted to the EAA Board (Attachment 6).
Purpose: To provide the Implementing Committee the opportunity to review and discuss the amended 2015 EAHCP Funding Application reflecting an increase in the budget appropriated for the National Academy of Science Science Review Panel contract.

Action: To consider possible approval to submit the amended 2015 EAA Funding Application to the EAA Board.

12. Consider future meetings, dates, locations, and agendas. – Joint Meeting, December 17, 2015 at the Edwards Aquifer Authority.
13. Questions from the public.
14. Adjourn.



MEETING MINUTES

November 19, 2015

1. Call to order.

Todd Votteler was not present. GBRA did not have representation. All others members were present or represented. Juan Guerra was present for Andy Sansom, Texas State University.

2. Public comment.

No comment.

3. Approval of October 15, 2015 Implementing Committee meeting minutes.

Darren Thompson, SAWS, identified a change to item 9, replace language about “completion of project” to “bid of project.” Revised minutes can be found at eahcp.org.

4. Receive report from the Program Manager on general topics related to the implementation of the Habitat Conservation Plan and operation of the Implementing Committee.

- Summary of Flood Impacts to EAHCP Restoration in the Comal and San Marcos springs systems.
Nathan Pence, EAHCP Program Manager, reported the current status of springflows and Index Well levels as well as reported on the work done to assess the impacts of the October flood. Mark Enders, City of New Braunfels, reported on the direct impacts of the flood on the Comal River system. Melani Howard, City of San Marcos/Texas State University, reported on the direct impacts of the flood on the San Marcos River system. Both Mr. Pence as well as Tom Taggart, City of San Marcos, explained the impacts to the EAHCP projects. Mr. Pence communicated that the ITP does not require mitigation of Take in the event of a flood but rather only drought directly or indirectly caused by pumping. Mr. Taggart explained that the impacts could have been far worse had it not been for EAHCP projects.
- ASR Operations by SAWS
SAWS is currently storing at 20 MGD. HCP total storage is 17,974 AF as of October 19th. All HCP water made available to SAWS was stored as of mid-October. Mr. Pence reported that EAA has been receiving calls for 2016 leasing.
- Budget Update – There was no discussion.
- National Academy of Sciences October 2015 Meeting Summary
Mr. Pence summarized the most recent visit if the NAS committee. Roland Ruiz, EAA, expressed concern about the tone of the discussion during the October 29th meeting.
- 2015 EAHCP Annual Report Timeline
Mr. Pence summarized the current timeline of deliverables for the 2015 Annual Report.

5. Presentation and discussion on an EAA summary of well permitting and pumping history from 2008 to 2014.

Earl Parker, EAA, reported the background of EAA regulatory pumping framework as well as the pumping summary of 2008 through 2014. Mr. Parker showed despite the highest Critical Period Reductions (35% in San Antonio Pool and 44% in Uvalde Pool), total pumping was below authorized volume by more than 50,000 acre-feet. For 2015, estimated Critical Period Reductions are expected to be approximately 20% for both San Antonio and Uvalde Pool. The full presentation can be found at eahcp.org.

It was recommended for the presentation in the future to include a breakout depiction of VISPO contribution to water conserved/pumped tables and to show recharge rankings (e.g., 2008 was the 8th lowest year on record for recharge). It was asked approximately how much water was associated with exempt wells; Mr. Parker stated he did not know offhand but could find out for the Committee.

6. Presentation and possible approval of a proposed Scope of Work to evaluate methodologies and develop timelines for the EAHCP restoration of native vegetation in the San Marcos and Comal ecosystems as it pertains to achieving the Biological Goals.

Mr. Pence provided the Committee a background of how the FMA describes the Adaptive Management process in terms of the proposed Scope of Work. The Scope of Work described an analysis of current Biological Goals and Objectives of native aquatic vegetation restoration in the San Marcos and Comal systems.

The presentation included additional language to be included in the Scope of Work to provide flexibility for the Program Manager as well as the Implementing Committee to resolve any conflicting recommendations between the two contractors selected for this analysis. Mr. Taggart discussed the rationale for including additional flexibility in the Scope of Work to provide a compromise between the two researchers selected for the analysis. Mr. Pence explained how the funding for this contract will come out of the Program Management budget specifically allocated for Adaptive Management.

Steve Ramsey motioned to adopt the Scope of Work to produce a contract to be executed. Seconded by Juan Guerra. There were no objections.

7. Presentation of and possible approval authorizing the EAHCP Program Manager to submit a letter to USFWS informing them about operational issues and future plans related to: 1) the evaluation of native aquatic vegetation restoration, 2) the source of data for calculating the compliance of Texas wild-rice coverage, and 3) the delay in implementing the flow manipulation in the Old Channel of the Comal River.

Mr. Pence presented the details of a letter to USFWS is to inform them of approaching Adaptive Management Decision Making as well as:

1. The vegetation analysis being done in both San Marcos and Comal springs systems.
2. The reference to TWR coverage numbers from BIO-WEST Inc. and not USFWS.
3. The requirement to increase in flows to the Old Channel of the Comal, described in the HCP, could be harmful. An analysis will be done to determine the best step forward. The letter will request concurrence to the delay in increased flows to the Old Channel so scour will not occur.

Steve Ramsey, City of New Braunfels, asked whether staff has communicated Old Channel flow manipulation subject to USFWS. Mr. Pence said that this motion is to initiate the process to submit formal communication, but there had already been conversation with USFWS prior to developing this request.

Adam Zerrenner with USFWS stated that the EAHCP is doing well and reassured the Committee current work and potential changes are routine and acceptable.

Tom Taggart motioned to approve authorizing the EAHCP Program Manager to submit a letter to USFWS regarding the 1) evaluation of native aquatic vegetation restoration, 2) the source of data for calculating the compliance of Texas wild-rice coverage, and 3) the delay in implementing the flow manipulation in the Old Channel of the Comal River. The motion was seconded by Darren Thompson. There were no objections.

8. Presentation and discussion about a strategic approach for optimizing EAHCP research programs.

Mr. Pence presented the rationale of the Applied Research Work Group based on the NAS Recommendations Review Work Group. The EAHCP conducts research in a variety of different programs including Applied Research, Ecological Modeling, Refugia and Hydrologic Modeling. Mr. Pence described the need was to provide the most productive way to conduct research between all programs within the EAHCP in a collaborative way. Mr. Taggart recommended the importance of cross referencing all research between various programs in the Annual Report.

9. Presentation and possible adoption of the Report of the 2015 Applied Research Work Group for implementation.

Mr. Pence introduced the Work Group's chair, Dr. Tom Arsuffi, to present the Work Group report. Dr. Arsuffi began by commending the Implementing Committee for putting together a Work Group membership that provided productive discussion as well as a great product. Details of the report can be found at eahcp.org.

Darren Thompson motioned to adopt the Applied Research Work Group report. Seconded by Steve Ramsey. There were no objections.

10. Presentation and possible direction authorizing the EAHCP Program Manager to initiate a phased approach for procuring a database for EAHCP data and for conducting a statistical analysis of EAHCP data.

Alicia Reinmund-Martinez, EAHCP Director, presented the details of building an EAHCP database and statistical analysis plan. The full presentation can be found on eahcp.org.

Mr. Taggart said he thought this type of work is very important. He suggested staff begin developing the details to insure long-term administrative success. He also asked about the funding source of this database as well as the "usability" of the product.

Mr. Pence answered that the work will be done through the 2016 funds through various line items dependent on budget expectations. The Scope of Work will include long-term management training for in-house employees. In terms of a usable database, Mrs. Reinmund-Martinez

described various examples of a user friendly interface in addition to a full data center to allow simple searching.

Juan Guerra, Texas State University, asked if a multi-year project cost will be established. Mr. Taggart continued by stating that database management is important in planning for year to year activities.

Juan Guerra motioned to approve the Program Manager to move forward in developing a database management and statistical analysis contract. Tom Taggart seconded. There were no objections.

11. Presentation and possible action to approve the amended 2015 EAA Funding Application to be submitted to the EAA Board.

Mr. Ruiz presented the summary of the 2015 EAA Funding Application to reflect changes to the overall budget to account for NAS invoices received this year for last year's work. All budget increases are within the overall budget.

Tom Taggart motioned to approve the amended 2015 EAA Funding Application as presented. Darren Thompson seconded. There were no objections.

12. Consider future meetings, dates, locations, and agendas.

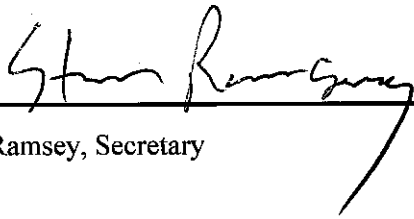
Joint Meeting, December 17, 2015 at the Edwards Aquifer Authority.

- Summary of 2015 work
- Introduction of the Adaptive Management Process

13. Questions from the public.

No comment.

14. Adjourn. 11:55 am

A handwritten signature in black ink, appearing to read "Steve Ramsey", is written over a horizontal line.

Steve Ramsey, Secretary



NOTICE OF OPEN MEETING

Available at eahcp.org

As required by 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), a joint meeting of the **Implementing, Stakeholder and Science Committees** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **9:00 am on Thursday, December 17th at the Edwards Aquifer Authority, 900 E. Quincy, San Antonio, TX.**

1. Call to order--Establish that all Committee members are present or represented- 9:00 am.
2. Public Comment.
3. Receive report from the Program Manager on general topics related to the Habitat Conservation Plan.
 - J-17 Forecast (Attachment 1 & 2)
 - Covered Species Photographs
 - Refugia Update
 - Regional Water Conservation Program Update
 - 2016 EAHCP Committee Dates (Attachment 3 & 4)
 - Data Management Program for EAHCP
 - National Academy of Sciences Report 1 and 2 update
4. Staff Report: Presentation on the Hydrologic Model.
 - Purpose: To present the status of the development of the Hydrologic Model to the committees.
 - Action: No action required.
5. Staff Report: Presentation on the Ecological Model.
 - Purpose: To present the status of the development of the Ecological Model to the committees.
 - Action: No action required.
6. Presentation of the first potential Non-routine Adaptive Management action: Evaluation of Native Submerged Aquatic Vegetation Restoration.
 - Purpose: To present details of the Adaptive Management Decision making process, including roles of Implementing, Stakeholder, and Science committees, and the plan for the Submerged Aquatic Vegetation project.

Action: No action required.

7. Panel Discussion: Discussion regarding the first potential Non-routine Adaptive Management action: Evaluation of Native Submerged Aquatic Vegetation Restoration.

Purpose: To provide the committees an opportunity to discuss various aspects of the Adaptive Management process.

Action: No action required.

8. Presentation of EAHCP Strategic Adaptive Management (Phase II) decision making process.

Purpose: To present the details of Phase II and the strategic Adaptive Management process.

Action: No action required.

9. Panel Discussion: Discussion regarding EAHCP Strategic Adaptive Management (Phase II) decision making process.

Purpose: To provide the committees an opportunity to discuss various aspects of the Phase II and the strategic Adaptive Management process.

Action: No action required.

10. Future agenda items and topics of discussion.

11. Questions from the public.

12. Adjourn.



MEETING MINUTES

December 17, 2015

1. **Call to order**--Establish that all Committee members are present or represented.
Tom Taggart, Chair of the Implementing Committee, called roll to ensure all partners are represented.
All committee members were present and accounted for.
2. **Public Comment.**
No comment
3. **Receive report from the Program Manager on general topics related to the Habitat Conservation Plan.**
 - **J-17 Forecast**
Nathan Pence, EAHCP Program Manager, presented the springflow and index well levels and J-17 forecasts.
 - **Covered Species Photographs**
Mr. Pence presented the photos received of the EAHCP Covered Species.
 - **Refugia Update**
Mr. Pence provided an update on the status of the Salvage Refugia Program.
 - **Regional Water Conservation Program Update**
Mr. Pence provided an update on the RWCP. Roland Ruiz, EAA, and Darren Thompson, SAWS, provided details about the leak repair program projected to conserve approximately 20,000 acre-feet over the next 5-years. This agreement will provide the remaining commitments necessary to satisfy the obligations required in the EAHCP.
 - **2016 EAHCP Committee Dates.** Mr. Pence told committee members that the 2016 meeting schedules have been posted online as attachments to this meeting.
 - **Data Management Program for EAHCP**
Alicia Reinmund-Martinez, EAHCP Director, presented the details of the future Data Management Program. The program is projected to be completed in 2016.
 - **National Academy of Sciences Report 1 and 2 update**
Mr. Pence presented a summary of the EAHCP's response to the NAS Report 1 and the beginning stages of developing Report 2.
 - **2015 Success**
Mr. Pence presented a list of accomplishments for the HCP for 2015.
4. **Staff Report: Presentation on the Hydrologic Model.**
Jim Winterle, EAA, presented an update on the Hydrologic Modeling effort. Full presentation can be found at eahcp.org.

There were questions and discussion on how to manage uncertainty in the hydrologic modeling results to make policy decisions in the future.
5. **Staff Report: Presentation on the Ecological Model.**

Ed Oborny, Bio-West Inc., presented an update on the development of the Ecological Model. Full presentation can be found at eahcp.org.

There were questions and discussion on how year-to-year changes in the systems could possibly effect the data used in the model and ultimately compromise the results.

6. Presentation of the first potential Nonroutine Adaptive Management action: Evaluation of Native Submerged Aquatic Vegetation Restoration.

Steve Raabe, Stakeholder Committee Chair, described the format of the presentations, panel discussions, and question and answer.

Mr. Pence presented the details of the process required in making Nonroutine Adaptive Management decisions. Full presentation is available at eahcp.org.

7. Panel Discussion: Discussion regarding the first potential Nonroutine Adaptive Management action: Evaluation of Native Submerged Aquatic Vegetation Restoration.

Mr. Raabe introduced Mr. Pence and Myron Hess, Vice-chair of the Stakeholder Committee. The Panel received questions from the audience regarding various topics.

8. Presentation of EAHCP Strategic Adaptive Management (Phase II) decision making process.

Mr. Pence presented the details of the process required in making Strategic Adaptive Management decisions in Phase II of the HCP. Full presentation is available at eahcp.org.

9. Panel Discussion: Discussion regarding EAHCP Strategic Adaptive Management (Phase II) decision making process.

Mr. Raabe introduced the panel of Mr. Pence, Mark Hamilton, EAA, and Tom Taggart, City of San Marcos.


Question regarding the Hydrologic Model and next steps were discussed. Additionally, Mr. Raabe asked questions regarding critical information needed to start planning for Phase II.

10. Future agenda items and topics of discussion.

11. Questions from the public.

- Gary Middleton, Stakeholder Committee meeting mentioned the need for a succession plan for the members on the various HCP committees.
- Dianne Wassenich expressed concern about the changes in the Refugia program.

12. Adjourn- 12:41 pm.



Steve Ramsey, Secretary

Appendix I2

NAS Recommendations Review Work Group: Report 1 – 2015 Activities

NAS Review Recommendations Work Group: Report 1 – Work Group Charge

June 5, 2015 Meeting Agenda

Meeting Minutes

June 26, 2015 Meeting Agenda

Meeting Minutes

July 10, 2015 Meeting Agenda

Meeting Minutes

NAS Review Recommendations Work Group: Report 1 – Final Report

2015 Implementing Committee

National Academy of Sciences

Recommendations Review Work Group: Report 1

Charge:

The Edwards Aquifer Authority contracted with the National Academy of Sciences (NAS), to act as an independent Science Review Panel (SRP), in order to evaluate select components of the Edwards Aquifer Habitat Conservation Plan (EAHCP). NAS is required to produce three reports. The first of these reports has been released and is entitled; “*Review of the Edwards Aquifer Habitat Conservation Plan: Report 1.*”

An official process for reviewing the NAS Report 1 was approved at the January 15, 2015, Implementing Committee Meeting. A component of this process included the creation of the Recommendation Review Work Group: Report 1 (RRWG), in order to provide Stakeholder and Implementing Committees representation during the development of an implementation plan by EAHCP staff - (*Report 1 Implementation Plan*). The Implementing Committee officially created the RRWG at their meeting on March 19, 2015.

Generally, the purpose of the RRWG is to provide staff with direction and guidance related to the development of an implementation plan for *Report 1*, including feasibility analysis, and to attend all NAS Report 1 related meetings to ensure consistency in representation of the Implementing and Stakeholder Committees throughout the implementation process.

The specific charge of the RRWG is to review the staff drafted *Report 1 Implementation Plan*, modify it as necessary, and if appropriate recommend the Plan to the Implementing Committee for adoption and implementation.

Committee Membership and Meeting Conductance:

Members include the following: *Cindy Loeffler* (Texas Parks and Wildlife Department), *Melani Howard* (City of San Marcos and Texas State University), *Roger Biggers* (New Braunfels Utilities), *Darren Thompson* (San Antonio Water System), and *Mark Hamilton* (Edwards Aquifer Authority).

The RRWG will first determine if a Chair is desired. If desired, the RRWG will nominate and select from its membership a Chair. A quorum will be necessary at the RRWG’s final meeting for official recommendation to the Implementing Committee for adoption. RRWG members will have the option of appointing an alternate to the Committee.

The RRWG will operate by consensus. In the event that consensus is not reached on the implementation of a specific recommendation, that recommendation and opposing rationales will be identified in a separate section of the *Report 1 Implementation Plan*.

The Work Group shall hold its first meeting during the week of May 25, 2015, and will meet a minimum of three times between May 25th and July 31st. The final *Report 1 Implementation Plan* will be considered for approval by the RRWG at their last meeting and will be presented to the Implementing Committee at their August 20th meeting for consideration of adoption.



NOTICE OF OPEN MEETING

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the National Academy of Sciences Recommendations Review Work Group: Report 1 has been formed and has been constructed of representatives from throughout the Edwards Aquifer Region; a meeting of the **National Academy of Sciences (NAS) Recommendations Review Work Group: Report 1** of the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, June 5, 2015 at the Dunbar Center located at 801 West MLK, San Marcos, TX. The meeting will start at 9 a.m.**

Members of this workgroup include: Cindy Loeffler (Texas Parks and Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

1. Call to Order and Introductions of Work Group members.
2. Public Comment.
3. Possible nomination and election of the Work Group Chair.
Purpose: To discuss the need for and elect a Work Group Chair.
Action: To unanimously elect a Chair for the Work Group if necessary.
4. Presentation of Work Group Charge (Attachment 1).
Purpose: Presentation of the Charge to the Work Group.
Action: To review and discuss Work Group charge.
5. Determination of Work Group meeting strategy, schedule and locations (Attachment 2).
Purpose: To establish a Work Group strategy and schedule to present matrix to the Implementing Committee on August 20, 2015.
Action: To approve Work Group strategy and schedule.
6. Presentation of Draft Implementation Plan (Attachment 3).
Purpose: To introduce the Implementation Plan intended to be discussed.
Action: No action necessary.
7. Discussion and possible modification of monitoring section of the Draft Implementation Plan (Attachment 4).
Purpose: To provide input on the development of the Implementation Plan for the NAS Report 1.
Action: To discuss and possibly modify monitoring section of the Draft Implementation Plan.
8. Discussion on additional information needed by Work Group members.
Purpose: To identify any additional information needed by the Work Group that would assist in their Charge.

Action: To provide a list of information/resources related to the NAS Report 1 for EAHCP Staff to prepare.

9. Future Agenda Items:

10. Questions from the Public.

11. Adjourn.



MEETING MINUTES

June 5, 2015

1. **Call to Order and Introductions of Work Group members.**

Members of this workgroup include: Cindy Loeffler (Texas Parks and Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

Darren Thomson was unable to make the meeting. Steve Bereyso represented the San Antonio Water System in Mr. Thompson's absence.

2. **Public Comment.**

No comment

3. **Presentation of Work Group Charge.**

Alicia Reinmund-Martinez, EAHCP Director, presented a summary of the Work Group Charge as presented and approved by the Implementing Committee on May 21, 2015. Discussion followed.

4. **Possible nomination and election of the Work Group Chair.**

The Work Group decided not to select/elect a Chair of the Work Group.

5. **Determination of Work Group meeting strategy, schedule and locations.**

Mrs. Reinmund-Martinez presented the proposed meeting schedule. The Work Group agreed on the approach and proposed dates and times (except for the July 24 meeting will be held on July 31st if necessary). It was suggested by the Work Group to maintain full-day meetings in order to finish within 3 meetings.

Cindy Loeffler requested if the Work Group can discuss previously discussed items at following meetings. This will be added to the next agenda.

6. **Presentation of Draft Implementation Plan.**

Nathan Pence, EAHCP Program Manager, presented a summary of the Draft Implementation Matrix to the Work Group.

The Work Group was reminded that all recommendations found in the matrix will have financial implications. The Work Group must also identify ways to maintain a neutral budget. The definitions of the matrix columns were presented and there were no questions from the Work Group.

7. Discussion and possible modification of the Biological Monitoring and Water Quality Monitoring sections of the Draft Implementation Plan.

Mr. Pence reviewed the monitoring recommendations with the Work Group. The committee covered each recommendation contained in the matrix provided line by line.

Recommendation 25:

- Zara Environmental did an applied research study on the distribution of Comal Springs Riffle Beetles (CSRB) during low-flow conditions in the Comal. We got the distribution during low-flows. We could do this again during high-flows.
- Mrs. Loeffler commented that Chad Norris, TPWD, said that this task/study was not complete, but it was a good start. Mrs. Loeffler suggested to bring in Mr. Norris and Randy Gibson, USFWS, to discuss this subject further.
- Steve Bereyso stated that the Science Committee members were skeptical of the Zara study. Discussion followed.

Recommendation 26:

- This recommendation is done through the existing Biological Monitoring program.
- Melani Howard, City of San Marcos/Texas State University, referred to page 106-107 of the NAS Report 1. NAS suggested to evaluate the data to determine were there may be repetition. Mrs. Howard proposed we may be able to save money if repetitive data collection is stopped.
- Mrs. Howard and Mrs. Loeffler agreed to take a holistic review of Biological Monitoring program and its data.
- Mrs. Howard recommended to integrate the Water Quality and Biological Monitoring efforts as NAS suggested.

Recommendation 27:

- A discussion about creating another protocol other than the cotton lure approach through the Applied Research program.
- Cindy and Melani suggested deleting that the Science Committee supports the cotton lure approach.
- Roger asked about what we know about CSRB travel. What have we learned about the cotton lure approach? Why do we think cotton lures are attracting CSRB?
- Steve Bereyso was very skeptical of doing more research. It won't lead to anything.
- Myron Hess commented that NAS may be giving us this recommendation to assist them in completing Report 3.

Recommendation 28:

- Are you sampling on the right dates and locations?
- Suggestion to put together a Water Quality and a Biological Monitoring Work Group.

- Mark Hamilton commented that the work group should also coordinate on what water quality data are needed to support the biology. Coordination needs to happen to improve the data.
- Mr. Bereyso mentioned that adding a PhD to the HCP staff is not an ongoing need. Mr. Pence mentioned that Refugia is about to get started and needs a project manager. Who will also facilitate these other Biological Monitoring and Water Quality Monitoring programs? Nathan will present a summary of the HCP staff roles and responsibilities at the next Implementing Committee meeting.
- Mrs. Howard said it could be grant funded. No real support for a contractor to provide the role.

Recommendation 29:

- Mrs. Howard mentioned that the Comal and San Marcos rivers are nutrient limited. Nutrients are critical to sampling. The work group should look at nutrients and for other things.
- Sample for the watershed and for the activities in the watershed.
- Mr. Hamilton said that a holistic approach is key to make the program more successful.

Recommendation 30:

- This could set the guidelines for the future work group. Evaluate the program to monitor the watershed, for the species. Tailor the program towards the species.
- What do we know about the relationship between CSRB and water quality parameters? Are the species impacted from these parameters?
- Personal care products are expensive but are anthropogenic. Don't need to do that all the time. You will see the anthropogenic influences. The work group decided that the Science Committee should weigh in on this.
- Mrs. Howard commented on doing a comprehensive sampling annually. Do we do sediment cores? Yes, we do sediment sampling and passive diffusive samplers.

Recommendation 31:

- Mr. Pence provided a summary of the Biological Monitoring program. He talked to BIO-WEST and Science Committee members about the program being tied to those reaches to determine if we meet the biological goals and objectives. The HCP does not have the money to add new sites for the entire river.
- Mrs. Loeffler mentioned that it would be nice to have full habitat sampling, unless we have a good reason not to. We can stop doing what we are doing but, should the Biological Monitoring work group address this issue?
- Roger Biggers, NBU, said he leans towards not supporting this recommendation.
- What are the pros and cons to continue what we are doing versus a randomized sampling design of Biological Monitoring?
- Myron Hess said this recommendation ties to #33. He asked if the reaches and the biological goals are appropriate.

- Mrs. Howard and Mrs. Loeffler said not to rethink the biological goals and objectives. Rather, we could add to them.
- Mr. Hess mentioned that NAS is asking us to look at how we are determining the achievement of the biological goals.

Recommendation 32:

- Mr. Pence defined the rationale of this staff recommendation. NAS suggested more frequently than every 5 years and more randomized sampling.

Recommendation 33:

- Mr. Pence provided a summary of the matrix.
- The description needs to be expanded to include more of the other 2 recommendations. Could be a cost savings to the program.
- This could be included in the Biological Monitoring Work Group.
- Steve Bereyso said this would be nice to know.
- NAS is saying to spend EAHCP money wisely.

Recommendation 34:

- Mr. Pence summarized the recommendation. We are studying the macro invertebrates because they are food source of the fountain darter. This would be a new approach to sampling the macro invertebrates. The Ecological Model does not need this data for the model.
- There was a lot of discussion. Cindy did not think it would cost that much. But, would not provide us with much more information.
- The Biological Monitoring Work Group could come up with different recommendations.
- Water quality constituents could be dropped and picked up on Biological Monitoring.
- What did the workshop participants say? Melani said we don't know the impacts of water quality on the macro invertebrates.
- Mr. Hamilton said the water quality Work Group needs to talk to the Biologists about why there is a dead spot in the system?
- Macro invertebrate sampling is cheaper than most other sampling.

8. Discussion of next steps and request for any additional information needed by the Work Group members.

The Work Group discussed a summary of the changes made will be presented at the next meeting. Have Randy and Chad at the next meeting. The Work Group can discuss to see if any changes need to be made.

Mr. Pence summarized the report, will include some text, summarizing the work groups and how they work together.

Mr. Biggers mentioned the EAHCP should not be duplicating efforts: What can we not do? What can we do? How can we collaborate to make a better program?

9. Future Agenda Items: June 26th in San Marcos, TX

10. Questions from the Public.

There was no comment.

11. Adjourn.



NOTICE OF OPEN MEETING - **REVISED**

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the National Academy of Sciences Recommendations Review Work Group: Report 1 has been formed and has been constructed of representatives from throughout the Edwards Aquifer Region; a meeting of the **National Academy of Sciences (NAS) Recommendations Review Work Group: Report 1** of the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, June 26, 2015 at the Dunbar Center located at 801 West MLK, San Marcos, TX. The meeting will start at 9 a.m.**

Members of this Work Group include: Cindy Loeffler (Texas Parks and Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

1. Call to Order.
2. Public Comment.
3. Receive report from the Program Manager on general topics related to the operation of the NAS Recommendations Review Work Group: Report 1.
 - Meeting Minutes (Attachment 1)
 - Revised Work Group meeting schedule (Attachment 2)
4. Discussion of and possible modification to the Biological Monitoring and Water Quality Monitoring sections of the Draft Implementation Plan (Attachment 3).

Purpose: To review the modifications made based on the June 5th Work Group meeting and discuss any additional modifications to the Biological or Water Quality Monitoring sections.

Action: To finalize the discussion on the modifications to the Biological and Water Quality Monitoring sections of the Draft Implementation Plan.
5. Discussion and possible modification to the Hydrologic Modeling section of the Draft Implementation Plan (Attachment 4).

Purpose: To provide input on the development of the Implementation Plan for the NAS Report 1.

Action: To discuss and possibly modify the Hydrologic Modeling section of the Draft Implementation Plan
6. Discussion and possible modification to the Ecological Modeling section of the Draft Implementation Plan (Attachment 5).

Purpose: To provide input on the development of the Implementation Plan for the NAS Report 1.

Action: To discuss and possibly modify the Ecological Modeling section of the Draft Implementation Plan
7. Discussion and possible modification to the Applied Research section of the Draft Implementation Plan (Attachment 6 & 7).

Purpose: To provide input on the development of the Implementation Plan for the NAS Report 1.
Action: To discuss and possibly modify the Applied Research section of the Draft Implementation Plan

8. Discussion of next steps and request for any additional information needed by the Work Group members.

Purpose: To identify any additional information needed by the Work Group that would assist in their Charge.

Action: To provide a list of information/resources related to the NAS Report 1 for EAHCP Staff to prepare.

9. Agenda Items for July 10 meeting:

- Overarching Issues
- Prioritization
- Final Discussion and Approval of the Implementation Plan for NAS Report 1.

10. Questions from the Public.

11. Adjourn.



NAS Recommendations Review Work Group: Report 1 MEETING MINUTES

June 26, 2015

1. Call to Order.

Members of this Work Group include: Cindy Loeffler (Texas Parks & Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

2. Public Comment.

No comment

3. Receive report from the Program Manager on general topics related to the operation of the NAS Recommendations Review Work Group: Report 1.

- Meeting Minutes

Nathan Pence, EAHCP Program Manager, mentioned the Work Group minutes are being captured and made available to the members for their review.

Cindy Loeffler made changes to the minutes presented. The revised minutes will be attached to the final Draft Implementation Plan.

- Revised Work Group meeting schedule

Mr. Pence presented the revised meeting schedule to the work group for their review.

4. Discussion of and possible modification to the Biological Monitoring and Water Quality Monitoring sections of the Draft Implementation Plan.

Mr. Pence presented the introduction to the report drafted by staff as well as identified the changes made to the Draft Implementation Plan from input provided at the June 5th Work Group meeting.

Changes to the implementation matrix included:

Recommendation #28- The group requested the addition of providing a cost-benefit analysis to the Biological Monitoring Work Group discussion.

Recommendation #31- The group mentioned many changes regarding the implementation being a “to be determined” rather than “no” and “yes” or “in progress” rather than “done.” Revisions to reflect this will be made and provided to the Work Group.

Mr. Pence introduced a discussion about various questions regarding the Comal Springs Riffle Beetle (CSRB) directed to Randy Gibson, USFWS, and Chad Norris, TPWD. Discussion specifically regarding the cotton lures in sampling CSRB and other potential ways to collect the species. Discussion followed.

5. Discussion and possible modification to the Hydrologic Modeling section of the Draft Implementation Plan.

Mr. Pence, began the discussion mentioning that EAA staff Jim Winterle was present for the Work Group if they had any question involving changes to the Hydrologic Modeling. The Work Group worked through the recommendations one at a time.

The Work Group made a unanimous decision to recommend to the EAA to conduct an Uncertainty Analysis sooner rather than later. This will be presented to the Implementing Committee at their next meeting.

There was discussion pertaining to the development of the Hydrologic Model. Comments were made that there are benefits to both MODFLOW and Finite Element model and the EAA is constantly working towards improving their modeling program. Discussion followed.

Changes to the implementation matrix included:

Recommendation #7- Referred to including error bars onto MODFLOW. Mr. Winterle and Jeremy White, USGS, commented that the goal of developing an uncertainty analysis would be to develop error bars. This resulted in a change to the status of implementation to “in progress.”

Recommendation #9- Referred to moving to a daily time-step for our Hydrologic Model, with comments from the group about the fundamental limitations to the development of a daily time-step. The current model can process daily time-step by averaging a monthly data feature but will not properly reflect daily pumping. Additionally, Mark Hamilton, EAA, wanted to clarify that the EAA is not 100% certain about recharge numbers in terms of the model so moving towards a daily time-step for pumping may be early in the process. Discussion followed about future goals and the cost-benefit of this recommendation.

6. Discussion and possible modification to the Ecological Modeling section of the Draft Implementation Plan.

Mr. Pence introduced the Ecological Modeling section of the Implementation Plan. Ed Oborny, BIO-WEST and Ecological Modeling Team Leader, was present to answer any questions the group had.

The Work Group discussed the Ecological Model timing and the NAS Report. Mr. Oborny mentioned many of these recommendations are included in the program currently. Discussion followed and edits to the matrix reflect those comments.

Suitability analysis for Texas wild-rice has been done; at this stage, Mr. Oborny suggested that our understanding of this species' needs can only be expanded by including additional dimensions that would be covered by a simulation model.

7. Discussion and possible modification to the Applied Research section of the Draft Implementation Plan.

Mr. Pence introduced the Applied Research recommendations. The Work Group determined that the specific research projects included in the NAS Report will be discussed by the Applied Research Work Group if created by the Implementing Committee.

The specific program recommendations were discussed individually. Discussion regarding various topics followed. Melani Howard commented that extending the Applied Research project contract to be more than one year is critical to both informing the process and including outside expertise. The Work Group agreed with Mrs. Howard's comment.

The Work Group's recommendation was that their expertise and/or charge does not include review and recommendation of specific research projects included in the report. Thus, these recommendations should be reviewed by the Applied Research Work Group. Mrs. Howard mentioned that the Texas wild-rice projects recommended are being done and can be answered if coordinated with restoration efforts.

8. Discussion of next steps and request for any additional information needed by the Work Group members.

Mr. Pence mentioned that at any point over the next couple of weeks if a question regarding an individual's expertise is needed then requests are welcome.

9. Agenda Items for July 10th meeting:

- Overarching Issues
- Prioritization
- Final Discussion and Approval of the Implementation Plan for NAS Report 1

10. Questions from the Public.

Lynn Fahlquist, USGS, asked for details about future Work Groups. Mr. Pence mentioned the process with approval by the Implementing Committee in the development of a Water Quality Monitoring Work Group, Biological Monitoring Work Group, and Applied Research Work Group.

Steve Bereyso, SAWS, mentioned CO2 input into the river for proper Texas wild-rice development below Rio Vista Dam.

11. Adjourn- 12:01



NOTICE OF OPEN MEETING

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the National Academy of Sciences Recommendations Review Work Group: Report 1 has been formed and has been constructed of representatives from throughout the Edwards Aquifer Region; a meeting of the **National Academy of Sciences (NAS) Recommendations Review Work Group: Report 1** of the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, July 10, 2015 at the San Marcos Activity Center, 501 E. Hopkins St., San Marcos, TX. The meeting will start at 9 a.m.**

Members of this Work Group include: Cindy Loeffler (Texas Parks and Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

1. Call to Order.
2. Public Comment.
3. Receive report from the Program Manager on general topics related to the operation of the NAS Recommendations Review Work Group: Report 1.
 - Meeting minutes (Attachment 1)
4. Discussion and possible modification to the Biological and Water Quality Monitoring, Hydrologic Modeling, Ecological Modeling and Applied Research Programs sections of the draft Report 1 Implementation Plan (Attachment 2-5).

Purpose: To review the modifications made based on the June 26th Work Group meeting and discuss any additional modifications to these sections.

Action: To finalize the discussion on the modifications to the revised sections of the draft Report 1 Implementation Plan.
5. Discussion and possible modification to the Overarching Issues section of the draft Report 1 Implementation Plan (Attachment 6).

Purpose: To provide input on the development of the NAS Report 1 Implementation Plan.

Action: To discuss and possibly modify the Overarching Issues section of the draft Report 1 Implementation Plan.
6. Discussion and prioritization of recommendations in the draft Report 1 Implementation Plan (Attachment 7).

Purpose: To prioritize the recommendations of the NAS Report 1 recorded in the matrix of the draft Report 1 Implementation Plan.

Action: To agree on and recommend a prioritized matrix for implementation.

7. Discussion and possible modification to the Summary Section of the draft Report 1 Implementation Plan (Attachment 8).

Purpose: To review and discuss any modifications to the Summary.

Action: To finalize the discussion on the modification to the revised Summary section of the draft Report 1 Implementation Plan.

8. Discussion and possible action to recommend the draft NAS Report 1 Implementation Plan for official adoption by the Implementing Committee (Attachments 7, 8 & 9).

Purpose: To recommend the draft Report 1 Implementation Plan to the Implementing Committee.

Action: Consider approval of the draft Report 1 Implementation Plan for submittal to the Implementing Committee for official adoption.

9. Questions from the Public.

10. Adjourn.



**NAS Recommendation Review Work Group: Report 1
July 10, 2015
MEETING MINUTES**

1. **Call to order**--Establish that all Committee members are present or represented--9:09 a.m.

Members of this Work Group include: Cindy Loeffler (Texas Parks & Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

Nathan Pence, EAHCP Program Manager, began the meeting by outlining the process for the meeting.

2. **Public Comment.**

No comments

3. **Receive report from the Program Manager on general topics related to the operation of the NAS Recommendations Review Work Group: Report 1.**

- Meeting Minutes
No changes made.

4. **Discussion and possible modification to the Biological and Water Quality Monitoring, Hydrologic Modeling, Ecological Modeling and Applied Research Programs sections of the draft Report 1 Implementation Plan.**

Mr. Pence began by summarizing various changes to each section of the Implementation Plan based on the last Work Group's discussion.

Recommendations 47-50 in the Applied Research section: Melanie Howard mentioned that these recommendations are currently an ongoing effort in the San Marcos system.

5. **Discussion and possible modification to the Overarching Issues section of the draft Report 1 Implementation Plan.**

Mr. Pence began the discussion by explaining that many of these recommendations were discussed and considered during the EARIP process. The Work Group reviewed each of the recommendations and made various comments.

Recommendation 60: Possible future issues, specifically climate change planning, were discussed and could be included into the development of an uncertainty analysis to develop more confidence in the planning process.

Recommendation 62: Developing a data management plan is a process the Edwards Aquifer Authority and the EAHCP is pursuing and will continue to pursue.

Recommendation 63: Conducting a statistical data analysis effort will ultimately be decided by the Implementing Committee.

6. **Discussion and prioritization of recommendations in the draft Report 1 Implementation Plan.**

Mr. Pence described the rationale to how the prioritization was developed. The matrix was compiled based on the implementation recommendation and organized within each recommendation based on various financial implications. Discussion followed.

The Work Group approved the prioritized recommendations format. Additionally, the Work Group agreed to have EAHCP staff work with the Applied Research Work Group first in order to have a plan for future research.

7. **Discussion and possible modification to the Summary Section of the draft Report 1 Implementation Plan.**

Mr. Pence reviewed and summarized the Report's summary section. The Work Group made various comments and edits to the summary. The Work Group agreed to move forward with this format and text for the final report.

8. **Discussion and possible action to recommend the draft NAS Report 1 Implementation Plan for official adoption by the Implementing Committee.**

Cindy Loeffler moved to accept the NAS Report 1 Implementation Plan for official adoption by the Implementing Committee. Roger Biggers seconded. There was no objection.

9. **Questions from the public.**

No comment or question.

10. **Adjourn.** 11:21 am



National Academy of Sciences - Review of the Edwards
Aquifer Habitat Conservation Plan

Report 1 Implementation Plan

August 20, 2015

The Edwards Aquifer Authority contracted with the National Academy of Sciences (NAS) to act as an independent Science Review Panel (SRP) in order to evaluate select components of the Edwards Aquifer Habitat Conservation Plan (EAHCP). NAS is required to produce three reports. The first of these reports has been released and is entitled, *Review of the Edwards Aquifer Habitat Conservation Plan: Report 1* (hereafter referred to as *Report 1*).

An official process for reviewing and implementing *Report 1* was approved at the January 15, 2015 Implementing Committee meeting. From February to May, this process included presentations to the Implementing, Science, and Stakeholder Committees. At the April 16 and May 21, 2015 Implementing Committee meetings, the EAHCP Program Manager presented a matrix outlining a preliminary evaluation of the NAS recommendations. Subsequent to these presentations, the Implementing Committee accepted the following structure for this evaluation for implementing *Report 1* recommendations:

| | |
|--|--|
| Required for Compliance | Is implementation of this recommendation required to maintain compliance with the Incidental Take Permit (ITP) or EAHCP? |
| Supports Achieving Biological Objectives or Goals | Will implementation of a recommendation contribute to achieving the Biological Objectives or Goals? |
| Fatal Flaw of Program | 1. Does the recommendation correct a wrong direction, decision, or approach that otherwise prevents the Permittee from achieving the Biological Objectives or Biological Goals in the HCP? 2. Does the recommendation correct a wrong direction, decision, or approach that would cause the Permittees to exceed the Take levels identified in the ITP? |
| Immediate Implementation | Within the next year |
| Delayed Implementation | 2-5 year implementation schedule |
| Operationally Feasible | Can the technical and physical elements of a recommendation be implemented based on the current level of knowledge, understanding, and resources? |
| Politically Feasible | Has there been an expression historically by the Permittees as to the political nature or controversial nature of the recommendation? |
| Fiscally Feasible | Are there funds available for implementation of the recommendation? |
| Implementation Strategy | How will the recommendation be implemented? |

Another component of this process included the creation of the *Report 1* Recommendation Review Work Group (RRWG). The RRWG provided Stakeholder and Implementing Committees representation during the development of the *National Academy of Sciences Report 1 Implementation Plan (Report 1 Implementation Plan)* by EAHCP staff. On March 19, 2015, the Implementing Committee assigned the following members to the RRWG and approved its charge: *Cindy Loeffler* (Texas Parks & Wildlife Department), *Melani Howard* (City of San Marcos and Texas State University), *Roger Biggers* (New Braunfels Utilities), *Darren Thompson* (San Antonio Water System), and *Mark Hamilton* (Edwards Aquifer Authority).

The specific charge of the RRWG was to—by consensus—review the staff-drafted *Report 1 Implementation Plan*, modify it as necessary, and, if appropriate, recommend the plan to the Implementing Committee for adoption and implementation. The RRWG held three meetings during June and July 2015 and decided not to elect a Chair, instead relying on EAHCP staff to facilitate the meetings. Meetings were held as open fora where attendees actively participated in the discussion and provided valuable input. The agendas and minutes from each meeting are included herein Appendix II.

At their final meeting on July 10, 2015, the RRWG voted and reached, with requested changes, a consensus on the “Summary” section (this document) of the draft *Report 1 Implementation Plan* and the RRWG’s budget-based prioritization of these recommendations. Refer to Appendix I for the NAS Report 1: RRWG Prioritization Matrix.

With this summary stated, the RRWG recommended the Implementing Committee approve and adopt the *Report 1 Implementation Plan*.

Introduction

During its meetings, the RRWG recognized four overarching themes in responding to the recommendations in *Report 1*:

1. Through their review of the Hydrologic and Ecological Modeling programs, the Biological and Water Quality Monitoring programs, and the Applied Research program, NAS in *Report 1* validates the Edward Aquifer Recovery Implementation Program planning process, the science, and the financial and institutional resources behind the EAHCP.
2. The RRWG realized that many of the NAS recommendations were already done or were currently being implemented by the EAHCP.
3. Since the EAHCP does not have a specific budget earmarked for the implementation of the recommendations from *Report 1*, the RRWG recognized the importance of analyzing the costs versus the benefits of implementing each of the NAS recommendations. With this understanding of the EAHCP budget, the RRWG prioritized the NAS recommendations in this report to the Implementing Committee.
4. The RRWG understood that no recommendations from *Report 1* are needed in order for the Permittees to maintain compliance with the EAHCP ITP.

With this stated, the following is a summary of the RRWG-recommended *Report 1 Implementation Plan* on the five topic areas in *Report 1*: Hydrologic Modeling, Ecological Modeling, Biological and Water Quality Monitoring, Applied Research, and Overarching Issues.

Hydrologic Modeling Program

Report 1 contains nine recommendations related to the Hydrologic Modeling Program. Two of these recommendations are the consideration of MODFLOW as a work in progress, and support for the continued development of the HSPF model for estimating and understanding recharge. The RRWG supported these recommendations, and also considered the importance of the iterative and continual process needed for model improvement. The RRWG supported the EAA's development of a multi-year modeling plan that outlines the future of model improvement, including quantitatively assessing model uncertainty. Addressing model uncertainty was important to the RRWG.

The RRWG also recognized that implementing the following two recommendations should be future goals for the hydrologic model to be implemented when EAA has the technical capability as well as the necessary financial and data resources:

1. Including conduits in the development of the hydrologic model;
2. Moving toward making springflow predictions on a daily time scale.

Ecological Modeling Program

Report 1 contains 15 recommendations related to the ecological model. The RRWG recognized that because the model is in year three of a three-year development timeline, five recommendations have already been implemented, and that seven recommendations were already in progress.

In addition, the RRWG recognized that the ecological model does not currently include a component for the Comal Springs Riffle Beetle (*Heterelmis comalensis*; CSRB), but RRWG nonetheless supported the recommendation to continue research on this Covered Species. As with the development of the hydrologic model, the RRWG recognized that the development of the ecological model was an iterative process and that when there is a better understanding of the CSRB, this component could be developed if required for compliance and provided resources are allocated.

Biological and Water Quality Monitoring Program

The RRWG advised the EAHCP to take a holistic view of both the Biological Monitoring and Water Quality Monitoring Programs. As so much has been learned about these two monitoring programs since the EAHCP began in 2013, this holistic approach would consider *Report 1* recommendations, Science Committee recommendations and input, ITP Permittee input, and solicited input from subject matter experts.

Towards this end, the NAS RRWG recommended creating both a Biological Monitoring Work Group and a Water Quality Monitoring Work Group, where both groups would coordinate to consider the costs and benefits of any changes to both monitoring programs. In addition, it was contemplated by the RRWG that these two work groups would meet jointly to specifically address the NAS recommendation to “increase coordination and integration” of the programs.

Biological Monitoring

Specific to the Biological Monitoring Program, the RRWG supported optimizing the sampling methods for the CSRB.

The RRWG recommended that the following issues be addressed by the Biological Monitoring Work Group:

- Determining a reason to scale results to the entire spring and reach system;
- Determining if the Covered Species are impacted by anthropogenic parameters.

Water Quality Monitoring

Specific to the Water Quality Monitoring Program, the NAS RRWG generally supported the ideas that:

- Nutrients play an important role in the Comal and San Marcos Springs systems.
- The Water Quality Monitoring Program should focus on parameters sampled and detection limits used for the protection of Covered Species and for watersheds rather than mimicking standard water quality sampling programs.
- Passive diffusion samplers might be a more cost effective alternative to comprehensive grab sampling techniques.

The RRWG recommended that the following issues be addressed by the Water Quality Monitoring Work Group:

- Ensuring the Water Quality Monitoring Program focuses on the Covered Species (biological goals) rather than human health/water quality standards.
- Determining whether enhanced sampling for nutrients and household/personal care products is needed.

Applied Research Program

For the recommendations pertaining to the EAHCP Applied Research Program, the RRWG recognized that the program had completed many of the recommendations or was currently in the process of incorporating them. In addition, the RRWG supported the recommendation that the Applied Research Program should offer longer-term projects (multi-year). The RRWG identified that this recommendation was critical for the Applied Research Program.

As with the Biological and Water Quality Monitoring Programs, the RRWG recommended the creation of an Applied Research Work Group to establish a research plan for the remainder of Phase I of the EAHCP. As identified in Chapter 7 of the EAHCP, funding for the Applied Research Program is limited to Phase 1 (2013 through 2019) only. The NAS RRWG stated that the Applied Research Work Group should start work as soon as possible to allow for potential inclusion of 2016 research projects in the prioritization process.

Specifically, the NAS RRWG recommended the following issues be addressed by the Applied Research Work Group:

- Determining if additional applied research studies are needed.
- Developing a research plan that prioritizes the numerous studies recommended by the SRP, the Science Committee, the Implementing Committee, and independent subject matter experts.

Overarching Issues

The RRWG discussed and reviewed the five overarching issues identified in *Report 1* and concluded that the EAHCP had completed or were in progress of completing most of these recommendations. Regarding the NAS Overarching Issue to consider future worst case scenarios, the RRWG addressed each scenario as follows:

- The impacts from increasing pumping levels from exempt well owners is being addressed by the Edwards Aquifer Authority during their annual operational planning process;
- A drought, worse than the Drought of Record, has been addressed in Chapter 8 of the EAHCP by categorizing it as an Unforeseen Circumstance;
- The risk to the Covered Species because of the mismatch between hydrologic changes and conservation triggers will be addressed during Phase II of the EAHCP;
- Given the uncertainty inherent in Edwards Aquifer-geographic scale climate forecasts, climate change impacts are best addressed by a shortened term limit (15 years) of the Incidental Take Permit;
- While the state court ruling on the Bragg constitutional taking decision may have implications for the EAHCP, it is not within the jurisdiction of the EAHCP to predict and/or respond to those implications and;
- The impacts from Whooping Crane ESA issues have been previously considered during the EARIP planning process.

The RRWG also agreed that the EAHCP should develop, as resources dictate, a comprehensive information management plan. Additionally, staff should provide the Implementing Committee with a proposal for rigorous statistical data analysis, allowing the Implementing Committee decide at that point if the effort is necessary or desired.

Appendix I: NAS Report 1: Recommendation Review Work Group Prioritization Matrix

National Academy of Sciences Report 1: Recommendations Review Work Group Prioritization Matrix

| Prioritization Status: Done, Continual or In-Progress | | | | | |
|--|-----------------------|---|--|---|--|
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Done | Hydrologic Model | Don't use the term "verification" when describing model runs with changing parameters. | None | Use the correct terminology in future discussions and reports. | EAA should draft a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models. |
| Done | Ecological Model | Develop an ecosystem-based conceptual model. | None | N/A | Already Done - 2010 EARIP Influence Diagrams: facilitated by Jean Cochrane |
| Done | Ecological Model | Develop a conceptual model that shows how water quality and quantity, other biota and restoration and mitigation activities are expected to interact with the indicator species. | None | N/A | Already Done - 2010 EARIP Influence Diagrams: facilitated by Jean Cochrane |
| Done | Ecological Model | In developing the fountain darter model, pay attention to movement, density dependence and other topics. | None | N/A | These studies were conducted through the Applied Research Program and results were incorporated into the Ecological Model |
| Done | Ecological Model | Include intermediate products in the development of the fountain darter model. | None | N/A | These analyses were performed as the first steps in the Ecological Model development. |
| Done | Ecological Model | Use the habitat suitability analyses for the fountain darter as "back-up" to individual-based modeling. | None | N/A | Early on in the development of the Ecological Model, the Ecological Model team developed a habitat suitability analyses for the fountain darter. This analyses could be used as a back-up to the Ecological Model if needed. |
| Done | Ecological Model | Revisit the estimation fountain darter suitability curves. | None | N/A | *These curves are the first step in creating the Ecological Model. If to be used for the development of the Ecological Model, we are past that point. *If the Fountain Darter module fails or does not calibrate, then suitability curves should be revisited. |
| Done | Applied Research | Conduct a follow-up fountain darter movement study. | None | N/A | A Fountain Darter movement study was conducted in 2014. NAS did not have the benefit of seeing these results prior to putting forth this recommendation. |
| Done | Applied Research | Increase transparency in prioritizing and funding research projects. | None | N/A | *In 2014 and 2015, EAHCP staff modified the Applied Research prioritization process to be more transparent, solicit additional proposals from new proposers, solicit more input from the Science Committee on the technical merits of proposals, solicit key elements from the Science Committee to be included in the RFP's, and generally increase the role of the Science Committee in the process. |
| Done | Overarching Issues | Future scenario planning: Think how possible worst case scenarios would impact both modeling and HCP implementation (provided 6 scenarios). | None | N/A | 1. The impacts from increasing pumping levels from exempt well owners is being addressed by the Edwards Aquifer Authority during their annual operational planning process; 2. A drought, worse than the Drought of Record, has been addressed in Chapter 8 of the EAHCP; 3. The risk to the Covered Species because of the mismatch between hydrologic changes and conservation triggers will be addressed during Phase II of the EAHCP; 4. Impacts from Climate Change have been addressed by a shortened term limit (15 years) of the Incidental Take Permit; 5. The impacts from the federal court ruling on the Bragg constitutional taking decision are not within the jurisdiction of the EAHCP and; 6. The impacts from Whooping Crane ESA issues has been previously addressed through the EARIP planning process. |
| 1. Done 2. Yes 3. In Progress - partner not host | Overarching Issues | Increase project integration through three steps: 1. Develop an overall conceptual model of the Edwards system. 2. Develop a unified data management system. 3. Convene an annual Science Meeting to discuss all relevant topics. | Yes | *Two of the specific recommendations identified (conceptual model and data integration) have been addressed in other sections of this implementation plan. *The third recommendation to hold a Annual Science meeting may be covered by the proposed Bio Monitoring, Water Quality and Applied Research work groups. | *A EAHCP Conceptual Model was created by EAHCP staff and share with Implementing Committee in 2014. *The Annual Science meeting covering the Edwards Aquifer appears to be a good idea. But not sure it is the EAHCP that should host, rather the EAHCP should be a participant. |
| Continual- thru the end of the ITP | Hydrologic Model | Do not compare results from MODFLOW and FEFLOW. | None | *EAA will not perform a head to head comparison of model results, but will rather utilize each model for specific purposes. *There has been much discussion by the IC and Stakeholders as to the purpose of having two models. Many have publically supported the use of both since they are now close to ready for utilization. | *Calibration of the models is not sufficient for a head to head comparison . *EAA should draft a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models. |
| Continual | Hydrologic Model | Consider MODFLOW as a work in progress and not a final product. | Funding is allocated in the EAA operational budget | Continue to update the MODFLOW model as additional data/information is realized. | *EAA has been committed to an iterative modeling process since the creation of the MODFLOW model; continuously improving and updating the model. The next iteration could be Modflow USG. *EAA should draft a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models. |
| Continual | Ecological Model | Improve the habitat suitability analyses for Texas wild rice. | Funding is allocated in the CoSM/TXSTATE work plan budget | Field Verification and Observation | *TWR has been extremely successful to date; therefore additional TWR work is not needed at this point. *The Meadows Center has been collecting this information as Applied Research imbedded in their TWR restoration work. Habitat suitability has taken the form of applied verification in the field. |
| Continual | Ecological Model | Test the robustness of the current habitat suitability analysis for Texas wild-rice. | Funding is allocated in the CoSM/TXSTATE work plan budget | Field Verification and Observation | *TWR has been extremely successful to date; therefore additional TWR work is not needed at this point. *The Meadows Center has been collecting this information as Applied Research imbedded in their TWR restoration work. Habitat suitability has taken the form of applied verification in the field. |
| Continual | Biological Monitoring | Continue monitoring index reaches. | Funding is allocated in the Biological Monitoring work plan budget | Implement the Biological Monitoring work plan | This is already part of the Bio Monitoring work plan and program. Recommend to establish a Biological Monitoring Work Group to do a holistic review of the biological monitoring program and its integration with the water quality monitoring program. |

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| In Progress- short time-frame | Hydrologic Model | Continue development and testing of the Hydrological Simulation Program (HSPF) for estimating recharge. | Funding is allocated in the EAA operational budget | Conduct comparison between Puente method, HSPF, and other estimations. | *EAA has been committed to an iterative modeling process since the creation of the HSPF models; continuously improving and updating the models. *Refinement of Recharge Estimates are a goal of the EAA strategic plan. *EAA should draft a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models. *Recharge is a major source of uncertainty. |
| In Progress | Hydrologic Model | Quantitatively assess model uncertainty. | Funding is allocated in the EAA operational budget | Have technical consultants conduct uncertainty analysis. EAA is already working on a Scope of Work for this evaluation. | This is already included in Model development by EAA staff. However there is merit to having a 3rd party perform this analysis. The Work Group unanimously recommended the EAA to perform this analysis (6/26). |
| In Progress | Hydrologic Model | Move toward a single model. | None | N/A | *There seems to be support for this from both the technical perspective and political perspective. *Participants in the workshop noted that a Cost/Benefit analysis of one model vs two should be conducted. |
| In Progress | Ecological Model | Develop a phased strategy for testing individual components in the submerged aquatic vegetation (SAV) model. | Funding is allocated in the Ecological Modeling work plan budget. | Conduct Analysis | The Ecological Model Team is already planning to perform this verification. |
| In Progress | Ecological Model | Make the Applied Research program more robust with quantitative projections of Comal Springs riffle beetle (CSRB) habitat. | Funding is allocated in the Applied Research work plan budget. | In 2015 and 2016, the Applied Research Program is focusing on the Comal Springs riffle beetle. | However, the CSRB is no longer a module in the Ecological Model, therefore the data collected will only be utilized if the CSRB is added to the model at some point in the future. |
| In Progress | Ecological Model | Ensure proper interpretation of the ongoing effort to build an individual-based model for fountain darter. | Funding is allocated in the Ecological Modeling work plan budget. | N/A | The Ecological Modeling team already plans to conduct verification testing. |
| In Progress | Applied Research | Increase competition and collaboration with outside scientific experts. | None | N/A | *For 2016 Applied Research solicitations, EAHCP staff referenced literature cited reports and bibliographies of researchers that performed similar research or are familiar with the EAHCP Covered Species, EAHCP staff will reach out to these identified researchers and ensure they are aware of the EAHCP research projects. * Additionally, for 2016 research solicitations, EAHCP staff will utilize numerous posting boards. |
| In Progress | Applied Research | Increase transparency of research results. | TBD - depends on method utilized for formatting, storage and access/dissemination. | *Develop a data management plan. *Utilize a data manager (consultant or staff) or staff scientific Ph. D to establish a required data format for contractors to adhere to, reformat and organize existing data. | *It is recommended that a scientific Ph. D be added to the HCP staff to assist with the creation and implementation of a data management plan, if determined it is needed to achieve compliance. *This recommendation seems to lead one to believe that there is a lack of transparency in the research process or that data generated through the EAHCP is not made available to other entities. However, all reports, results and data are posted on the EAHCP website and provided to any requestor. *The NAS RSWG discussed that the purpose of data generated within the EAHCP is for the purpose of building the Ecological Model or providing information to the Implementing Committee to make decisions. The purpose is not to ensure the data is in a usable format for another program/entity to utilize. If it is not in a usable format for a requesting program/entity to use, it should be the responsibility of the requestor to format for their purposes. |
| In progress | Overarching Issues | Conduct performance-based monitoring of the minimization/mitigation measures. | None | EAHCP staff has already begun to develop a tracking matrix of all M&M measures, how to measure success/completion and their status (% completion as measured against the Biological Goals). | This matrix should be completed late-summer 2015. |
| In Progress | Applied Research | Texas wild-rice: Focus studies on the restoration of this plant. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| In Progress | Applied Research | Texas wild-rice: Focus studies on the restoration of this plant. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| In Progress | Applied Research | Texas wild-rice: Focus studies on the restoration of this plant. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| In Progress | Applied Research | Texas wild-rice: Focus studies on the restoration of this plant. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| Prioritization Status: Yes to be Implemented w/ no budget impact | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Hydrologic Model | Display error bars on MODFLOW data. | Funding is allocated in the EAA operational budget | These error bars will be established by the Uncertainty Analysis being conducted by EAA | *The error bars will be most useful on the act of forbearance. *EAA has a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models. |
| Yes | Ecological Model | Clarify the goal of the submerged aquatic vegetation (SAV) model. | None | Require the Ecological Modeling team to provide a clear and concise goal of the SAV model. | |

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| Yes | Applied Research | Remove Literature Review tasks | None - if any, could result in cost savings. | Request literature reviews with the proposal, rather than as a deliverable of the contract. | <p>*Thus far Literature Review has been conducted by all selected contractors and represents a very minor expense. Proposers should do their background work (literature review) prior to submitting, but what is the harm in requesting to see their lit review if selected.</p> <p>*As most of the Applied Research in the HCP has been conducted or determined to not be needed, and new projects and topics are recommended for research by NAS and the Science Committee, a Applied Research work group should be formed to review completed research and establish a new research plan moving forward.</p> <p>*In Table 7.1, applied research funding ends in 2019; with identified additional research needs and continuing unknowns, the Implementing Committee might consider extending applied research funding through the duration of the ITP. This additional funding would need to be reallocated from another HCP activity to applied research.</p> <p>*Additionally, it is recommended that a scientific Ph. D be added to the HCP staff to assist with workgroup facilitation, analysis and resulting implementation. Additionally, this staff person could assist in review of the research proposals, selecting contractors, and facilitating the research prioritization process and QA/QC of research conductance.</p> |
| Yes - as allowed for by the FMA | Applied Research | Offer longer-term projects. | None - the Applied Research budget is capped at \$450,000 annually | The FMA and budgeting cycle should be explored to identify opportunities to create multiple year research projects. Recommended as a critical component by the Work Group | <p>*The Science Committee has echoed the same recommendation for longer and on-going studies. However, that remains a challenge within the current planning and budgeting framework.</p> <p>*The NAS RRRWG supported this as an important step in increasing the number of potential bidders to projects. All opportunities to implement this recommendation should be explored.</p> |
| Future Goal | Hydrologic Model | Include conduits in the development of the Hydrologic Model. | Funding is allocated in the EAA operational budget | Will require additional hydrologic research and data collection. | <p>*Workshop participants generally supported modeling of conduits; however, many cautioned about the limited modeling capabilities to achieve this and the lack of data needed.</p> <p>*EAA has a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models.</p> |
| Future Goal | Hydrologic Model | Move toward making predictions on a daily time scale. | Funding is allocated in the EAA operational budget | Will require additional hydrologic research and data collection. | <p>*This would require outside consultation and expertise if established.</p> <p>*EAA has a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models.</p> |
| Prioritization Status: Yes or TBD w/ budget impact | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Overarching Issues | A comprehensive information management plan. | Significant - initial setup of a comprehensive data management plan would likely require engaging a consultant and require purchase of additional software/hardware. Currently, there is no identified budget for this activity. | In the immediate future, staff will internally implement a data mgmt effort that focuses on security of data, format of newly collected data, backing up all data, and ensuring there is a transparent process in place to provide data to others. | <p>*It is anticipated that newly proposed Director of Refugia and Covered Species could assist with implementation of this recommendation.</p> <p>*The purpose of data generated within the EAHCP is for the purpose of building the Ecological Model or providing information to the Implementing Committee to make decisions. The purpose is not to ensure the data is in a usable format for another program/entity to utilize. If it is not in a usable format for a requesting program/entity to use, it should be the responsibility of the requestor to format for their purposes.</p> |
| TBD- by the Implementing Committee | Overarching Issues | Conduct rigorous statistical data analysis. | Significant - this analysis would be performed by a contractor. Currently, there is no identified budget for this activity. | Staff will first work with the SC to determine if any additional information can be gained to further compliance with the ITP from additional data analysis; this will be formatted in the form of questions to be answered by the analysis. Staff will then provide the Implementing Committee with a proposal for rigorous statistical data analysis, allowing the Implementing Committee to decide at that point if the effort is necessary or desired. | <p>*Before implementation of this recommendation, the Science Committee should be utilized to identify questions that should be answered through the additional data analysis. These questions should be directly tied to achieving compliance or furthering accomplishment of the Biological Goals.</p> <p>*Utilize a data manager (consultant or staff) to facilitate a Science Committee discussion to explore what, if any, questions should be answered by additional data analysis.</p> |
| Prioritization Status: Yes/No to be Implemented and Prioritized by the Water Quality Work Group | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Biological and Water Quality Monitoring | Increase coordination and integration of the biological monitoring and water quality monitoring programs. | None | Create a Water Quality monitoring work group and a Biological monitoring work group to develop a strategy to implement this recommendation. | It is recommended that a Director of Refugia and Covered Species Programs be added to the HCP staff to assist with this workgroup facilitation, analysis and resulting implementation. |
| Yes - ask the Water Quality work group for concurrence | Water Quality Monitoring | Enhance nutrient sampling. | Currently, there is no identified budget for this activity. For this sampling to be added, another component of equal or greater cost would need to be dropped. | Create a Water Quality monitoring work group to develop a strategy to implement this recommendation. | <p>*As several years of data have been collected under the HCP Water Quality program and much has been learned, it is time to take a step back and revisit the Water Quality monitoring program from a holistic approach. It is recommended that a work group be formed to consider all NAS Water Quality monitoring recommendations and look for needed modifications based on data collected.</p> <p>*Additionally it is recommended that a Director of Refugia and Covered Species Programs be added to the HCP staff to assist with this workgroup facilitation, analysis and resulting implementation.</p> |
| Yes - ask the Water Quality work group for concurrence | Water Quality Monitoring | Conduct additional residential herbicide, residential chemicals, and personal care product testing. | Currently, there is no identified budget for this activity. For this sampling to be added, another component of equal or greater cost would need to be dropped. | Create a Water Quality monitoring work group to develop a strategy to implement this recommendation. | <p>*As several years of data have been collected under the HCP water quality monitoring program and much has been learned, it is time to take a step back and revisit the water quality monitoring program from a holistic approach. It is recommended that a work group be formed to consider all NAS water quality monitoring recommendations and look for needed modifications based on data collected.</p> <p>*Additionally it is recommended that a Director of Refugia and Covered Species Programs be added to the HCP staff to assist with this workgroup facilitation, analysis and resulting implementation.</p> |
| Prioritization Status: Yes/No to be Implemented and Prioritized by the Biological Monitoring Work Group | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Biological and Water Quality Monitoring | Increase coordination and integration of the biological monitoring and water quality monitoring programs. | None | Create a Water Quality monitoring work group and a Biological monitoring work group to develop a strategy to implement this recommendation. | It is recommended that a Director of Refugia and Covered Species Programs be added to the HCP staff to assist with this workgroup facilitation, analysis and resulting implementation. |

| TBD | Biological Monitoring | Provide a clear mechanism to scale results to the entire spring and reach system. | Currently, there is no identified budget for this activity. For this sampling to be added, another component of equal or greater cost would need to be dropped. | Create a Biological monitoring work group to develop a strategy to implement this recommendation. | *The NAS RRRWG discussed that the purpose of expanding the index reaches to representative reaches (system wide representation) has not been determined. If this is considered, a rationale as to why a system wide representation is needed for ITP compliance should be developed. *The Biological Goals and Objectives are tied to the previously identified reaches, not the entire river system. * NAS themselves comments that this is necessary only if desired. |
|---|-----------------------|--|--|--|---|
| No - ask the Biological Monitoring work group for concurrence | Biological Monitoring | Increase the frequency of sampling in Comal Springs system. | Currently, there is no identified budget for this activity. For this sampling to be added, another component of equal or greater cost would need to be dropped. | Create a Biological monitoring work group to develop a strategy to implement this recommendation. | *Originally, the Variable Flow sampling was conducted 4 times a year. It has since been reduced to twice a year as it was determined there was no additional advantage to sampling a higher frequency. *The NAS RRRWG discussed the consistency in data sets and lack of variability in most parameters, leading to the questioning of why implementation of this recommendation would be needed. |
| Prioritization Status: Yes/No to be Implemented and Prioritized by the Applied Research Work Group | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Ecological Model | Develop a much deeper understanding of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | The workshop participants generally supported more CSRB research. However, there was discussion about if the CSRB should be used as an indicator species, as it is assumed the CSRB simply retreats into subterranean habitat. |
| Yes | Biological Monitoring | Develop quantitative sampling methods for the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | *The Science Committee has been discussing this topic at recent meetings. This recommendation should complement their discussions. *Workshop participants generally supported establishment of new methods. *This research would specifically look at methods other than use of the "cotton lure"; but also could be designed to include an "Optimization Study" for the cotton lure. *This research could also be used to determine the composition of the biofilm; or if already established by other researchers, could determine the utilization of the biofilm by the CSRB. |
| TBD | Applied Research | Fountain Darter: Conduct additional studies on movement, preferably allowing for Lagrangian tracks to be estimated. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | Applies to Applied Research Recommendations 41-58 *As most of the Applied Research in the HCP has been conducted or determined to not be needed, and new projects and topics are recommended for research by NAS and the Science Committee, a Applied Research work group should be formed to review completed research and establish a new research plan moving forward. |
| TBD | Applied Research | Fountain Darter: Confront the persistent lack of a relationship found between flow and fountain darter metrics...it is critical to refine the relationship at low to moderate flows and also at high flows (scour events). | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | *In Table 7.1, applied research funding ends in 2019; with identified additional research needs and continuing unknowns, the Implementing Committee might should consider extending applied research funding through the duration of the ITP. This additional funding would need to be reallocated from another HCP activity to applied research. |
| TBD | Applied Research | Fountain Darter: Obtain measurements related to individual fountain darter health that go beyond the densities and lengths of individuals measured in the current bio monitoring. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | *Additionally, it is recommended that a scientific Ph. D be added to the HCP staff to assist with workshop facilitation, analysis and resulting implementation. Additionally, this staff person could assist in review of the research proposals, selecting contractors, and facilitating the research prioritization process and QA/QC of research conductance. |
| TBD | Applied Research | Submerged Aquatic Vegetation: Supply data on SAV growth, dispersal, and recolonization for those SAV species that are the best habitat for the fountain darter. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | *Recommendations 47-50 refer directly to Texas wild-rice studies that are being conducted as an ongoing effort in the San Marcos System. |
| TBD | Applied Research | Submerged Aquatic Vegetation: Determine if the fountain darters are using SAV for protection, to find food, and/or as a nursery area for young. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Submerged Aquatic Vegetation: Determine why the fountain darters prefer bryophytes and filamentous algae, which are not vascular plants. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life history, life cycle and spatial distribution for better modeling of this species. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life stages of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life stages of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life stages of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Determine the representativeness of Cotton Lure sampling | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life stages of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Determine its status as an indicator species. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Determine the effects from phosphorus sources, cycling, and availability on the productivity of the ecosystems. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |

| TBD | Ecological Model | Include more field studies in the Applied Research program to assess silt impacts and critical life history and habitat assessment of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | However, the CSRB is no longer a module in the Ecological Model, therefore the data collected will only be utilized if the CSRB is added to the model at some point in the future. Need to address the concerns related to siltation through Applied Research program. |
|--|-----------------------|---|---|--|---|
| In Progress - consider next steps | Biological Monitoring | Measure the distribution of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | This study was conducted in 2014 by ZARA environmental as part of the Applied Research program. The study established a distribution during a low flow year, but did not establish a population estimate with confidence. This study could be expanded by conducting again during a normal flow year or attempting to establish a population estimate. It could be done through the 2016 Applied Research program. |
| Prioritization Status: No, not recommended for Implementation | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| No | Ecological Model | Add nutrient limitation to the submerged aquatic vegetation (SAV) model formulation. | No - no funding to conduct the extensive research that would be needed. | N/A | *Nutrients are not a limiting factor, except to algae (presence/absence). Algae is not in the Ecological Model. *The SAV model is tied to Fountain Darter habitat, so therefore this is not necessary. |
| No | Biological Monitoring | Conduct special studies on the fountain darter. | No - the Bio Monitoring Budget is already maxed out. For this sampling to be added, another component would need to be dropped. | If this recommendation was implemented, it should be prioritized by the Science Committee as part of the regular Applied Research program. | *The purpose of expanding the index reaches to representative reaches (system wide representation) has not been determined. If this is considered, a rationale as to why a system wide representation is needed for ITP compliance should be developed. *The Biological Goals and Objectives are tied to the previously identified reaches, not the entire river system. * NAS themselves comments that this is necessary only if desired. |
| No | Biological Monitoring | Expand macro invertebrate surveys. | No - the Bio Monitoring Budget is already maxed out. For this sampling to be added, another component would need to be dropped. | Create a Biological monitoring work group to develop a strategy to implement this recommendation. | *The participants in the NAS Report #1 workshop supported this recommendation, but did not identify how it contributed to compliance or the Biological Goals. *Macroinvertebrate sampling is typically performed to monitor the health of an aquatic system; the health of the Comal and San Marcos system is being monitored by other components of the monitoring programs. *Macroinvertebrate sampling in the HCP was to originally performed to populate the Ecological model. That effort is now close to complete, and new data would not be generated in time to be used by the modeling team. |
| No | Applied Research | Develop a general conceptual model for the Comal and San Marcos springs ecosystem. | Yes | N/A | Since influence diagrams were created during the EARIP process and were used as conceptual models to develop the Ecological Model, at this time, the EAHCP does not need to re-create them. |

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|-----------------------|
| Hydrological Model |
| Ecological Model |
| Bio and WQ Monitoring |
| Applied Research |
| Overarching Issues |

Appendix II: Agendas and Meeting Minutes of the Recommendations Review Work Group



NOTICE OF OPEN MEETING

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the National Academy of Sciences Recommendations Review Work Group: Report 1 has been formed and has been constructed of representatives from throughout the Edwards Aquifer Region; a meeting of the **National Academy of Sciences (NAS) Recommendations Review Work Group: Report 1** of the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, June 5, 2015 at the Dunbar Center located at 801 West MLK, San Marcos, TX. The meeting will start at 9 a.m.**

Members of this workgroup include: Cindy Loeffler (Texas Parks and Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

1. Call to Order and Introductions of Work Group members.
2. Public Comment.
3. Possible nomination and election of the Work Group Chair.
Purpose: To discuss the need for and elect a Work Group Chair.
Action: To unanimously elect a Chair for the Work Group if necessary.
4. Presentation of Work Group Charge (Attachment 1).
Purpose: Presentation of the Charge to the Work Group.
Action: To review and discuss Work Group charge.
5. Determination of Work Group meeting strategy, schedule and locations (Attachment 2).
Purpose: To establish a Work Group strategy and schedule to present matrix to the Implementing Committee on August 20, 2015.
Action: To approve Work Group strategy and schedule.
6. Presentation of Draft Implementation Plan (Attachment 3).
Purpose: To introduce the Implementation Plan intended to be discussed.
Action: No action necessary.
7. Discussion and possible modification of monitoring section of the Draft Implementation Plan (Attachment 4).
Purpose: To provide input on the development of the Implementation Plan for the NAS Report 1.
Action: To discuss and possibly modify monitoring section of the Draft Implementation Plan.
8. Discussion on additional information needed by Work Group members.
Purpose: To identify any additional information needed by the Work Group that would assist in their Charge.

Action: To provide a list of information/resources related to the NAS Report 1 for EAHCP Staff to prepare.

9. Future Agenda Items:

10. Questions from the Public.

11. Adjourn.



MEETING MINUTES

June 5, 2015

1. **Call to Order and Introductions of Work Group members.**

Members of this workgroup include: Cindy Loeffler (Texas Parks and Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

Darren Thomson was unable to make the meeting. Steve Bereyso represented the San Antonio Water System in Mr. Thompson's absence.

2. **Public Comment.**

No comment

3. **Presentation of Work Group Charge.**

Alicia Reinmund-Martinez, EAHCP Director, presented a summary of the Work Group Charge as presented and approved by the Implementing Committee on May 21, 2015. Discussion followed.

4. **Possible nomination and election of the Work Group Chair.**

The Work Group decided not to select/elect a Chair of the Work Group.

5. **Determination of Work Group meeting strategy, schedule and locations.**

Mrs. Reinmund-Martinez presented the proposed meeting schedule. The Work Group agreed on the approach and proposed dates and times (except for the July 24 meeting will be held on July 31st if necessary). It was suggested by the Work Group to maintain full-day meetings in order to finish within 3 meetings.

Cindy Loeffler requested if the Work Group can discuss previously discussed items at following meetings. This will be added to the next agenda.

6. **Presentation of Draft Implementation Plan.**

Nathan Pence, EAHCP Program Manager, presented a summary of the Draft Implementation Matrix to the Work Group.

The Work Group was reminded that all recommendations found in the matrix will have financial implications. The Work Group must also identify ways to maintain a neutral budget. The definitions of the matrix columns were presented and there were no questions from the Work Group.

7. Discussion and possible modification of the Biological Monitoring and Water Quality Monitoring sections of the Draft Implementation Plan.

Mr. Pence reviewed the monitoring recommendations with the Work Group. The committee covered each recommendation contained in the matrix provided line by line.

Recommendation 25:

- Zara Environmental did an applied research study on the distribution of Comal Springs Riffle Beetles (CSRB) during low-flow conditions in the Comal. We got the distribution during low-flows. We could do this again during high-flows.
- Mrs. Loeffler commented that Chad Norris, TPWD, said that this task/study was not complete, but it was a good start. Mrs. Loeffler suggested to bring in Mr. Norris and Randy Gibson, USFWS, to discuss this subject further.
- Steve Bereyso stated that the Science Committee members were skeptical of the Zara study. Discussion followed.

Recommendation 26:

- This recommendation is done through the existing Biological Monitoring program.
- Melani Howard, City of San Marcos/Texas State University, referred to page 106-107 of the NAS Report 1. NAS suggested to evaluate the data to determine were there may be repetition. Mrs. Howard proposed we may be able to save money if repetitive data collection is stopped.
- Mrs. Howard and Mrs. Loeffler agreed to take a holistic review of Biological Monitoring program and its data.
- Mrs. Howard recommended to integrate the Water Quality and Biological Monitoring efforts as NAS suggested.

Recommendation 27:

- A discussion about creating another protocol other than the cotton lure approach through the Applied Research program.
- Cindy and Melani suggested deleting that the Science Committee supports the cotton lure approach.
- Roger asked about what we know about CSRB travel. What have we learned about the cotton lure approach? Why do we think cotton lures are attracting CSRB?
- Steve Bereyso was very skeptical of doing more research. It won't lead to anything.
- Myron Hess commented that NAS may be giving us this recommendation to assist them in completing Report 3.

Recommendation 28:

- Are you sampling on the right dates and locations?
- Suggestion to put together a Water Quality and a Biological Monitoring Work Group.

- Mark Hamilton commented that the work group should also coordinate on what water quality data are needed to support the biology. Coordination needs to happen to improve the data.
- Mr. Bereyso mentioned that adding a PhD to the HCP staff is not an ongoing need. Mr. Pence mentioned that Refugia is about to get started and needs a project manager. Who will also facilitate these other Biological Monitoring and Water Quality Monitoring programs? Nathan will present a summary of the HCP staff roles and responsibilities at the next Implementing Committee meeting.
- Mrs. Howard said it could be grant funded. No real support for a contractor to provide the role.

Recommendation 29:

- Mrs. Howard mentioned that the Comal and San Marcos rivers are nutrient limited. Nutrients are critical to sampling. The work group should look at nutrients and for other things.
- Sample for the watershed and for the activities in the watershed.
- Mr. Hamilton said that a holistic approach is key to make the program more successful.

Recommendation 30:

- This could set the guidelines for the future work group. Evaluate the program to monitor the watershed, for the species. Tailor the program towards the species.
- What do we know about the relationship between CSRB and water quality parameters? Are the species impacted from these parameters?
- Personal care products are expensive but are anthropogenic. Don't need to do that all the time. You will see the anthropogenic influences. The work group decided that the Science Committee should weigh in on this.
- Mrs. Howard commented on doing a comprehensive sampling annually. Do we do sediment cores? Yes, we do sediment sampling and passive diffusive samplers.

Recommendation 31:

- Mr. Pence provided a summary of the Biological Monitoring program. He talked to BIO-WEST and Science Committee members about the program being tied to those reaches to determine if we meet the biological goals and objectives. The HCP does not have the money to add new sites for the entire river.
- Mrs. Loeffler mentioned that it would be nice to have full habitat sampling, unless we have a good reason not to. We can stop doing what we are doing but, should the Biological Monitoring work group address this issue?
- Roger Biggers, NBU, said he leans towards not supporting this recommendation.
- What are the pros and cons to continue what we are doing versus a randomized sampling design of Biological Monitoring?
- Myron Hess said this recommendation ties to #33. He asked if the reaches and the biological goals are appropriate.

- Mrs. Howard and Mrs. Loeffler said not to rethink the biological goals and objectives. Rather, we could add to them.
- Mr. Hess mentioned that NAS is asking us to look at how we are determining the achievement of the biological goals.

Recommendation 32:

- Mr. Pence defined the rationale of this staff recommendation. NAS suggested more frequently than every 5 years and more randomized sampling.

Recommendation 33:

- Mr. Pence provided a summary of the matrix.
- The description needs to be expanded to include more of the other 2 recommendations. Could be a cost savings to the program.
- This could be included in the Biological Monitoring Work Group.
- Steve Bereyso said this would be nice to know.
- NAS is saying to spend EAHCP money wisely.

Recommendation 34:

- Mr. Pence summarized the recommendation. We are studying the macro invertebrates because they are food source of the fountain darter. This would be a new approach to sampling the macro invertebrates. The Ecological Model does not need this data for the model.
- There was a lot of discussion. Cindy did not think it would cost that much. But, would not provide us with much more information.
- The Biological Monitoring Work Group could come up with different recommendations.
- Water quality constituents could be dropped and picked up on Biological Monitoring.
- What did the workshop participants say? Melani said we don't know the impacts of water quality on the macro invertebrates.
- Mr. Hamilton said the water quality Work Group needs to talk to the Biologists about why there is a dead spot in the system?
- Macro invertebrate sampling is cheaper than most other sampling.

8. Discussion of next steps and request for any additional information needed by the Work Group members.

The Work Group discussed a summary of the changes made will be presented at the next meeting. Have Randy and Chad at the next meeting. The Work Group can discuss to see if any changes need to be made.

Mr. Pence summarized the report, will include some text, summarizing the work groups and how they work together.

Mr. Biggers mentioned the EAHCP should not be duplicating efforts: What can we not do? What can we do? How can we collaborate to make a better program?

9. Future Agenda Items: June 26th in San Marcos, TX

10. Questions from the Public.

There was no comment.

11. Adjourn.



NOTICE OF OPEN MEETING - **REVISED**

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the National Academy of Sciences Recommendations Review Work Group: Report 1 has been formed and has been constructed of representatives from throughout the Edwards Aquifer Region; a meeting of the **National Academy of Sciences (NAS) Recommendations Review Work Group: Report 1** of the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, June 26, 2015 at the Dunbar Center located at 801 West MLK, San Marcos, TX. The meeting will start at 9 a.m.**

Members of this Work Group include: Cindy Loeffler (Texas Parks and Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

1. Call to Order.
2. Public Comment.
3. Receive report from the Program Manager on general topics related to the operation of the NAS Recommendations Review Work Group: Report 1.
 - Meeting Minutes (Attachment 1)
 - Revised Work Group meeting schedule (Attachment 2)
4. Discussion of and possible modification to the Biological Monitoring and Water Quality Monitoring sections of the Draft Implementation Plan (Attachment 3).

Purpose: To review the modifications made based on the June 5th Work Group meeting and discuss any additional modifications to the Biological or Water Quality Monitoring sections.

Action: To finalize the discussion on the modifications to the Biological and Water Quality Monitoring sections of the Draft Implementation Plan.
5. Discussion and possible modification to the Hydrologic Modeling section of the Draft Implementation Plan (Attachment 4).

Purpose: To provide input on the development of the Implementation Plan for the NAS Report 1.

Action: To discuss and possibly modify the Hydrologic Modeling section of the Draft Implementation Plan
6. Discussion and possible modification to the Ecological Modeling section of the Draft Implementation Plan (Attachment 5).

Purpose: To provide input on the development of the Implementation Plan for the NAS Report 1.

Action: To discuss and possibly modify the Ecological Modeling section of the Draft Implementation Plan
7. Discussion and possible modification to the Applied Research section of the Draft Implementation Plan (Attachment 6 & 7).

Purpose: To provide input on the development of the Implementation Plan for the NAS Report 1.
Action: To discuss and possibly modify the Applied Research section of the Draft Implementation Plan

8. Discussion of next steps and request for any additional information needed by the Work Group members.

Purpose: To identify any additional information needed by the Work Group that would assist in their Charge.

Action: To provide a list of information/resources related to the NAS Report 1 for EAHCP Staff to prepare.

9. Agenda Items for July 10 meeting:

- Overarching Issues
- Prioritization
- Final Discussion and Approval of the Implementation Plan for NAS Report 1.

10. Questions from the Public.

11. Adjourn.



NAS Recommendations Review Work Group: Report 1 MEETING MINUTES

June 26, 2015

1. Call to Order.

Members of this Work Group include: Cindy Loeffler (Texas Parks & Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

2. Public Comment.

No comment

3. Receive report from the Program Manager on general topics related to the operation of the NAS Recommendations Review Work Group: Report 1.

- Meeting Minutes

Nathan Pence, EAHCP Program Manager, mentioned the Work Group minutes are being captured and made available to the members for their review.

Cindy Loeffler made changes to the minutes presented. The revised minutes will be attached to the final Draft Implementation Plan.

- Revised Work Group meeting schedule

Mr. Pence presented the revised meeting schedule to the work group for their review.

4. Discussion of and possible modification to the Biological Monitoring and Water Quality Monitoring sections of the Draft Implementation Plan.

Mr. Pence presented the introduction to the report drafted by staff as well as identified the changes made to the Draft Implementation Plan from input provided at the June 5th Work Group meeting.

Changes to the implementation matrix included:

Recommendation #28- The group requested the addition of providing a cost-benefit analysis to the Biological Monitoring Work Group discussion.

Recommendation #31- The group mentioned many changes regarding the implementation being a “to be determined” rather than “no” and “yes” or “in progress” rather than “done.” Revisions to reflect this will be made and provided to the Work Group.

Mr. Pence introduced a discussion about various questions regarding the Comal Springs Riffle Beetle (CSRB) directed to Randy Gibson, USFWS, and Chad Norris, TPWD. Discussion specifically regarding the cotton lures in sampling CSRB and other potential ways to collect the species. Discussion followed.

5. Discussion and possible modification to the Hydrologic Modeling section of the Draft Implementation Plan.

Mr. Pence, began the discussion mentioning that EAA staff Jim Winterle was present for the Work Group if they had any question involving changes to the Hydrologic Modeling. The Work Group worked through the recommendations one at a time.

The Work Group made a unanimous decision to recommend to the EAA to conduct an Uncertainty Analysis sooner rather than later. This will be presented to the Implementing Committee at their next meeting.

There was discussion pertaining to the development of the Hydrologic Model. Comments were made that there are benefits to both MODFLOW and Finite Element model and the EAA is constantly working towards improving their modeling program. Discussion followed.

Changes to the implementation matrix included:

Recommendation #7- Referred to including error bars onto MODFLOW. Mr. Winterle and Jeremy White, USGS, commented that the goal of developing an uncertainty analysis would be to develop error bars. This resulted in a change to the status of implementation to “in progress.”

Recommendation #9- Referred to moving to a daily time-step for our Hydrologic Model, with comments from the group about the fundamental limitations to the development of a daily time-step. The current model can process daily time-step by averaging a monthly data feature but will not properly reflect daily pumping. Additionally, Mark Hamilton, EAA, wanted to clarify that the EAA is not 100% certain about recharge numbers in terms of the model so moving towards a daily time-step for pumping may be early in the process. Discussion followed about future goals and the cost-benefit of this recommendation.

6. Discussion and possible modification to the Ecological Modeling section of the Draft Implementation Plan.

Mr. Pence introduced the Ecological Modeling section of the Implementation Plan. Ed Oborny, BIO-WEST and Ecological Modeling Team Leader, was present to answer any questions the group had.

The Work Group discussed the Ecological Model timing and the NAS Report. Mr. Oborny mentioned many of these recommendations are included in the program currently. Discussion followed and edits to the matrix reflect those comments.

Suitability analysis for Texas wild-rice has been done; at this stage, Mr. Oborny suggested that our understanding of this species' needs can only be expanded by including additional dimensions that would be covered by a simulation model.

7. Discussion and possible modification to the Applied Research section of the Draft Implementation Plan.

Mr. Pence introduced the Applied Research recommendations. The Work Group determined that the specific research projects included in the NAS Report will be discussed by the Applied Research Work Group if created by the Implementing Committee.

The specific program recommendations were discussed individually. Discussion regarding various topics followed. Melani Howard commented that extending the Applied Research project contract to be more than one year is critical to both informing the process and including outside expertise. The Work Group agreed with Mrs. Howard's comment.

The Work Group's recommendation was that their expertise and/or charge does not include review and recommendation of specific research projects included in the report. Thus, these recommendations should be reviewed by the Applied Research Work Group. Mrs. Howard mentioned that the Texas wild-rice projects recommended are being done and can be answered if coordinated with restoration efforts.

8. Discussion of next steps and request for any additional information needed by the Work Group members.

Mr. Pence mentioned that at any point over the next couple of weeks if a question regarding an individual's expertise is needed then requests are welcome.

9. Agenda Items for July 10th meeting:

- Overarching Issues
- Prioritization
- Final Discussion and Approval of the Implementation Plan for NAS Report 1

10. Questions from the Public.

Lynn Fahlquist, USGS, asked for details about future Work Groups. Mr. Pence mentioned the process with approval by the Implementing Committee in the development of a Water Quality Monitoring Work Group, Biological Monitoring Work Group, and Applied Research Work Group.

Steve Bereyso, SAWS, mentioned CO₂ input into the river for proper Texas wild-rice development below Rio Vista Dam.

11. Adjourn- 12:01



NOTICE OF OPEN MEETING

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As requested by the EAHCP Implementing Committee, the National Academy of Sciences Recommendations Review Work Group: Report 1 has been formed and has been constructed of representatives from throughout the Edwards Aquifer Region; a meeting of the **National Academy of Sciences (NAS) Recommendations Review Work Group: Report 1** of the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, July 10, 2015 at the San Marcos Activity Center, 501 E. Hopkins St., San Marcos, TX. The meeting will start at 9 a.m.**

Members of this Work Group include: Cindy Loeffler (Texas Parks and Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

1. Call to Order.
2. Public Comment.
3. Receive report from the Program Manager on general topics related to the operation of the NAS Recommendations Review Work Group: Report 1.
 - Meeting minutes (Attachment 1)
4. Discussion and possible modification to the Biological and Water Quality Monitoring, Hydrologic Modeling, Ecological Modeling and Applied Research Programs sections of the draft Report 1 Implementation Plan (Attachment 2-5).

Purpose: To review the modifications made based on the June 26th Work Group meeting and discuss any additional modifications to these sections.

Action: To finalize the discussion on the modifications to the revised sections of the draft Report 1 Implementation Plan.
5. Discussion and possible modification to the Overarching Issues section of the draft Report 1 Implementation Plan (Attachment 6).

Purpose: To provide input on the development of the NAS Report 1 Implementation Plan.

Action: To discuss and possibly modify the Overarching Issues section of the draft Report 1 Implementation Plan.
6. Discussion and prioritization of recommendations in the draft Report 1 Implementation Plan (Attachment 7).

Purpose: To prioritize the recommendations of the NAS Report 1 recorded in the matrix of the draft Report 1 Implementation Plan.

Action: To agree on and recommend a prioritized matrix for implementation.

7. Discussion and possible modification to the Summary Section of the draft Report 1 Implementation Plan (Attachment 8).

Purpose: To review and discuss any modifications to the Summary.

Action: To finalize the discussion on the modification to the revised Summary section of the draft Report 1 Implementation Plan.

8. Discussion and possible action to recommend the draft NAS Report 1 Implementation Plan for official adoption by the Implementing Committee (Attachments 7, 8 & 9).

Purpose: To recommend the draft Report 1 Implementation Plan to the Implementing Committee.

Action: Consider approval of the draft Report 1 Implementation Plan for submittal to the Implementing Committee for official adoption.

9. Questions from the Public.

10. Adjourn.



**NAS Recommendation Review Work Group: Report 1
July 10, 2015
MEETING MINUTES**

1. **Call to order**--Establish that all Committee members are present or represented--9:09 a.m.

Members of this Work Group include: Cindy Loeffler (Texas Parks & Wildlife Department), Melani Howard (City of San Marcos and Texas State University), Roger Biggers (New Braunfels Utilities), Darren Thompson (San Antonio Water System), and Mark Hamilton (Edwards Aquifer Authority).

Nathan Pence, EAHCP Program Manager, began the meeting by outlining the process for the meeting.

2. **Public Comment.**

No comments

3. **Receive report from the Program Manager on general topics related to the operation of the NAS Recommendations Review Work Group: Report 1.**

- Meeting Minutes
No changes made.

4. **Discussion and possible modification to the Biological and Water Quality Monitoring, Hydrologic Modeling, Ecological Modeling and Applied Research Programs sections of the draft Report 1 Implementation Plan.**

Mr. Pence began by summarizing various changes to each section of the Implementation Plan based on the last Work Group's discussion.

Recommendations 47-50 in the Applied Research section: Melanie Howard mentioned that these recommendations are currently an ongoing effort in the San Marcos system.

5. **Discussion and possible modification to the Overarching Issues section of the draft Report 1 Implementation Plan.**

Mr. Pence began the discussion by explaining that many of these recommendations were discussed and considered during the EARIP process. The Work Group reviewed each of the recommendations and made various comments.

Recommendation 60: Possible future issues, specifically climate change planning, were discussed and could be included into the development of an uncertainty analysis to develop more confidence in the planning process.

Recommendation 62: Developing a data management plan is a process the Edwards Aquifer Authority and the EAHCP is pursuing and will continue to pursue.

Recommendation 63: Conducting a statistical data analysis effort will ultimately be decided by the Implementing Committee.

6. **Discussion and prioritization of recommendations in the draft Report 1 Implementation Plan.**

Mr. Pence described the rationale to how the prioritization was developed. The matrix was compiled based on the implementation recommendation and organized within each recommendation based on various financial implications. Discussion followed.

The Work Group approved the prioritized recommendations format. Additionally, the Work Group agreed to have EAHCP staff work with the Applied Research Work Group first in order to have a plan for future research.

7. **Discussion and possible modification to the Summary Section of the draft Report 1 Implementation Plan.**

Mr. Pence reviewed and summarized the Report's summary section. The Work Group made various comments and edits to the summary. The Work Group agreed to move forward with this format and text for the final report.

8. **Discussion and possible action to recommend the draft NAS Report 1 Implementation Plan for official adoption by the Implementing Committee.**

Cindy Loeffler moved to accept the NAS Report 1 Implementation Plan for official adoption by the Implementing Committee. Roger Biggers seconded. There was no objection.

9. **Questions from the public.**

No comment or question.

10. **Adjourn.** 11:21 am

Appendix I3

Applied Research Work Group

Applied Research Work Group – Work Group Charge

September 11, 2015 Meeting Agenda

Meeting Minutes

September 25, 2015 Meeting Agenda

Meeting Minutes

October 16, 2015 Meeting Agenda

Meeting Minutes

Applied Research Work Group – Final Report

2015 Implementing Committee

Applied Research Work Group

Charge:

The Edwards Aquifer Habitat Conservation Plan (EAHCP) calls for the Applied Research program to build knowledge about the Covered Species and to facilitate the collection of data for the Ecological Model. This effort provides the EAHCP with a more accurate understanding of the ecological dynamics of the Comal and San Marcos springs, particularly under low-flow conditions.

In early 2015, the EAHCP received the first report of the National Academy of Sciences (NAS) where they provided recommendations towards all EAHCP programs including Applied Research. From these recommendations a robust list of possible projects were collected and presented to the NAS Recommendation Review Work Group (RRWG).

Based on the recommendation of the RRWG, the Implementing Committee created the Applied Research Work Group at their August 20, 2015 meeting.

The purpose of the 2015 Implementing Committee Applied Research Work Group is to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. This schedule will be used to develop the Work Plans for the Applied Research program in 2016 through 2019.

Committee Membership and Meeting Organization:

The Implementing Committee will appoint the membership at its meeting on August 20, 2015.

If desired, a Work Group Chair will be nominated and elected. The Work Group will develop the Applied Research Project Schedule through a consensus decision making process and will prioritize the Project Schedule according to subject need for developing research projects in the years from 2016 through 2019.

The Work Group will hold all meetings between September and October 2015. The final Applied Research Project Schedule will be presented to the Implementing Committee for approval at their November 19, 2015 meeting.



NOTICE OF OPEN MEETING

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, September 11, 2015, at 9 a.m. at the San Marcos Recreation Hall (Lions Club Tube Rental at City Park), 170 Charles Austin Dr., San Marcos, Texas, 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
2. Public Comment.
3. Possible nomination and election of the Work Group Chair.
Purpose: To discuss the need for and elect a Work Group Chair.
Action: To unanimously elect a Chair for the Work Group, if necessary.
4. Presentation of Work Group Charge (Attachment 1).
Purpose: Presentation of the Charge to the Work Group.
Action: None.
5. Consideration and adoption of a Work Group timeline, strategy, and deliverable format. (Attachment 2).
Purpose: To establish a Work Group timeline, strategy, and deliverable format.
Action: To adopt a Work Group timeline, strategy, and deliverable format.
6. Present background of Applied Research Program (Attachment 3).
Purpose: Presentation of the Applied Research Program background.
Action: None.
7. Review Biological Objectives and Goals (Attachments 4 and 5).
Purpose: Presentation of the Biological Objectives and Goals to the Work Group.
Action: None.

8. Presentation of Applied Research categories (Attachment 6).
Purpose: To discuss the presented Applied Research categories and determine whether more are needed to comprise the Applied Research Project Schedule.
Action: To obtain feedback on Applied Research categories and initiate discussion on whether any additional categories are needed.
9. Identify what additional stakeholder and/or expert input (e.g., agencies, committees, permittees) is desired to be solicited for informing Work Group proceedings.
Purpose: To determine whom to reach out to for soliciting Applied Research Work Group input.
Action: To recommend a list of stakeholders and/or experts to solicit for Applied Research Work Group input.
10. Future agenda items.
 - Finalize a list of Applied Research categories
 - Begin listing possible Applied Research projects
 - Evaluate stakeholder and/or expert input (if applicable)
11. Questions and comments from the public.
12. Adjourn.



NOTICE OF OPEN MEETING

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MINUTES

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, September 11, 2015, at 9 a.m. at the San Marcos Recreation Hall (Lions Club Tube Rental at City Park), 170 Charles Austin Dr., San Marcos, Texas, 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

All members were present.

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
9:09 a.m.
2. Public Comment.
None.
3. Possible nomination and election of the Work Group Chair.
The Work Group unanimously elected Dr. Arsuffi as the Work Group Chair.
4. Presentation of Work Group Charge.
No comment or question with regards to the Charge; however, the Work Group requested a copy of National Academy of Sciences Report 1 for its reference for this Work Group.
5. Consideration and adoption of a Work Group timeline, strategy, and deliverable format.
All proposed dates work for the Work Group members, with the exception that Drs. Arsuffi and Bush cannot make the October 9th meeting. October 16th was proposed to reschedule this meeting; Dr. Arsuffi stated he would check his schedule and notify EAHCP staff whether this date will work for him.
6. Present background of Applied Research Program.
This item was not discussed; it is deferred for discussion until the next meeting.

7. Review Biological Objectives and Goals.

Attachments were reviewed. Mr. Nathan Pence, EAHCP Program Manager, explained that the Work Group should ensure recommendations for Applied Research should further our understanding of EAHCP's Biological Objectives and Goals. No comments or questions.

8. Presentation of Applied Research categories.

Applied Research categories emerging from the Work Group's discussion are provided below. EAHCP staff informed the Work Group that they would refine the list and provide a copy to the Work Group for reference by Monday of the following week.

Categories of Research:

- 1. Measuring the success of the conservation measures; including consideration of indirect effects of species manipulation (+ and - ; e.g., elephant ear evapotranspiration)*
- 2. Basic research on biology of Covered Species, particularly invertebrates, not otherwise covered by refugia research program*
- 3. Suitability of relative indicators of trends relevant to Biological Goals and Objectives over time, including the representativeness of study sites and the representativeness of methodologies, such as sampling techniques*
- 4. Water quality as impacted by watershed-level human influences*
- 5. Habitat quality – HCP has goals for species*
- 6. Disturbance ecology/System memory – floods, recreation, etc.; what is the ability for the species to resist, respond, and rebound to short and long-term events?*
- 7. Data management, to include database creation, statistical analysis of data, and long-term data format/template and maintenance considerations*
- 8. Eco-model verification and/or validation (to end after 2016)*
- 9. Subaquatic vegetation (SAV) restoration, including effects of sedimentation; evaluation of SAV restoration success; and confirmation of Table 4.1 in HCP (FD density per SAV species)*

9. Identify what additional stakeholder and/or expert input (e.g., agencies, committees, permittees) is desired to be solicited for informing Work Group proceedings.

Dr. Ostrand stated he would like time to revisit the discussion from this meeting, review National Academy of Sciences Report 1 recommendations, and the draft Applied Research Project Schedule before he would feel comfortable recommending individuals from whom to solicit feedback. Dr. Bush agreed. Mr. Norris stated he already feels comfortable recommending soliciting feedback Dr. Weston Nowlin and Ed Oborny (Bio-West) for their expertise respective of EAHCP invertebrate research.

Mrs. Reinmund-Martinez mentioned the need to revisit past research studies to examine recommendations for future directions made by study authors in their final reports.

10. Future agenda items.

- Finalize a list of Applied Research categories
- Begin listing possible Applied Research projects
- Evaluate stakeholder and/or expert input (if applicable)

11. Questions and comments from the public.

Ken Diehl (San Antonio Water Systems): Mr. Diehl asked about the statistical analysis project referenced during the Work Group discussion on Applied Research categories. Mr. Diehl asked whether existing EAHCP data was so complex that it actually warranted this type of investigation.

12. Adjourn.
11:49 a.m.



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Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
2. Public Comment.
3. Approval of Minutes (Attachment 1).
4. Program Manager Update:
 - Draft Applied Research Work Group Report (Attachment 2)
 - Updated Workgroup Timeline & Strategy (Attachment 3)
5. Presentation of Applied Research categories (Attachment 4).
Purpose: To discuss the presented Applied Research categories and determine whether more are needed to comprise the Applied Research Project Schedule.
Action: To obtain feedback on Applied Research categories and initiate discussion on whether any additional categories are needed.
6. Presentation of revised EAHCP Applied Research Project Schedule (Attachments 5 and 6).
Purpose: To discuss the presented version of the revised Applied Research Project Schedule.
Action: To obtain feedback on revised Schedule.
7. Presentation of Applied Research Project Matrix (Attachment 7).
Purpose: To discuss Applied Research projects needed for each category.
Action: To recommend and prioritize Applied Research projects in each category.

8. Identify what additional stakeholder and/or expert input (e.g., agencies, committees, permittees) is desired to be solicited for informing Work Group proceedings.

Purpose: To determine whom to reach out to for soliciting Applied Research Work Group input.

Action: To recommend a list of stakeholders and/or experts to solicit for Applied Research Work Group input.

9. Future agenda items.
 - Discuss possible Applied Research projects
 - Receive input from experts

10. Questions and comments from the public.

11. Adjourn.



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MINUTES

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, September 25, 2015, at 9 a.m. at the Dunbar Recreation Center, 801 Martin Luther King Drive, San Marcos, Texas 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

All members were present.

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
9:05 a.m.
2. Public Comment.
Mr. Steven Bereyso explained that he may need to take personal calls during the meeting. He apologized for the inconvenience, and for the interruption this may cause.
3. Approval of Minutes (Attachment 1).
The minutes were approved without discussion.
4. Program Manager Update:
 - Draft Applied Research Work Group Report (Attachment 2)
Mr. Bob Hall requested for the report to be revised to state "all currently identifiable research" rather than "all possible research." Staff will circulate a Word file copy of the draft report for the Work Group's input.
 - Updated Workgroup Timeline & Strategy (Attachment 3)
No discussion.
5. Presentation of Applied Research categories (Attachment 4).
Applied Research Categories

- *Recommended to rephrase “Quantitative sampling methods” to “Standard sampling methods;” also recommended to rephrase “Habitat quality” as “Habitat quality and requirements.”*
- *Dr. Arsuffi recommends reviewing literature for precedents related to data management. Staff will follow-up with him concerning an article he found discussing data management issues similar to those faced by EAHCP.*

Categories Not Fitting

- *Regarding reaches, point made that study reaches may not link up with Species issues. Also, only if species’ distribution extends beyond reaches may there be some merit to extrapolating to greater segments of the system. Arsuffi states reaches cannot be extrapolated unless done as stratified random sampling.*
 - *For bio monitoring, Arsuffi suggests additional locations for sampling to be replicated might be worthwhile to identify whether restoration is having “trickle down” effects in non-restored parts of the system.*
 - *Dr. Ostrand emphasized that it will be extremely important to confirm links between water quality and stream species—without that direct link, people will continue to throw stones at glass house.*
 - *No comments on “Eco-model” or “Basic biology...” categories.*
6. Presentation of revised EAHCP Applied Research Project Schedule (Attachments 5 and 6).
No discussion.
7. Presentation of Applied Research Project Matrix (Attachment 7).
Presented project matrix; group discussed each category and particular focuses for each.
- *Gill parasite is not a huge focus right now. Parasites are not as detrimental to species as once thought.*
 - *TWR enhancement program is doing well. Chad asked whether we know which plants have been planted vs. gardened, etc. Nathan replied that we do have GIS data on planted species. Ken Ostrand commented on the long-term research that other agencies are doing with TWR. The goal is to maintain genetic diversity. Ostrand mentioned the increase of surface area of TWR. There are still differences in mapping methods. Either way, there is a positive trend.*
 - *Access points...Chad stated the need to continue to watch construction impacts to TWR. Wants construction to be completed and done. Ostrand asked what the goal for the species was in relation to the access points. Nathan answered that we want to remove the impacts to the banks caused by recreation.*
 - *Sessom’s Creek sand bar removal...Nathan felt it was important to evaluate the effects of the removal of the sand bar. Sand bar is still coming back. Upstream causes need to be addressed. No consensus on why it had to be done. Not sure that the money spent was worth the benefit to the species.*
 - *Non-native removal...lots of things to consider. Arsuffi wondered if TWR or other species expanding or improving due to other habitat restoration projects.*
 - *Mgmt. of public recreation...Nathan stated that existing mapping probably picked up impact to SSAs. Chad asked how we are demonstrating improvement since mapping did not take place prior to HCP?*
 - *Invasive animal removal...lots of positive impacts to species removal. Ostrand suggested modeling effort to measure impacts to native spp. Arsuffi said that each species will react differently to improvements. Suggested determining thresholds that are fixed or capped.*
 - *Control on non-native plant spp...Nathan felt that those spp are monitored thru existing programs*
 - *Riparian restoration...difficult to measure. Chad stated that western shoreline is very difficult to improve due to existing habitat. Nathan asked about other measures (e.g., terracing,*

- sediment traps, watering, etc.) Arsuffi cautioned against comparing western shoreline riparian system against other systems. Not all are the same.*
- *Litter and floating veg...no response.*
 - *Mgmt. of golf course...really related to water quality and runoff, etc.*
 - *Sediment removal...definitely yes to evaluate success. Arsuffi again cautioned against the issue of natural runoff vs. anthropogenic sediment increases.*
 - *Quantitative sampling or standard sampling methods...need to do it for CPRB, not for Gambusia or non-listed spp. At some point it's important to do it for all species, but right now would focus on listed first.*
 - *Ostrand wanted to know the goal...Nathan related existing goals. HCP doesn't require physical numbers. Arsuffi questioned the take estimate vs. populations. Feels that take is or should be based on population estimates. HCP doesn't have a pop. metric requirement. Discussion followed. Norris felt that some invertebrates could be "clumped" together in pop estimates. Ostrand disagreed. Bob Hall asked that collection of Comal or SM salamanders is known, but not much is known about blind salamanders. Need categories and which spp need to be worked on. SC can assist in furthering the sampling methods.*
 - *Habitat quality...maybe we need to determine the criteria that defines habitat quality. Need to create habitat for each spp using things like temp, DO, flow rate, etc. Some spp are well known, but still a lot of gaps in data.*
 - *Data analysis...funds dependent. Need to prioritize, especially for listed spp. Long-term trend analysis is needed.*
 - *Arsuffi wanted categories... long-term and short-term analysis of specific questions. Ostrand wanted to address standard methods. Is sampling method effective or not?*
 - *Arsuffi – mentioned control or reference sites. Difficult to find a reference site that hasn't been manipulated. Ostrand mentioned a stat method called BACI to use when there is no define control. Norris wants to study spring runs. Ostrand commented that riffle beetle still the priority research spp.*
 - *Nathan summarized what would be provided to the group.*
8. Identify what additional stakeholder and/or expert input (e.g., agencies, committees, permittees) is desired to be solicited for informing Work Group proceedings.
- *Weston Nowlin, Randy Gibson, and Ed Oborny were mentioned as experts to consult regarding riffle beetle research; however, Dr. Arsuffi suggested it may be inappropriate to tap Nowlin or Oborny due to conflicts of interest as they are contractors.*
 - *Arsuffi would like to obtain a report by Cindy Loeffler regarding the NAS Recommendations Review Work Group's recommendations. Nathan offers presentation on NAS RRRWG instead.*
 - *Andy Gluesenkamp suggested (salamanders); discussion followed.*
 - *Group will evaluate spreadsheet and send suggestions to Nathan, who will then later be invited to answer questions. Asks group to e-mail specific questions they wish to ask which experts before next time.*
9. Future agenda items.
- *Discuss possible Applied Research projects*
 - *Receive input from experts*
- Dr. Ostrand stated he did not think it would be appropriate to invite outside experts until the fourth meeting to ask questions about specific projects.*
10. Questions and comments from the public.
- None.*
11. Adjourn. - 11:39 a.m.



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Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
2. Public Comment.
3. Approval of Minutes (Attachment 1).
4. Program Manager Update:
 - Draft Applied Research Work Group Report (Attachment 2)
 - Applied Research Categories Listing (Attachment 3)
5. Explanation of the incorporation of NAS Applied Research Recommendations into the Applied Research Project Schedule and to Applied Research Work Group deliberations.
Purpose: To discuss the incorporation of NAS Applied Research Recommendations into the Applied Research Work Group's process.
Action: To inform the Work Group about the incorporation of the NAS Applied Research Recommendations into the ARWG process.
6. Presentation of revised Applied Research Project Prioritization Matrix and revised EAHCP Applied Research Project Schedule (Attachments 4, 5, and 6).
Purpose: To discuss the presented version of the revised Applied Research Project Schedule.
Action: To obtain feedback on revised Schedule.
7. Consideration of the approval of final deliverables, including draft Report of the 2015 Applied Research Work Group, draft 2016-2019 Applied Research Project Schedule, and draft Applied Research Project Prioritization matrix.

Purpose: To, discuss final Work Group approval, or identify the next steps needed to proceed with final Work Group approval, of the aforementioned deliverables.

Action: To possibly approve, or identify next steps needed for approval, of the final Work Group deliverables.

8. Consider future meetings, dates, locations, and agendas. – October 23, 2015, 9-12 p.m., Dunbar Center (if applicable).
9. Questions and comments from the public.
10. Adjourn.



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MINUTES

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, October 16, 2015, at 9 a.m. at the Dunbar Recreation Center, 801 Martin Luther King Drive, San Marcos, Texas 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

All Work Group members were present.

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
9:05 a.m.
2. Public Comment.
No comment.
3. Approval of Minutes (Attachment 1).
Janis Bush motioned to approve with the change of "thresholds" phrase to state "*threat thresholds*;" Accepted with motion as changed; motion was seconded by Chad Norris with no opposition.
4. Program Manager Update:
 - Draft Applied Research Work Group Report (Attachment 2)
 - Regarding the "Conservation measures" category, Ostrand objected to the phrase "the efficiencies of the benefits to the Species;" it was decided to rephrase this description to state, "Assessing the effectiveness of EAHCP Conservation Measures, *and the holistic practical benefits to the Species*, in achieving Biological Objectives and Goals."
 - Regarding "Standard sampling methods, Arsuffi recommended to delete the word "valid" in the description (i.e., "*Ensuring sampling methods are reliable measures for Species*" rather than "Ensuring sampling methods are reliable, valid measures for Species").

- Regarding the “Habitat quality and requirements” category, Bush recommended for the language to be revised to include the concept of habitat “*quantity*” in addition to habitat quality in the title and the description of the category.
 - Regarding the “Water quality” category, Ostrand objected to the phrase “not typical human health measures,” it was decided to leave this phrase out since the description already specifies “tailoring to the needs of species.”
 - Regarding the “System memory/Disturbance ecology” category, Arsuffi recommended to replace “and the resilience” with “*and the response (i.e., resilience and/or resistance) of the system post-disturbance*”
 - For the section of the report titled “Applied Research Project Schedule,” Norris recommended that the language be amended to clarify that other, additional projects may be identified in the future in response to changes in circumstance.
 - Applied Research Categories Listing (Attachment 3)
 - Tom Arsuffi expressed concern regarding overlap between “not fitting” categories and the applied research program—specifically the eco-model and study reaches—his question being, since ARWG has commented on this, will their input be considered by the Science Committee (SC)? Norris echoes the sentiment related to basic biology studies.
 - Arsuffi feels SC needs to have input regarding the work groups—and recommendation oversight over their recommendations. Ken Ostrand also agrees with the process of having the SC review WG recommendations before the IC.
 - Alicia Reinmund-Martinez states she will work with Arsuffi to present the recommendations of the ARWG at the November 10 SC meeting.
5. Explanation of the incorporation of NAS Applied Research Recommendations into the Applied Research Project Schedule and to Applied Research Work Group deliberations.
- With regards to the draft Project Schedule’s listing of studies completed in prior years, Norris raised the issue that sometimes “done” does not mean “done well,” and that in some cases “completed” studies should nevertheless be readdressed due to deficiencies in what the investigators were able to accomplish. with a particular example of this scenario
 - In stating this, Norris explains that one study that most comes to his mind is the baseline distribution of the CSRB study, which he feels needs to be done again due to issues with study methodology. With regards to this point, Bob Hall shared that internally, EAHCP had already planned to improve on this prior study once the CSRB sampling study has been completed as a first step.
 - The point was made that reevaluating completion of existing studies that are supposed to be “finished” raises issues related to peer review, and whether anything can ever be deemed completely “finished”—but ultimately, the criterion of this exercise would be to formally determine whether a given study was completed in an acceptable fashion by scientific standards, and that the job of determining whether a study is done or not would be most appropriately done by the Science Committee.

- The group agreed in recommending for the SC to take on this task, with a first step being to develop a formal process for evaluating whether past projects are complete, valid, and whether they need to be repeated in some fashion. This will be added as a section to the draft ARWG report, to be drafted internally, coordinated with Arsuffi, and distributed to the remaining ARWG members.
 - Additionally, it was recommended that the role of the SC relative to future work groups (i.e., Biological Monitoring, etc.) be well defined.
6. Presentation of revised Applied Research Project Prioritization Matrix and revised EAHCP Applied Research Project Schedule (Attachments 4, 5, and 6).
 - Bush makes the point that leaving in TBD/contingency into the schedule is a good strategy for accommodating future studies that may not yet be on our radar.
 - Arsuffi makes the point that for some projects, such as evaluating the success of invasive species removal, planning needs to start happening soon (early next year at the latest) to facilitate a successful study.
 - The point is made that future studies may rely on data being collected now to make necessary evaluations; hence, the work groups, such as the Bio Monitoring Work Group, need to take ARWG-recommended future studies into account in their recommendations to ensure that programs are collecting this data now to facilitate later analysis.
 - The point was also made that accepted baselines for various measures need to be identified. Baselines can be developed through existing data, suggested Arsuffi. It may be helpful to have the Bio-Monitoring Work Group incorporate consideration of baselines as well, or to incorporate this into the statistical analysis of existing EAHCP data.
 - The Work Group recommends for Science Committee workshop to evaluate the ARWG-recommended Applied Research Project Schedule studies in the context of the program in general. Comprehensively vetting the schedule taking into account NAS' involvement, program deadlines, and the role of workgroups will help minimize risk of needing to repeat these studies in the future. This would be a good time to plan for adaptive management—to stop, take stock, see where the HCP is going. Now is a good time for this to be efficient and cost effective. Arsuffi offers for this workshop to take place at the Llano River Field Station in Junction, Texas.
 7. Consideration of the approval of final deliverables, including draft Report of the 2015 Applied Research Work Group, draft 2016-2019 Applied Research Project Schedule, and draft Applied Research Project Prioritization matrix.
 - Arsuffi moved to approve the final deliverables amended to reflect recommended changes, Ostrand seconds, with no opposition.
 8. Consider future meetings, dates, locations, and agendas. – October 23, 2015, 9-12 p.m., Dunbar Center (if applicable).
 Today's October 16 meeting was determined to be the final meeting of the 2015 ARWG given approval of final deliverables.
 9. Questions and comments from the public.

None.

10. Adjourn.
10:46 a.m.



Edwards Aquifer Habitat Conservation Plan
Applied Research Work Group

Report of the 2015 Applied Research Work Group

October 16, 2015

Introduction

The Edwards Aquifer Habitat Conservation Plan (EAHCP) calls for the Applied Research Program to build knowledge about the Covered Species, and to facilitate the collection of data for the Ecological Model. This effort provides the EAHCP with a more accurate understanding of the ecological dynamics of the Comal and San Marcos spring systems, particularly under low-flow conditions. The Applied Research Program is an important component of the EAHCP as it helps build information necessary for meeting the Biological Objectives and Goals.

In early 2015, the EAHCP received the first report of the National Academy of Sciences (NAS), where NAS provided recommendations towards all EAHCP programs, including the Applied Research Program. From these recommendations, a robust list of possible studies was compiled and presented to the NAS Recommendation Review Work Group (RRWG).

For the NAS recommendations pertaining to the EAHCP Applied Research Program, the RRWG recognized that the EAHCP program had completed many of the NAS recommendations for the EAHCP Applied Research Program, or was currently in the process of incorporating them. These determinations are documented in the RRWG's *Prioritization Matrix* (Appendix I), as presented in the RRWG final report. The RRWG recommended the creation of an Applied Research Work Group (ARWG) to establish a research project schedule for the remainder of Phase I of the EAHCP. As identified in Chapter 7 of the EAHCP, funding for the Applied Research Program is limited to Phase 1 (2013 through 2019) only. The RRWG stated that the ARWG should start work as soon as possible to allow for potential inclusion of 2016 research projects in the prioritization process.

Specifically, the RRWG recommended the following issues be addressed by the ARWG: (1) Determining if additional applied research studies are needed; and (2) Developing a research plan that prioritizes the numerous studies recommended by NAS, the Science Committee, the Implementing Committee, and independent subject matter experts.

Based on the recommendation of the RRWG, the EAHCP Implementing Committee created the ARWG at its August 20, 2015 meeting, approving its charge "to recommend a holistic Applied Research Project Schedule that takes into account currently identifiable research necessary to better understand EAHCP's Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. This schedule will be used to develop, review, and assess the Work Plans for the Applied Research Program in 2016 through 2019.

The Implementing Committee appointed the following individuals to the ARWG at its August, 20 meeting: Tom Arsuffi (Texas Tech University), Janis Bush (University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Kenneth Ostrand (United States Fish & Wildlife Service. Dr. Tom Arsuffi was elected as the Work Group Chair at the first meeting of the Work Group. The Work Group held a total of three meetings during September and October 2015.

Appended to this report are the *Recommendations Review Work Group Prioritization Matrix* (Appendix I), the *2016-2019 Applied Research Project Schedule* (Appendix II), the *2016-2019 Applied Research Project Prioritization Matrix* (Appendix III), the Charge of the 2015 ARWG (Appendix IV), and the ARWG's meeting agendas and minutes (Appendix V).

NAS Applied Research Recommendations

As previously mentioned, the RRWG recommended that an ARWG be convened to determine (1) if additional applied research studies are needed, and (2) to develop a research plan that prioritizes the numerous studies that have been recommended by NAS, the Science Committee, the Implementing Committee, and independent subject matter experts. Ultimately, the ARWG determined that input from independent subject matter experts was not needed to complete its charge.

Reflecting the recommendation by the RRWG, a comprehensive list of the studies recommended by NAS was presented for consideration by the ARWG from the first meeting onwards as part of a proposed draft Applied Research Project Schedule. These NAS-recommended studies appear in blue on the *2016-2019 Applied Research Project Schedule* (Appendix II). Four NAS studies (three studies on the Comal Springs Riffle Beetle (CSRB) and one study on the effects from phosphorus on the ecosystems) were not recommended for implementation because it was believed necessary to first determine the CSRB sampling techniques—scheduled for 2016—and/or because the studies are more appropriate for the EAHCP Refugia program, or do not contribute to the overall achievement of the EAHCP Biological Goals and Objectives. These four studies appear at the bottom of the *Project Schedule*.

This strategy enabled the ARWG to take all NAS recommendations under consideration, so that NAS' contributions to the Applied Research Program could be duly incorporated into the final draft Applied Research Project Schedule as deemed appropriate by the ARWG.

Categories of Applied Research

In its first meeting, the ARWG identified categories of Applied Research on which to focus. The identification of these categories was based on the ARWG's review of to-be-conducted Applied Research studies identified to-date, including a comprehensive list of the studies recommended by NAS (as mentioned above), as well as studies recommended by the Science Committee and the Implementing Committee.

From this holistic review process, the ARWG identified five final categories, which are listed below along with a short description:

- 1. Conservation measures**

Assessing the holistic practical benefits of EAHCP Conservation Measures to the Species, and the effectiveness of the Conservation Measures in achieving Biological Objectives & Goals.

2. **Standard sampling methods**

Establishing reliable sampling methods for the Species to ensure they permit evaluation of trends over time, including standardization as an important goal; and that they are consistent with Biological Objectives & Goals.

3. **Habitat quality, quantity, and requirements**

Evaluating the habitat requirements of the Species, including the assessment of whether habitat is of sufficient quality and quantity, and validating HCP's assumptions related to habitat, consistent with Biological Objectives & Goals.

4. **System memory/Disturbance ecology**

Measuring the effects of disturbance (e.g., drought, scouring floods, etc.) on the system, and the response (i.e., resilience and/or resistance) of the system post-disturbance as it relates to Biological Objectives & Goals.

5. **Data**

Data management considerations relevant to existing and future data to be collected, as well as applications for analysis of existing data relevant to Biological Objectives & Goals.

Besides the above, four additional categories were discussed and identified as important, but did not fit in the Applied Research Program due to logistical and/or programmatic factors. These additional categories of research will be covered by other EAHCP programs. These categories are listed below, along with a short description and mention of what other EAHCP Program they fall under.

1. **Study reaches**

Evaluating the appropriateness of study reaches in the Comal and San Marcos systems will be conducted by the Biological Monitoring Work Group.

2. **Water quality**

Assessing water quality issues for the Comal and San Marcos systems, including watershed concerns and tailoring programs to the needs of species, will be conducted by the Water Quality Monitoring Work Group.

3. **Eco-model**

Validating the eco-model and other research applications related to the eco-model will be conducted within the scope of the EAA's modeling program.

4. **Basic biology of Species**

Starting in 2017, studies related to aspects of the basic biology of Species will be conducted through the Refugia Research Program.

Applied Research Project Prioritization Matrix

The *Applied Research Project Prioritization Matrix* (Appendix III) was developed at the request of the ARWG. This matrix was used by the Work Group as a reference for prioritizing projects within different Applied Research categories.

Within each of the five Applied Research categories listed on the matrix, the Work Group identified logical subcategories corresponding to that category. For example, projects fitting in the “Conservation measures” category are organized by subcategories corresponding to the various EAHCP Conservation Measures in the San Marcos and Comal Springs systems. Similarly, in the case of projects fitting in the “System memory/Disturbance ecology” category, the Work Group identified subcategories corresponding to the System and Reach where projects would be located.

Within each category, the Work Group prioritized specific projects.

Applied Research Project Schedule

The following section of this report is a summary of the *2016-2019 Applied Research Project Schedule* as recommended by the ARWG. This summary provides a narrative description of the studies which the ARWG recommends to constitute the EAHCP Applied Research Program over the next four years.

2016

Three of the five projects lined up for 2016 will consist of studies concerning the basic biology of the Comal Springs Riffle Beetle (CSRB). The efficacy of different sampling techniques for the CSRB will also be studied in a fourth, separate project, representing a standard sampling method study.

The fifth remaining project in 2016 will be database creation and management, including compiling and formatting data, creating standard data templates, and normalizing data for all EAHCP applied research conducted to date.

2017

Six studies were identified for 2017, including the second phase of a two-year evaluation of the life history of the CSRB. Two habitat projects will investigate 1) the suitability of submerged aquatic vegetation types for Fountain Darter habitat, and 2) the effects of sedimentation on submerged aquatic vegetation (SAV), the Fountain Darter, and the CSRB, respectively. A fourth study will evaluate the efficacy of different sampling techniques for the Comal Springs Dryopid Beetle. Rounding out the project schedule for the year, two projects will develop additional study questions to further explore biological objectives and statistically analyze existing EAHCP data concerning system memory/disturbance ecology and species-specific questions.

2018

For 2018, four studies will be conducted. One will evaluate the efficacy of different sampling techniques for the Peck's Cave Amphipod. The remaining three will investigate the effectiveness of Conservation Measures, with one evaluating success of SAV restoration and Texas Wild-rice enhancement, and the other confirming EAHCP Tables 4-1 and 4-21. A contingency "slot" has been left open in the Project Schedule to accommodate an additional project if need arises.

2019

In 2019, two studies were identified to be included on the Applied Research Project Schedule, including an evaluation of the success of removal of invasive animal species and an evaluation of the success of Sessom Creek sandbar removal and general sediment removal efforts in both systems. Like 2018, a contingency "slot" has been left open in the Project Schedule for 2019 to accommodate an additional project if need arises.

Role of the Science Committee in Relation to the Applied Research Program

The role of the Science Committee in the Applied Research Program is determined by the *Funding and Management Agreement* (FMA). Following the framework established by the FMA, the Implementing Committee adopted a process whereby the Science Committee plays a role in establishment of Scopes of Work for Applied Research projects. In keeping with the FMA, as the governing document for the EAHCP program, and the Implementing Committee's request, the following is the role of the Science Committee in the Applied Research Program:

1. Per the FMA and Implementing Committee-adopted process, the Science Committee will assist in developing the study questions for Applied Research projects; reviewing offerors' Scopes of Work for scientific merit; and reviewing the proposed methodology in the awarded offeror's study plan.
2. As specifically requested by Implementing Committee Chairman, the Science Committee will provide comments on the *Report of the 2015 Applied Research Work Group*, and, if agreeable, an endorsement of the report. Science Committee comments provided will be kept independent of the report, allowing the Implementing Committee to consider all perspectives.
3. The Science Committee will receive presentations by Applied Research Program contractors providing final scientific reports concerning the data and results of studies conducted in support of the EAHCP.

In addition to the official role of the Science Committee as described above, the ARWG also recommends for consideration by the Implementing Committee that the Science Committee exercise oversight in the following additional instances:

4. Evaluating the completion and success of studies conducted in support of the EAHCP to determine whether a given study was completed in an acceptable fashion by scientific standards, or whether it needs to be repeated or expanded upon in some fashion to

adequately supply desired information necessary to meet EAHCP Biological Objectives and Goals.

5. Given the significant complexity of the Applied Research Program, the ARWG also recommends that a Science Committee workshop be held to provide the Science Committee with an adequate forum to evaluate the progress to date of the Applied Research Program, with an eye to the coming four years of the program as laid out in the *2016-2019 Applied Research Project Schedule*.

Conclusion

At their final meeting on October 16, 2015, the ARWG unanimously approved this draft *Report of the 2015 Applied Research Work Group*, including the draft versions of the *2016-2019 Applied Research Project Schedule* and the *2016-2019 Applied Research Project Prioritization Matrix* appended herein. The ARWG recommends these documents to the Implementing Committee as its final deliverables for approval and adoption.

Appendix I: National Academy of Sciences Report I Implementation Plan: Recommendations Review Work Group Prioritization Matrix

| Prioritization Status: Done, Continual or In-Progress | | | | | |
|--|-----------------------|---|--|---|--|
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Done | Hydrologic Model | Don't use the term "verification" when describing model runs with changing parameters. | None | Use the correct terminology in future discussions and reports. | EAA should draft a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models. |
| Done | Ecological Model | Develop an ecosystem-based conceptual model. | None | N/A | Already Done - 2010 EARIP Influence Diagrams: facilitated by Jean Cochrane |
| Done | Ecological Model | Develop a conceptual model that shows how water quality and quantity, other biota and restoration and mitigation activities are expected to interact with the indicator species. | None | N/A | Already Done - 2010 EARIP Influence Diagrams: facilitated by Jean Cochrane |
| Done | Ecological Model | In developing the fountain darter model, pay attention to movement, density dependence and other topics. | None | N/A | These studies were conducted through the Applied Research Program and results were incorporated into the Ecological Model |
| Done | Ecological Model | Include intermediate products in the development of the fountain darter model. | None | N/A | These analyses were performed as the first steps in the Ecological Model development. |
| Done | Ecological Model | Use the habitat suitability analyses for the fountain darter as "back-up" to individual-based modeling. | None | N/A | Early on in the development of the Ecological Model, the Ecological Model team developed a habitat suitability analyses for the fountain darter. This analyses could be used as a back-up to the Ecological Model if needed. |
| Done | Ecological Model | Revisit the estimation fountain darter suitability curves. | None | N/A | *These curves are the first step in creating the Ecological Model. If to be used for the development of the Ecological Model, we are past that point. *If the Fountain Darter module fails or does not calibrate, then suitability curves should be revisited. |
| Done | Applied Research | Conduct a follow-up fountain darter movement study. | None | N/A | A Fountain Darter movement study was conducted in 2014. NAS did not have the benefit of seeing these results prior to putting forth this recommendation. |
| Done | Applied Research | Increase transparency in prioritizing and funding research projects. | None | N/A | *In 2014 and 2015, EAHCP staff modified the Applied Research prioritization process to be more transparent, solicit additional proposals from new proposers, solicit more input from the Science Committee on the technical merits of proposals, solicit key elements from the Science Committee to be included in the RFP's, and generally increase the role of the Science Committee in the process. |
| Done | Overarching Issues | Future scenario planning: Think how possible worst case scenarios would impact both modeling and HCP implementation (provided 6 scenarios). | None | N/A | 1. The impacts from increasing pumping levels from exempt well owners is being addressed by the Edwards Aquifer Authority during their annual operational planning process; 2. A drought, worse than the Drought of Record, has been addressed in Chapter 8 of the EAHCP; 3. The risk to the Covered Species because of the mismatch between hydrologic changes and conservation triggers will be addressed during Phase II of the EAHCP; 4. Impacts from Climate Change have been addressed by a shortened term limit (15 years) of the Incidental Take Permit; 5. The impacts from the federal court ruling on the Bragg constitutional taking decision are not within the jurisdiction of the EAHCP and; 6. The impacts from Whooping Crane ESA issues has been previously addressed through the EARIP planning process. |
| 1. Done 2. Yes 3. In Progress - partner not host | Overarching Issues | Increase project integration through three steps: 1. Develop an overall conceptual model of the Edwards system. 2. Develop a unified data management system. 3. Convene an annual Science Meeting to discuss all relevant topics. | Yes | *Two of the specific recommendations identified (conceptual model and data integration) have been addressed in other sections of this implementation plan. *The third recommendation to hold a Annual Science meeting may be covered by the proposed Bio Monitoring, Water Quality and Applied Research work groups. | *A EAHCP Conceptual Model was created by EAHCP staff and share with Implementing Committee in 2014. *The Annual Science meeting covering the Edwards Aquifer appears to be a good idea. But not sure it is the EAHCP that should host, rather the EAHCP should be a participant. |
| Continual- thru the end of the ITP | Hydrologic Model | Do not compare results from MODFLOW and FEFLOW. | None | *EAA will not perform a head to head comparison of model results, but will rather utilize each model for specific purposes. *There has been much discussion by the IC and Stakeholders as to the purpose of having two models. Many have publically supported the use of both since they are now close to ready for utilization. | *Calibration of the models is not sufficient for a head to head comparison . *EAA should draft a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models. |
| Continual | Hydrologic Model | Consider MODFLOW as a work in progress and not a final product. | Funding is allocated in the EAA operational budget | Continue to update the MODFLOW model as additional data/information is realized. | *EAA has been committed to an iterative modeling process since the creation of the MODFLOW model; continuously improving and updating the model. The next iteration could be Modflow USG. *EAA should draft a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models. |
| Continual | Ecological Model | Improve the habitat suitability analyses for Texas wild rice. | Funding is allocated in the CoSM/TXSTATE work plan budget | Field Verification and Observation | *TWR has been extremely successful to date; therefore additional TWR work is not needed at this point. *The Meadows Center has been collecting this information as Applied Research imbedded in their TWR restoration work. Habitat suitability has taken the form of applied verification in the field. |
| Continual | Ecological Model | Test the robustness of the current habitat suitability analysis for Texas wild-rice. | Funding is allocated in the CoSM/TXSTATE work plan budget | Field Verification and Observation | *TWR has been extremely successful to date; therefore additional TWR work is not needed at this point. *The Meadows Center has been collecting this information as Applied Research imbedded in their TWR restoration work. Habitat suitability has taken the form of applied verification in the field. |
| Continual | Biological Monitoring | Continue monitoring index reaches. | Funding is allocated in the Biological Monitoring work plan budget | Implement the Biological Monitoring work plan | This is already part of the Bio Monitoring work plan and program. Recommend to establish a Biological Monitoring Work Group to do a holistic review of the biological monitoring program and its integration with the water quality monitoring program. |

Appendix I: National Academy of Sciences Report I Implementation Plan: Recommendations Review Work Group Prioritization Matrix

| | | | | | |
|---|--------------------|--|---|---|---|
| In Progress- short time-frame | Hydrologic Model | Continue development and testing of the Hydrological Simulation Program (HSPF) for estimating recharge. | Funding is allocated in the EAA operational budget | Conduct comparison between Puente method, HSPF, and other estimations. | <p>*EAA has been committed to an iterative modeling process since the creation of the HSPF models; continuously improving and updating the models.</p> <p>*Refinement of Recharge Estimates are a goal of the EAA strategic plan.</p> <p>*EAA should draft a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models.</p> <p>*Recharge is a major source of uncertainty.</p> |
| In Progress | Hydrologic Model | Quantitatively assess model uncertainty. | Funding is allocated in the EAA operational budget | Have technical consultants conduct uncertainty analysis. EAA is already working on a Scope of Work for this evaluation. | This is already included in Model development by EAA staff. However there is merit to having a 3rd party perform this analysis. The Work Group unanimously recommended the EAA to perform this analysis (6/26). |
| In Progress | Hydrologic Model | Move toward a single model. | None | N/A | <p>*There seems to be support for this from both the technical perspective and political perspective.</p> <p>*Participants in the workshop noted that a Cost/Benefit analysis of one model vs two should be conducted.</p> |
| In Progress | Ecological Model | Develop a phased strategy for testing individual components in the submerged aquatic vegetation (SAV) model. | Funding is allocated in the Ecological Modeling work plan budget. | Conduct Analysis | The Ecological Model Team is already planning to perform this verification. |
| In Progress | Ecological Model | Make the Applied Research program more robust with quantitative projections of Comal Springs riffle beetle (CSRB) habitat. | Funding is allocated in the Applied Research work plan budget. | In 2015 and 2016, the Applied Research Program is focusing on the Comal Springs riffle beetle. | However, the CSRB is no longer a module in the Ecological Model, therefore the data collected will only be utilized if the CSRB is added to the model at some point in the future. |
| In Progress | Ecological Model | Ensure proper interpretation of the ongoing effort to build an individual-based model for fountain darter. | Funding is allocated in the Ecological Modeling work plan budget. | N/A | The Ecological Modeling team already plans to conduct verification testing. |
| In Progress | Applied Research | Increase competition and collaboration with outside scientific experts. | None | N/A | <p>*For 2016 Applied Research solicitations, EAHCP staff referenced literature cited reports and bibliographies of researchers that performed similar research or are familiar with the EAHCP Covered Species. EAHCP staff will reach out to these identified researchers and ensure they are aware of the EAHCP research projects.</p> <p>* Additionally, for 2016 research solicitations, EAHCP staff will utilize numerous posting boards.</p> |
| In Progress | Applied Research | Increase transparency of research results. | TBD - depends on method utilized for formatting, storage and access/dissemination. | <p>*Develop a data management plan.</p> <p>*Utilize a data manager (consultant or staff) or staff scientific Ph. D to establish a required data format for contractors to adhere to, reformat and organize existing data.</p> | <p>*It is recommended that a scientific Ph. D be added to the HCP staff to assist with the creation and implementation of a data management plan, if determined it is needed to achieve compliance.</p> <p>*This recommendation seems to lead one to believe that there is a lack of transparency in the research process or that data generated through the EAHCP is not made available to other entities. However, all reports, results and data are posted on the EAHCP website and provided to any requestor.</p> <p>*The NAS RRRWG discussed that the purpose of data generated within the EAHCP is for the purpose of building the Ecological Model or providing information to the Implementing Committee to make decisions. The purpose is not to ensure the data is in a usable format for another program/entity to utilize. If it is not in a usable format for a requesting program/entity to use, it should be the responsibility of the requestor to format for their purposes.</p> |
| In progress | Overarching Issues | Conduct performance-based monitoring of the minimization/mitigation measures. | None | EAHCP staff has already begun to develop a tracking matrix of all M&M measures, how to measure success/completion and their status (% completion as measured against the Biological Goals). | This matrix should be completed late-summer 2015. |
| In Progress | Applied Research | Texas wild-rice: Focus studies on the restoration of this plant. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| In Progress | Applied Research | Texas wild-rice: Focus studies on the restoration of this plant. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| In Progress | Applied Research | Texas wild-rice: Focus studies on the restoration of this plant. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| In Progress | Applied Research | Texas wild-rice: Focus studies on the restoration of this plant. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| Prioritization Status: Yes to be Implemented w/ no budget impact | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Hydrologic Model | Display error bars on MODFLOW data. | Funding is allocated in the EAA operational budget | These error bars will be established by the Uncertainty Analysis being conducted by EAA | <p>*The error bars will be most useful on the act of forbearance.</p> <p>*EAA has a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models.</p> |
| Yes | Ecological Model | Clarify the goal of the submerged aquatic vegetation (SAV) model. | None | Require the Ecological Modeling team to provide a clear and concise goal of the SAV model. | |

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| Yes | Applied Research | Remove Literature Review tasks | None - if any, could result in cost savings. | Request literature reviews with the proposal, rather than as a deliverable of the contract. | <p>*Thus far Literature Review has been conducted by all selected contractors and represents a very minor expense. Proposers should do their background work (literature review) prior to submitting, but what is the harm in requesting to see their lit review if selected.</p> <p>*As most of the Applied Research in the HCP has been conducted or determined to not be needed, and new projects and topics are recommended for research by NAS and the Science Committee, a Applied Research work group should be formed to review completed research and establish a new research plan moving forward.</p> <p>*In Table 7.1, applied research funding ends in 2019; with identified additional research needs and continuing unknowns, the Implementing Committee might consider extending applied research funding through the duration of the ITP. This additional funding would need to be reallocated from another HCP activity to applied research.</p> <p>*Additionally, it is recommended that a scientific Ph. D be added to the HCP staff to assist with workgroup facilitation, analysis and resulting implementation. Additionally, this staff person could assist in review of the research proposals, selecting contractors, and facilitating the research prioritization process and QA/QC of research conductance.</p> |
|--|---|---|---|--|---|
| Yes - as allowed for by the FMA | Applied Research | Offer longer-term projects. | None - the Applied Research budget is capped at \$450,000 annually | The FMA and budgeting cycle should be explored to identify opportunities to create multiple year research projects. Recommended as a critical component by the Work Group | <p>*The Science Committee has echoed the same recommendation for longer and on-going studies. However, that remains a challenge within the current planning and budgeting framework.</p> <p>*The NAS RSWG supported this as an important step in increasing the number of potential bidders to projects. All opportunities to implement this recommendation should be explored.</p> |
| Future Goal | Hydrologic Model | Include conduits in the development of the Hydrologic Model. | Funding is allocated in the EAA operational budget | Will require additional hydrologic research and data collection. | <p>*Workshop participants generally supported modeling of conduits; however, many cautioned about the limited modeling capabilities to achieve this and the lack of data needed.</p> <p>*EAA has a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models.</p> |
| Future Goal | Hydrologic Model | Move toward making predictions on a daily time scale. | Funding is allocated in the EAA operational budget | Will require additional hydrologic research and data collection. | <p>*This would require outside consultation and expertise if established.</p> <p>*EAA has a multi-year modeling plan that outlines future modeling efforts that will effect/be utilized by the EAHCP. This plan should be comprehensive to all models.</p> |
| Prioritization Status: Yes or TBD w/ budget impact | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Overarching Issues | A comprehensive information management plan. | Significant - initial setup of a comprehensive data management plan would likely require engaging a consultant and require purchase of additional software/hardware. Currently, there is no identified budget for this activity. | In the immediate future, staff will internally implement a data mgmt effort that focuses on security of data, format of newly collected data, backing up all data, and ensuring there is a transparent process in place to provide data to others. | <p>*It is anticipated that newly proposed Director of Refugia and Covered Species could assist with implementation of this recommendation.</p> <p>*The purpose of data generated within the EAHCP is for the purpose of building the Ecological Model or providing information to the Implementing Committee to make decisions. The purpose is not to ensure the data is in a usable format for another program/entity to utilize. If it is not in a usable format for a requesting program/entity to use, it should be the responsibility of the requestor to format for their purposes.</p> |
| TBD- by the Implementing Committee | Overarching Issues | Conduct rigorous statistical data analysis. | Significant - this analysis would be performed by a contractor. Currently, there is no identified budget for this activity. | Staff will first work with the SC to determine if any additional information can be gained to further compliance with the ITP from additional data analysis; this will be formatted in the form of questions to be answered by the analysis. Staff will then provide the Implementing Committee with a proposal for rigorous statistical data analysis, allowing the Implementing Committee to decide at that point if the effort is necessary or desired. | <p>*Before implementation of this recommendation, the Science Committee should be utilized to identify questions that should be answered through the additional data analysis. These questions should be directly tied to achieving compliance or furthering accomplishment of the Biological Goals.</p> <p>*Utilize a data manager (consultant or staff) to facilitate a Science Committee discussion to explore what, if any, questions should be answered by additional data analysis.</p> |
| Prioritization Status: Yes/No to be Implemented and Prioritized by the Water Quality Work Group | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Biological and Water Quality Monitoring | Increase coordination and integration of the biological monitoring and water quality monitoring programs. | None | Create a Water Quality monitoring work group and a Biological monitoring work group to develop a strategy to implement this recommendation. | It is recommended that a Director of Refugia and Covered Species Programs be added to the HCP staff to assist with this workgroup facilitation, analysis and resulting implementation. |
| Yes - ask the Water Quality work group for concurrence | Water Quality Monitoring | Enhance nutrient sampling. | Currently, there is no identified budget for this activity. For this sampling to be added, another component of equal or greater cost would need to be dropped. | Create a Water Quality monitoring work group to develop a strategy to implement this recommendation. | <p>*As several years of data have been collected under the HCP Water Quality program and much has been learned, it is time to take a step back and revisit the Water Quality monitoring program from a holistic approach. It is recommended that a work group be formed to consider all NAS Water Quality monitoring recommendations and look for needed modifications based on data collected.</p> <p>*Additionally it is recommended that a Director of Refugia and Covered Species Programs be added to the HCP staff to assist with this workgroup facilitation, analysis and resulting implementation.</p> |
| Yes - ask the Water Quality work group for concurrence | Water Quality Monitoring | Conduct additional residential herbicide, residential chemicals, and personal care product testing. | Currently, there is no identified budget for this activity. For this sampling to be added, another component of equal or greater cost would need to be dropped. | Create a Water Quality monitoring work group to develop a strategy to implement this recommendation. | <p>*As several years of data have been collected under the HCP water quality monitoring program and much has been learned, it is time to take a step back and revisit the water quality monitoring program from a holistic approach. It is recommended that a work group be formed to consider all NAS water quality monitoring recommendations and look for needed modifications based on data collected.</p> <p>*Additionally it is recommended that a Director of Refugia and Covered Species Programs be added to the HCP staff to assist with this workgroup facilitation, analysis and resulting implementation.</p> |
| Prioritization Status: Yes/No to be Implemented and Prioritized by the Biological Monitoring Work Group | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Biological and Water Quality Monitoring | Increase coordination and integration of the biological monitoring and water quality monitoring programs. | None | Create a Water Quality monitoring work group and a Biological monitoring work group to develop a strategy to implement this recommendation. | It is recommended that a Director of Refugia and Covered Species Programs be added to the HCP staff to assist with this workgroup facilitation, analysis and resulting implementation. |

Appendix I: National Academy of Sciences Report I Implementation Plan: Recommendations Review Work Group Prioritization Matrix

| TBD | Biological Monitoring | Provide a clear mechanism to scale results to the entire spring and reach system. | Currently, there is no identified budget for this activity. For this sampling to be added, another component of equal or greater cost would need to be dropped. | Create a Biological monitoring work group to develop a strategy to implement this recommendation. | *The NAS RRRWG discussed that the purpose of expanding the index reaches to representative reaches (system wide representation) has not been determined. If this is considered, a rationale as to why a system wide representation is needed for ITP compliance should be developed. *The Biological Goals and Objectives are tied to the previously identified reaches, not the entire river system. * NAS themselves comments that this is necessary only if desired. |
|---|-----------------------|--|--|--|---|
| No - ask the Biological Monitoring work group for concurrence | Biological Monitoring | Increase the frequency of sampling in Comal Springs system. | Currently, there is no identified budget for this activity. For this sampling to be added, another component of equal or greater cost would need to be dropped. | Create a Biological monitoring work group to develop a strategy to implement this recommendation. | *Originally, the Variable Flow sampling was conducted 4 times a year. It has since been reduced to twice a year as it was determined there was no additional advantage to sampling a higher frequency. *The NAS RRRWG discussed the consistency in data sets and lack of variability in most parameters, leading to the questioning of why implementation of this recommendation would be needed. |
| Prioritization Status: Yes/No to be Implemented and Prioritized by the Applied Research Work Group | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| Yes | Ecological Model | Develop a much deeper understanding of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | The workshop participants generally supported more CSRB research. However, there was discussion about if the CSRB should be used as an indicator species, as it is assumed the CSRB simply retreats into subterranean habitat. |
| Yes | Biological Monitoring | Develop quantitative sampling methods for the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | *The Science Committee has been discussing this topic at recent meetings. This recommendation should complement their discussions. *Workshop participants generally supported establishment of new methods. *This research would specifically look at methods other than use of the "cotton lure"; but also could be designed to include an "Optimization Study" for the cotton lure. *This research could also be used to determine the composition of the biofilm; or if already established by other researchers, could determine the utilization of the biofilm by the CSRB. |
| TBD | Applied Research | Fountain Darter: Conduct additional studies on movement, preferably allowing for Lagrangian tracks to be estimated. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | Applies to Applied Research Recommendations 41-58 *As most of the Applied Research in the HCP has been conducted or determined to not be needed, and new projects and topics are recommended for research by NAS and the Science Committee, a Applied Research work group should be formed to review completed research and establish a new research plan moving forward. |
| TBD | Applied Research | Fountain Darter: Confront the persistent lack of a relationship found between flow and fountain darter metrics...it is critical to refine the relationship at low to moderate flows and also at high flows (scour events). | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | *In Table 7.1, applied research funding ends in 2019; with identified additional research needs and continuing unknowns, the Implementing Committee might should consider extending applied research funding through the duration of the ITP. This additional funding would need to be reallocated from another HCP activity to applied research. |
| TBD | Applied Research | Fountain Darter: Obtain measurements related to individual fountain darter health that go beyond the densities and lengths of individuals measured in the current bio monitoring. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | *Additionally, it is recommended that a scientific Ph. D be added to the HCP staff to assist with workshop facilitation, analysis and resulting implementation. Additionally, this staff person could assist in review of the research proposals, selecting contractors, and facilitating the research prioritization process and QA/QC of research conductance. |
| TBD | Applied Research | Submerged Aquatic Vegetation: Supply data on SAV growth, dispersal, and recolonization for those SAV species that are the best habitat for the fountain darter. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | *Recommendations 47-50 refer directly to Texas wild-rice studies that are being conducted as an ongoing effort in the San Marcos System. |
| TBD | Applied Research | Submerged Aquatic Vegetation: Determine if the fountain darters are using SAV for protection, to find food, and/or as a nursery area for young. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Submerged Aquatic Vegetation: Determine why the fountain darters prefer bryophytes and filamentous algae, which are not vascular plants. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life history, life cycle and spatial distribution for better modeling of this species. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life stages of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life stages of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life stages of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Determine the representativeness of Cotton Lure sampling | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Understand the life stages of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Comal Springs riffle beetle: Determine its status as an indicator species. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |
| TBD | Applied Research | Determine the effects from phosphorus sources, cycling, and availability on the productivity of the ecosystems. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | |

Appendix I: National Academy of Sciences Report I Implementation Plan: Recommendations Review Work Group Prioritization Matrix

| | | | | | |
|---|-----------------------|---|---|--|---|
| TBD | Ecological Model | Include more field studies in the Applied Research program to assess silt impacts and critical life history and habitat assessment of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | However, the CSRB is no longer a module in the Ecological Model, therefore the data collected will only be utilized if the CSRB is added to the model at some point in the future. Need to address the concerns related to siltation through Applied Research program. |
| In Progress - consider next steps | Biological Monitoring | Measure the distribution of the CSRB. | The Applied Research budget is capped at \$450,000 annually through 2019, allowing for approximately 4-5 research studies annually. | Utilize the Applied Research work group to establish a prioritized research plan for the remainder of Phase I. | This study was conducted in 2014 by ZARA environmental as part of the Applied Research program. The study established a distribution during a low flow year, but did not establish a population estimate with confidence. This study could be expanded by conducting again during a normal flow year or attempting to establish a population estimate. It could be done through the 2016 Applied Research program. |
| Prioritization Status: No, not recommended for Implementation | | | | | |
| Status | Report Category | Recommendation | Fiscal Impacts | Implementation Strategy | Comments |
| No | Ecological Model | Add nutrient limitation to the submerged aquatic vegetation (SAV) model formulation. | No - no funding to conduct the extensive research that would be needed. | N/A | *Nutrients are not a limiting factor, except to algae (presence/absence). Algae is not in the Ecological Model. *The SAV model is tied to Fountain Darter habitat, so therefore this is not necessary. |
| No | Biological Monitoring | Conduct special studies on the fountain darter. | No - the Bio Monitoring Budget is already maxed out. For this sampling to be added, another component would need to be dropped. | If this recommendation was implemented, it should be prioritized by the Science Committee as part of the regular Applied Research program. | *The purpose of expanding the index reaches to representative reaches (system wide representation) has not been determined. If this is considered, a rationale as to why a system wide representation is needed for ITP compliance should be developed. *The Biological Goals and Objectives are tied to the previously identified reaches, not the entire river system. * NAS themselves comments that this is necessary only if desired. |
| No | Biological Monitoring | Expand macro invertebrate surveys. | No - the Bio Monitoring Budget is already maxed out. For this sampling to be added, another component would need to be dropped. | Create a Biological monitoring work group to develop a strategy to implement this recommendation. | *The participants in the NAS Report #1 workshop supported this recommendation, but did not identify how it contributed to compliance or the Biological Goals. *Macroinvertebrate sampling is typically performed to monitor the health of an aquatic system; the health of the Comal and San Marcos system is being monitored by other components of the monitoring programs. *Macroinvertebrate sampling in the HCP was to originally performed to populate the Ecological model. That effort is now close to complete, and new data would not be generated in time to be used by the modeling team. |
| No | Applied Research | Develop a general conceptual model for the Comal and San Marcos springs ecosystem. | Yes | N/A | Since influence diagrams were created during the EARIP process and were used as conceptual models to develop the Ecological Model, at this time, the EAHCP does not need to re-create them. |

| |
|-----------------------|
| Hydrological Model |
| Ecological Model |
| Bio and WQ Monitoring |
| Applied Research |
| Overarching Issues |

EAHCP 2016-2019 APPLIED RESEARCH PROJECT SCHEDULE



| YEAR | Applied Research Program | | | Other Research Programs & Contracts | | | |
|------|--|---|---------------------------------------|--|--|---------------------------------------|--|
| | Research Categories | Research Projects | Biological Goal Reference & Rationale | Salvage Refugia | Refugia | EAA Modeling Plan | Eco Modeling |
| 2013 | 1. EcoModel SAV | 1. pH Drift | | | | 1. Develop FE Model | 1. Develop EcoModel |
| | | 2. Low flow effects on native vegetation (NAS 49) | | | | 2. Develop ModFlow Model | |
| | | 3. Field vs. lab Study | | | | | |
| | 2. EcoModel FD | 1. Low flow effects on food source (NAS 44, 45) | | | | | |
| 2014 | 1. EcoModel FD | 1. Low flow effects on FD fecundity (NAS 44) | | | | 1. Develop FE Model | 1. Develop EcoModel |
| | | 2. Effects of predation on FD (NAS 44, 45) | | | | 2. Develop ModFlow Model | |
| | | 3. FD movement under low flow (NAS 41) | | | | | |
| | 2. Basic Biology of Species (CSRB) | 1. Baseline distribution (NAS 51) | | | | | |
| | | 2. Plastron functionality | | | | | |
| 2015 | | 3. Low flow effects on survival (NAS 54) | | | | | |
| | 1. Basic Biology of Species (CSRB) | 1. Habitat connectivity | | 1. Training at SMARC | | 1. Complete FE Model | 1. Develop EcoModel |
| | 2. EcoModel SAV | 1. Algae dynamics | | 2. Produce F ¹ TX Blind Salamander | | 2. Complete ModFlow Model | |
| | | 2. <i>Ludwigia</i> interference (NAS 44) | | 3. Work w/ TXSTATE and SMARC researchers | | | |
| 2016 | | 3. Sediment (recreation/turbidity) impacts on TWR (NAS 49, 50) | | 4. Obtain property access for collection research | | | |
| | 1. Basic Biology of Species (CSRB) | 1. CSRB tolerances of elevated temperature & low DO* (NAS 54) | Water quality, habitat quality | 1. Collection methods/location for TX Blind Salamander | | 1. FE Model verification | 1. Complete EcoModel |
| | | 2. Evaluate CSRB life history Phase I* (NAS 51, 52, 53, 54) | Population | 2. Collection methods for CSDB | | 2. ModFlow Model verification | 2. FD Random Drop Netting (NAS 42, 44) |
| | | 3. CSRB Trophic level & functional feeding group categorization* (NAS 51, 55) | Population | 3. Establish suitable surrogates | | 3. Hardy Thermal Model verification** | 3. FD Mortality in Adverse Conditions (NAS 41) |
| | 2. Standard Sampling Methods | 1. CSRB quantitative sampling techniques (NAS 55) (#2 Priority) | Population | | | 4. Recharge modeling | |
| 2017 | 3. Data | 1. Compile data, format, template, normalization; IC consideration in Dec 2015 (#1 Priority) | | | | | |
| | 1. Basic Biology of Species (CSRB) | 1. Evaluate CSRB life history Phase II* (NAS 51, 52, 53, 54) | Population | | Refugia research will accomplish the below deliverables for each species; moving onto the next step, only when the previous has been concluded for all listed species. | 1. EcoModel verification*** | |
| | 2. Habitat Quality, Quantity, & Requirements | 1. SAV as FD habitat (shelter, prey habitat) (NAS 45, 46) | Habitat based population | | | 2. Recharge modeling | |
| | | 2. Effects of sedimentation on SAV, FD and CSRB (NAS 56) | Habitat, water quality (silt free) | | | | |
| | 3. Standard Sampling Methods | 1. CS Dryopid Beetle quantitative sampling techniques | Population | | | | |
| 2018 | 4. Data | 1. Statistical analysis of data (System Memory/Disturbance Ecology) | | | | | |
| | | 2. Statistical analysis of data (Species) | | | 1. Collection methods and locations | | |
| | 1. Habitat Quality & Requirements | 1. Peck's Amphipod quantitative sampling techniques | Population | | 2. General husbandry (feeding, density, etc.) | | |
| | 2. Conservation Measures | 1. Evaluate success of SAV restoration & TWR enhancement (coincides w/ 5 yr SAV mapping) (NAS 44, 47, 48) | Habitat | | 3. Propagation techniques (egg to adult) | 1. HydroModel Runs | |
| | | 2. Confirm species-specific Tables 4-1, 4-21 | Habitat | | 4. Reintroduction/genetics | 2. EcoModel Runs | |
| 2019 | | 3. Evaluate success of flow-split management | Habitat | | Evaluate Life Histories of Covered Species | 3. Recharge modeling | |
| | 3. TBD | 1. TBD/Contingency | TBD | | | | |
| | 1. Conservation Measures | 1. Evaluate success of removal of invasive animal species and reduction of introduction | Habitat | | | 1. HydroModel Runs | |
| | | 2. Evaluate success of Sessom Creek sand bar removal and sediment removal efforts | Habitat | | | 2. EcoModel Runs | |
| | 2. TBD | 1. TBD/Contingency | TBD | | | | |

Legend/Footnotes

* RFP developed and posted for solicitation

** Use low flow data from 2013 and 2014 for verification of model (desktop exercise)

** May require contract w/ Meadows

*** Use data collected in 2016 to perform a verification analysis

NAS-recommended projects

Funding to be allocated/Research yet TBD

NAS Projects Not Recommended for Implementation

1. Determine the effects from phosphorus sources, cycling, and availability on the productivity of the ecosystems (NAS 58)

2. CSRB population (quantitative) and distribution in Comal (NAS 55)

3. CSRB population (quantitative) and distribution in San Marcos (NAS 55)

4. Evaluate CSRB status as an indicator species (NAS 57)

EAHCP 2016-2019 APPLIED RESEARCH PROJECT PRIORITIZATION MATRIX

| Measures | Both Systems | | | | | | | | Comal | | | San Marcos | Flow Protection Measures | | |
|--|-------------------------------|--|-------------------------------|--|--|---|---|--|--|---------------------------------|-------------------|---|--------------------------|-------------------|-------------------|
| | Mgmt. Golf Course | Mgmt. Public Recreation | Control Litter & Floating Veg | Control Non-Native Plant Species/Control Non-Native Harmful/Predator Species | Riparian Restoration | SAV Restoration, Maintenance, & TWR Enhancement & Restoration | Invasive Animal Removal/Reduce Non-Native Introduction | Sediment Removal & Sessom Creek Sand Bar Removal | Flow-Split | Decaying Veg Removal & DO Mgmt. | Gill Parasites | Designation of Permanent Access Points/Bank Stabilization | VISPO & ASR | RWCP | Critical Period |
| 1. Conservation measures | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? | Evaluate success? |
| | Maybe | Yes | No | No | Maybe | Yes | Yes | Yes | Yes | Maybe | No | Maybe | Hydro Modeling | Hydro Modeling | Hydro Modeling |
| | | Establishing the effectiveness of SSAs would provide support for Comal efforts | | As long as captured under other Conservation Measures... | Western shoreline--spring run 3...cost effectiveness? Not all riparian areas created equally | Confirm species-specific Tables 4-1, 4-21? | Modeling to project necessary intensity of removal efforts, identify trigger thresholds | But--sedimentation a natural process...sort out anthropogenic sources. | Maybe in Bio-Monitoring Program | Beyond HCP Needs | | Construction Impacts on Species | | | |
| | | | | | | Is TWR expanding on its own? Indirect benefits may offset need for gardening efforts... | | Cost-effectiveness if Sand Bar Returns Cyclically...Bio Gain? | | | | | | | |
| Species | Inverts - Spring Dwellers | | | Invertebrates - Aquifer Dwellers | | | Salamanders | | | Fish | | Flora | | | |
| | Comal Springs Riffle Beetle | Peck's Cave Amphipod | Comal Springs Dryopid Beetle | Texas Troglobitic Water Slater | Edwards Aquifer Diving Beetle | Texas Blind Salamander | Comal Springs Salamander | San Marcos Salamander | San Marcos Gambusia | Fountain Darter | Texas Wild-rice | | | | |
| 2. Standard sampling methods | Yes | Yes | Yes | No | No | Yes | No | Yes | No | No | No | | | | |
| | | | | | | | | | | | | | | | |
| Species | Comal Springs Riffle Beetle | Peck's Cave Amphipod | Comal Springs Dryopid Beetle | Texas Troglobitic Water Slater | Edwards Aquifer Diving Beetle | Texas Blind Salamander | Comal Springs Salamander | San Marcos Salamander | San Marcos Gambusia | Fountain Darter | Texas Wild-rice | | | | |
| 3. Habitat quality, quantity, and requirements | Little known--but in progress | "Some" known | Very little known | Very little known | Very little known | Many gaps in knowledge | Many gaps in knowledge | Fewer gaps in knowledge | N/A | Much is known | Much is known | | | | |
| | | | | | | | | | | | | | | | |
| Species | Comal Springs Riffle Beetle | Peck's Cave Amphipod | Comal Springs Dryopid Beetle | Texas Troglobitic Water Slater | Edwards Aquifer Diving Beetle | Texas Blind Salamander | Comal Springs Salamander | San Marcos Salamander | San Marcos Gambusia | Fountain Darter | Texas Wild-rice | | | | |
| 4. Data analysis | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | | | | |
| | Yes | Yes | Yes | No | No | Yes | No | Yes | No | Yes | Yes | | | | |
| | | | | | | | | | | | | | | | |
| System/Reaches | San Marcos | | | | New Braunfels | | | | | | | | | | |
| 5. System memory/Disturbance ecology | Rio Vista to IH 35 | Below Sewell | Above Sewell | Spring Lake | New Channel | Old Channel | Landa Lake | Upper Spring Run | Spring Runs 1-3 | | | | | | |
| | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | Stat analysis? | | | | | | |
| | | Yes | Yes | | | Yes | Yes | | CSRB high priority, as impacted first, and most frequently | | | | | | |
| | | | | | | | | | | | | | | | |

Legend
Indicates project is high priority.

2015 Implementing Committee

Applied Research Work Group

Charge:

The Edwards Aquifer Habitat Conservation Plan (EAHCP) calls for the Applied Research program to build knowledge about the Covered Species and to facilitate the collection of data for the Ecological Model. This effort provides the EAHCP with a more accurate understanding of the ecological dynamics of the Comal and San Marcos springs, particularly under low-flow conditions.

In early 2015, the EAHCP received the first report of the National Academy of Sciences (NAS) where they provided recommendations towards all EAHCP programs including Applied Research. From these recommendations a robust list of possible projects were collected and presented to the NAS Recommendation Review Work Group (RRWG).

Based on the recommendation of the RRWG, the Implementing Committee created the Applied Research Work Group at their August 20, 2015 meeting.

The purpose of the 2015 Implementing Committee Applied Research Work Group is to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. This schedule will be used to develop the Work Plans for the Applied Research program in 2016 through 2019.

Committee Membership and Meeting Organization:

The Implementing Committee will appoint the membership at its meeting on August 20, 2015.

If desired, a Work Group Chair will be nominated and elected. The Work Group will develop the Applied Research Project Schedule through a consensus decision making process and will prioritize the Project Schedule according to subject need for developing research projects in the years from 2016 through 2019.

The Work Group will hold all meetings between September and October 2015. The final Applied Research Project Schedule will be presented to the Implementing Committee for approval at their November 19, 2015 meeting.



NOTICE OF OPEN MEETING

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, September 11, 2015, at 9 a.m. at the San Marcos Recreation Hall (Lions Club Tube Rental at City Park), 170 Charles Austin Dr., San Marcos, Texas, 78666.** Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
2. Public Comment.
3. Possible nomination and election of the Work Group Chair.
Purpose: To discuss the need for and elect a Work Group Chair.
Action: To unanimously elect a Chair for the Work Group, if necessary.
4. Presentation of Work Group Charge (Attachment 1).
Purpose: Presentation of the Charge to the Work Group.
Action: None.
5. Consideration and adoption of a Work Group timeline, strategy, and deliverable format. (Attachment 2).
Purpose: To establish a Work Group timeline, strategy, and deliverable format.
Action: To adopt a Work Group timeline, strategy, and deliverable format.
6. Present background of Applied Research Program (Attachment 3).
Purpose: Presentation of the Applied Research Program background.
Action: None.
7. Review Biological Objectives and Goals (Attachments 4 and 5).
Purpose: Presentation of the Biological Objectives and Goals to the Work Group.
Action: None.

Appendix V: Meeting Agendas and Minutes of the 2015 Applied Research Work Group

8. Presentation of Applied Research categories (Attachment 6).
Purpose: To discuss the presented Applied Research categories and determine whether more are needed to comprise the Applied Research Project Schedule.
Action: To obtain feedback on Applied Research categories and initiate discussion on whether any additional categories are needed.
9. Identify what additional stakeholder and/or expert input (e.g., agencies, committees, permittees) is desired to be solicited for informing Work Group proceedings.
Purpose: To determine whom to reach out to for soliciting Applied Research Work Group input.
Action: To recommend a list of stakeholders and/or experts to solicit for Applied Research Work Group input.
10. Future agenda items.
 - Finalize a list of Applied Research categories
 - Begin listing possible Applied Research projects
 - Evaluate stakeholder and/or expert input (if applicable)
11. Questions and comments from the public.
12. Adjourn.



NOTICE OF OPEN MEETING

Available at eahcp.org

MINUTES

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, September 11, 2015, at 9 a.m. at the San Marcos Recreation Hall (Lions Club Tube Rental at City Park), 170 Charles Austin Dr., San Marcos, Texas, 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

All members were present.

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
9:09 a.m.
2. Public Comment.
None.
3. Possible nomination and election of the Work Group Chair.
The Work Group unanimously elected Dr. Arsuffi as the Work Group Chair.
4. Presentation of Work Group Charge.
No comment or question with regards to the Charge; however, the Work Group requested a copy of National Academy of Sciences Report 1 for its reference for this Work Group.
5. Consideration and adoption of a Work Group timeline, strategy, and deliverable format.
All proposed dates work for the Work Group members, with the exception that Drs. Arsuffi and Bush cannot make the October 9th meeting. October 16th was proposed to reschedule this meeting; Dr. Arsuffi stated he would check his schedule and notify EAHCP staff whether this date will work for him.
6. Present background of Applied Research Program.
This item was not discussed; it is deferred for discussion until the next meeting.

7. Review Biological Objectives and Goals.

Attachments were reviewed. Mr. Nathan Pence, EAHCP Program Manager, explained that the Work Group should ensure recommendations for Applied Research should further our understanding of EAHCP's Biological Objectives and Goals. No comments or questions.

8. Presentation of Applied Research categories.

Applied Research categories emerging from the Work Group's discussion are provided below. EAHCP staff informed the Work Group that they would refine the list and provide a copy to the Work Group for reference by Monday of the following week.

Categories of Research:

- 1. Measuring the success of the conservation measures; including consideration of indirect effects of species manipulation (+ and - ; e.g., elephant ear evapotranspiration)*
- 2. Basic research on biology of Covered Species, particularly invertebrates, not otherwise covered by refugia research program*
- 3. Suitability of relative indicators of trends relevant to Biological Goals and Objectives over time, including the representativeness of study sites and the representativeness of methodologies, such as sampling techniques*
- 4. Water quality as impacted by watershed-level human influences*
- 5. Habitat quality – HCP has goals for species*
- 6. Disturbance ecology/System memory – floods, recreation, etc.; what is the ability for the species to resist, respond, and rebound to short and long-term events?*
- 7. Data management, to include database creation, statistical analysis of data, and long-term data format/template and maintenance considerations*
- 8. Eco-model verification and/or validation (to end after 2016)*
- 9. Subaquatic vegetation (SAV) restoration, including effects of sedimentation; evaluation of SAV restoration success; and confirmation of Table 4.1 in HCP (FD density per SAV species)*

9. Identify what additional stakeholder and/or expert input (e.g., agencies, committees, permittees) is desired to be solicited for informing Work Group proceedings.

Dr. Ostrand stated he would like time to revisit the discussion from this meeting, review National Academy of Sciences Report 1 recommendations, and the draft Applied Research Project Schedule before he would feel comfortable recommending individuals from whom to solicit feedback. Dr. Bush agreed. Mr. Norris stated he already feels comfortable recommending soliciting feedback Dr. Weston Nowlin and Ed Oborny (Bio-West) for their expertise respective of EAHCP invertebrate research.

Mrs. Reinmund-Martinez mentioned the need to revisit past research studies to examine recommendations for future directions made by study authors in their final reports.

10. Future agenda items.

- Finalize a list of Applied Research categories
- Begin listing possible Applied Research projects
- Evaluate stakeholder and/or expert input (if applicable)

11. Questions and comments from the public.

Ken Diehl (San Antonio Water Systems): Mr. Diehl asked about the statistical analysis project referenced during the Work Group discussion on Applied Research categories. Mr. Diehl asked whether existing EAHCP data was so complex that it actually warranted this type of investigation.

12. Adjourn.
11:49 a.m.



NOTICE OF OPEN MEETING

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, September 25, 2015, at 9 a.m. at the Dunbar Recreation Center, 801 Martin Luther King Drive, San Marcos, Texas 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
2. Public Comment.
3. Approval of Minutes (Attachment 1).
4. Program Manager Update:
 - Draft Applied Research Work Group Report (Attachment 2)
 - Updated Workgroup Timeline & Strategy (Attachment 3)
5. Presentation of Applied Research categories (Attachment 4).
Purpose: To discuss the presented Applied Research categories and determine whether more are needed to comprise the Applied Research Project Schedule.
Action: To obtain feedback on Applied Research categories and initiate discussion on whether any additional categories are needed.
6. Presentation of revised EAHCP Applied Research Project Schedule (Attachments 5 and 6).
Purpose: To discuss the presented version of the revised Applied Research Project Schedule.
Action: To obtain feedback on revised Schedule.
7. Presentation of Applied Research Project Matrix (Attachment 7).
Purpose: To discuss Applied Research projects needed for each category.
Action: To recommend and prioritize Applied Research projects in each category.

Appendix V: Meeting Agendas and Minutes of the 2015 Applied Research Work Group

8. Identify what additional stakeholder and/or expert input (e.g., agencies, committees, permittees) is desired to be solicited for informing Work Group proceedings.

Purpose: To determine whom to reach out to for soliciting Applied Research Work Group input.

Action: To recommend a list of stakeholders and/or experts to solicit for Applied Research Work Group input.

9. Future agenda items.
 - Discuss possible Applied Research projects
 - Receive input from experts

10. Questions and comments from the public.

11. Adjourn.



NOTICE OF OPEN MEETING

Available at eahcp.org

MINUTES – REVISED PER ARWG 10/16 INPUT

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, September 25, 2015, at 9 a.m. at the Dunbar Recreation Center, 801 Martin Luther King Drive, San Marcos, Texas 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

All members were present.

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
9:05 a.m.
2. Public Comment.
Mr. Steven Bereyso explained that he may need to take personal calls during the meeting. He apologized for the inconvenience, and for the interruption this may cause.
3. Approval of Minutes (Attachment 1).
The minutes were approved without discussion.
4. Program Manager Update:
 - Draft Applied Research Work Group Report (Attachment 2)
Mr. Bob Hall requested for the report to be revised to state "all currently identifiable research" rather than "all possible research." Staff will circulate a Word file copy of the draft report for the Work Group's input.
 - Updated Workgroup Timeline & Strategy (Attachment 3)
No discussion.
5. Presentation of Applied Research categories (Attachment 4).
Applied Research Categories

Appendix V: Meeting Agendas and Minutes of the 2015 Applied Research Work Group

- *Recommended to rephrase “Quantitative sampling methods” to “Standard sampling methods;” also recommended to rephrase “Habitat quality” as “Habitat quality and requirements.”*
- *Dr. Arsuffi recommends reviewing literature for precedents related to data management. Staff will follow-up with him concerning an article he found discussing data management issues similar to those faced by EAHCP.*

Categories Not Fitting

- *Regarding reaches, point made that study reaches may not link up with Species issues. Also, only if species’ distribution extends beyond reaches may there be some merit to extrapolating to greater segments of the system. Arsuffi states reaches cannot be extrapolated unless done as stratified random sampling.*
 - *For bio monitoring, Arsuffi suggests additional locations for sampling to be replicated might be worthwhile to identify whether restoration is having “trickle down” effects in non-restored parts of the system.*
 - *Dr. Ostrand emphasized that it will be extremely important to confirm links between water quality and stream species—without that direct link, people will continue to throw stones at glass house.*
 - *No comments on “Eco-model” or “Basic biology...” categories.*
6. Presentation of revised EAHCP Applied Research Project Schedule (Attachments 5 and 6).
No discussion.
7. Presentation of Applied Research Project Matrix (Attachment 7).
Presented project matrix; group discussed each category and particular focuses for each.
- *Gill parasite is not a huge focus right now. Parasites are not as detrimental to species as once thought.*
 - *TWR enhancement program is doing well. Chad asked whether we know which plants have been planted vs. gardened, etc. Nathan replied that we do have GIS data on planted species. Ken Ostrand commented on the long-term research that other agencies are doing with TWR. The goal is to maintain genetic diversity. Ostrand mentioned the increase of surface area of TWR. There are still differences in mapping methods. Either way, there is a positive trend.*
 - *Access points...Chad stated the need to continue to watch construction impacts to TWR. Wants construction to be completed and done. Ostrand asked what the goal for the species was in relation to the access points. Nathan answered that we want to remove the impacts to the banks caused by recreation.*
 - *Sessom’s Creek sand bar removal...Nathan felt it was important to evaluate the effects of the removal of the sand bar. Sand bar is still coming back. Upstream causes need to be addressed. No consensus on why it had to be done. Not sure that the money spent was worth the benefit to the species.*
 - *Non-native removal...lots of things to consider. Arsuffi wondered if TWR or other species expanding or improving due to other habitat restoration projects.*
 - *Mgmt. of public recreation...Nathan stated that existing mapping probably picked up impact to SSAs. Chad asked how we are demonstrating improvement since mapping did not take place prior to HCP?*
 - *Invasive animal removal...lots of positive impacts to species removal. Ostrand suggested modeling effort to measure impacts to native spp. Arsuffi said that each species will react differently to improvements. Suggested determining threat thresholds that are fixed or capped.*
 - *Control on non-native plant spp...Nathan felt that those spp are monitored thru existing programs*
 - *Riparian restoration...difficult to measure. Chad stated that western shoreline is very difficult to improve due to existing habitat. Nathan asked about other measures (e.g., terracing,*

Appendix V: Meeting Agendas and Minutes of the 2015 Applied Research Work Group

- sediment traps, watering, etc.) Arsuffi cautioned against comparing western shoreline riparian system against other systems. Not all are the same.*
- *Litter and floating veg...no response.*
 - *Mgmt. of golf course...really related to water quality and runoff, etc.*
 - *Sediment removal...definitely yes to evaluate success. Arsuffi again cautioned against the issue of natural runoff vs. anthropogenic sediment increases.*
 - *Quantitative sampling or standard sampling methods...need to do it for CPRB, not for Gambusia or non-listed spp. At some point it's important to do it for all species, but right now would focus on listed first.*
 - *Ostrand wanted to know the goal...Nathan related existing goals. HCP doesn't require physical numbers. Arsuffi questioned the take estimate vs. populations. Feels that take is or should be based on population estimates. HCP doesn't have a pop. metric requirement. Discussion followed. Norris felt that some invertebrates could be "clumped" together in pop estimates. Ostrand disagreed. Bob Hall asked that collection of Comal or SM salamanders is known, but not much is known about blind salamanders. Need categories and which spp need to be worked on. SC can assist in furthering the sampling methods.*
 - *Habitat quality...maybe we need to determine the criteria that defines habitat quality. Need to create habitat for each spp using things like temp, DO, flow rate, etc. Some spp are well known, but still a lot of gaps in data.*
 - *Data analysis...funds dependent. Need to prioritize, especially for listed spp. Long-term trend analysis is needed.*
 - *Arsuffi wanted categories... long-term and short-term analysis of specific questions. Ostrand wanted to address standard methods. Is sampling method effective or not?*
 - *Arsuffi – mentioned control or reference sites. Difficult to find a reference site that hasn't been manipulated. Ostrand mentioned a stat method called BACI to use when there is no define control. Norris wants to study spring runs. Ostrand commented that riffle beetle still the priority research spp.*
 - *Nathan summarized what would be provided to the group.*
8. Identify what additional stakeholder and/or expert input (e.g., agencies, committees, permittees) is desired to be solicited for informing Work Group proceedings.
- *Weston Nowlin, Randy Gibson, and Ed Oborny were mentioned as experts to consult regarding riffle beetle research; however, Dr. Arsuffi suggested it may be inappropriate to tap Nowlin or Oborny due to conflicts of interest as they are contractors.*
 - *Arsuffi would like to obtain a report by Cindy Loeffler regarding the NAS Recommendations Review Work Group's recommendations. Nathan offers presentation on NAS RRRWG instead.*
 - *Andy Gluesenkamp suggested (salamanders); discussion followed.*
 - *Group will evaluate spreadsheet and send suggestions to Nathan, who will then later be invited to answer questions. Asks group to e-mail specific questions they wish to ask which experts before next time.*
9. Future agenda items.
- Discuss possible Applied Research projects
 - Receive input from experts
- Dr. Ostrand stated he did not think it would be appropriate to invite outside experts until the fourth meeting to ask questions about specific projects.*
10. Questions and comments from the public.
- None.*
11. Adjourn. - 11:39 a.m.



NOTICE OF OPEN MEETING

Available at eahcp.org

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, October 16, 2015, at 9 a.m. at the Dunbar Recreation Center, 801 Martin Luther King Drive, San Marcos, Texas 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
2. Public Comment.
3. Approval of Minutes (Attachment 1).
4. Program Manager Update:
 - Draft Applied Research Work Group Report (Attachment 2)
 - Applied Research Categories Listing (Attachment 3)
5. Explanation of the incorporation of NAS Applied Research Recommendations into the Applied Research Project Schedule and to Applied Research Work Group deliberations.
Purpose: To discuss the incorporation of NAS Applied Research Recommendations into the Applied Research Work Group's process.
Action: To inform the Work Group about the incorporation of the NAS Applied Research Recommendations into the ARWG process.
6. Presentation of revised Applied Research Project Prioritization Matrix and revised EAHCP Applied Research Project Schedule (Attachments 4, 5, and 6).
Purpose: To discuss the presented version of the revised Applied Research Project Schedule.
Action: To obtain feedback on revised Schedule.
7. Consideration of the approval of final deliverables, including draft Report of the 2015 Applied Research Work Group, draft 2016-2019 Applied Research Project Schedule, and draft Applied Research Project Prioritization matrix.

Appendix V: Meeting Agendas and Minutes of the 2015 Applied Research Work Group

Purpose: To, discuss final Work Group approval, or identify the next steps needed to proceed with final Work Group approval, of the aforementioned deliverables.

Action: To possibly approve, or identify next steps needed for approval, of the final Work Group deliverables.

8. Consider future meetings, dates, locations, and agendas. – October 23, 2015, 9-12 p.m., Dunbar Center (if applicable).
9. Questions and comments from the public.
10. Adjourn.



NOTICE OF OPEN MEETING

Available at eahcp.org

MINUTES

As requested by the EAHCP Implementing Committee, the **Applied Research Work Group** has been formed to recommend a holistic Applied Research Project Schedule that will take into account all possible research necessary to better understand our Covered Species in order to achieve the EAHCP's Biological Goals and Objectives. The Applied Research Work Group is comprised of representatives from throughout the Edwards Aquifer Region. A meeting of this Work Group for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Friday, October 16, 2015, at 9 a.m. at the Dunbar Recreation Center, 801 Martin Luther King Drive, San Marcos, Texas 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this Work Group include Tom Arsuffi (Texas Tech University), Janis Bush (The University of Texas at San Antonio), Bob Hall (Edwards Aquifer Authority), Chad Norris (Texas Parks & Wildlife Department), and Ken Ostrand (San Marcos Aquatic Resource Center).

All Work Group members were present.

At this meeting, the following business may be considered and recommended for Work Group action:

1. Call to Order.
9:05 a.m.
2. Public Comment.
No comment.
3. Approval of Minutes (Attachment 1).
Janis Bush motioned to approve with the change of "thresholds" phrase to state "*threat thresholds*;" Accepted with motion as changed; motion was seconded by Chad Norris with no opposition.
4. Program Manager Update:
 - Draft Applied Research Work Group Report (Attachment 2)
 - Regarding the "Conservation measures" category, Ostrand objected to the phrase "the efficiencies of the benefits to the Species;" it was decided to rephrase this description to state, "Assessing the effectiveness of EAHCP Conservation Measures, and the holistic practical benefits to the Species, in achieving Biological Objectives and Goals."
 - Regarding "Standard sampling methods, Arsuffi recommended to delete the word "valid" in the description (i.e., "*Ensuring sampling methods are reliable measures for Species*" rather than "Ensuring sampling methods are reliable, valid measures for Species").

Appendix V: Meeting Agendas and Minutes of the 2015 Applied Research Work Group

- Regarding the “Habitat quality and requirements” category, Bush recommended for the language to be revised to include the concept of habitat “*quantity*” in addition to habitat quality in the title and the description of the category.
- Regarding the “Water quality” category, Ostrand objected to the phrase “not typical human health measures,” it was decided to leave this phrase out since the description already specifies “tailoring to the needs of species.”
- Regarding the “System memory/Disturbance ecology” category, Arsuffi recommended to replace “and the resilience” with “*and the response (i.e., resilience and/or resistance) of the system post-disturbance*”
- For the section of the report titled “Applied Research Project Schedule,” Norris recommended that the language be amended to clarify that other, additional projects may be identified in the future in response to changes in circumstance.
- Applied Research Categories Listing (Attachment 3)
 - Tom Arsuffi expressed concern regarding overlap between “not fitting” categories and the applied research program—specifically the eco-model and study reaches—his question being, since ARWG has commented on this, will their input be considered by the Science Committee (SC)? Norris echoes the sentiment related to basic biology studies.
 - Arsuffi feels SC needs to have input regarding the work groups—and recommendation oversight over their recommendations. Ken Ostrand also agrees with the process of having the SC review WG recommendations before the IC.
 - Alicia Reinmund-Martinez states she will work with Arsuffi to present the recommendations of the ARWG at the November 10 SC meeting.
- 5. Explanation of the incorporation of NAS Applied Research Recommendations into the Applied Research Project Schedule and to Applied Research Work Group deliberations.
 - With regards to the draft Project Schedule’s listing of studies completed in prior years, Norris raised the issue that sometimes “done” does not mean “done well,” and that in some cases “completed” studies should nevertheless be readdressed due to deficiencies in what the investigators were able to accomplish. with a particular example of this scenario
 - In stating this, Norris explains that one study that most comes to his mind is the baseline distribution of the CSRB study, which he feels needs to be done again due to issues with study methodology. With regards to this point, Bob Hall shared that internally, EAHCP had already planned to improve on this prior study once the CSRB sampling study has been completed as a first step.
 - The point was made that reevaluating completion of existing studies that are supposed to be “finished” raises issues related to peer review, and whether anything can ever be deemed completely “finished”—but ultimately, the criterion of this exercise would be to formally determine whether a given study was completed in an acceptable fashion by scientific standards, and that the job of determining whether a study is done or not would be most appropriately done by the Science Committee.

Appendix V: Meeting Agendas and Minutes of the 2015 Applied Research Work Group

- The group agreed in recommending for the SC to take on this task, with a first step being to develop a formal process for evaluating whether past projects are complete, valid, and whether they need to be repeated in some fashion. This will be added as a section to the draft ARWG report, to be drafted internally, coordinated with Arsuffi, and distributed to the remaining ARWG members.
 - Additionally, it was recommended that the role of the SC relative to future work groups (i.e., Biological Monitoring, etc.) be well defined.
6. Presentation of revised Applied Research Project Prioritization Matrix and revised EAHCP Applied Research Project Schedule (Attachments 4, 5, and 6).
- Bush makes the point that leaving in TBD/contingency into the schedule is a good strategy for accommodating future studies that may not yet be on our radar.
 - Arsuffi makes the point that for some projects, such as evaluating the success of invasive species removal, planning needs to start happening soon (early next year at the latest) to facilitate a successful study.
 - The point is made that future studies may rely on data being collected now to make necessary evaluations; hence, the work groups, such as the Bio Monitoring Work Group, need to take ARWG-recommended future studies into account in their recommendations to ensure that programs are collecting this data now to facilitate later analysis.
 - The point was also made that accepted baselines for various measures need to be identified. Baselines can be developed through existing data, suggested Arsuffi. It may be helpful to have the Bio-Monitoring Work Group incorporate consideration of baselines as well, or to incorporate this into the statistical analysis of existing EAHCP data.
 - The Work Group recommends for Science Committee workshop to evaluate the ARWG-recommended Applied Research Project Schedule studies in the context of the program in general. Comprehensively vetting the schedule taking into account NAS' involvement, program deadlines, and the role of workgroups will help minimize risk of needing to repeat these studies in the future. This would be a good time to plan for adaptive management—to stop, take stock, see where the HCP is going. Now is a good time for this to be efficient and cost effective. Arsuffi offers for this workshop to take place at the Llano River Field Station in Junction, Texas.
7. Consideration of the approval of final deliverables, including draft Report of the 2015 Applied Research Work Group, draft 2016-2019 Applied Research Project Schedule, and draft Applied Research Project Prioritization matrix.
- Arsuffi moved to approve the final deliverables amended to reflect recommended changes, Ostrand seconds, with no opposition.
8. Consider future meetings, dates, locations, and agendas. – October 23, 2015, 9-12 p.m., Dunbar Center (if applicable).
Today's October 16 meeting was determined to be the final meeting of the 2015 ARWG given approval of final deliverables.
9. Questions and comments from the public.

Appendix V: Meeting Agendas and Minutes of the 2015 Applied Research Work Group

None.

10. Adjourn.
10:46 a.m.

Appendix I4

Adaptive Management Stakeholder Committee

| | |
|-------------------|--|
| March 19, 2015 | Meeting Agenda |
| | Meeting Minutes |
| April 22, 2015 | Joint Workshop with the Science Committee Agenda |
| | Report on April 22 Workshop to Implementing Committee |
| December 17, 2015 | Joint Implementing, Stakeholder and Science Committee Meeting Agenda |
| | Meeting Minutes |



NOTICE OF OPEN MEETING

Available at eahcp.org

As required by 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), a meeting of the **Stakeholder Committee** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **1:00 p.m. on Thursday, March 19, 2015 at the Guadalupe-Blanco River Authority Annex Building, 905 Nolan, Seguin, TX.**

1. Call to order--Establish that all Committee members are present or represented- 1:00 p.m.
2. Public Comment.
3. Approval of minutes from the August 21, 2014 Stakeholder Committee meeting (Attachment 1)
4. Receive report from the Program Manager on general updates about the Habitat Conservation Plan.
 - Springflow and Index Well levels
 - Rainfall Deficit (Attachment 2)
 - Attorney General Opinion- Refugia contracting (Attachment 3)
 - Newsletter Distribution
 - 2015 Stakeholder Meeting Schedule (Attachment 4)
5. Presentation of the 2014 Net Disturbance and Take Assessment Report (Attachment 5).

Purpose: To provide the Stakeholders a summary of the 2014 Net Disturbance and Take Assessment Report.

Action: None required.
6. Receive report on the adopted review process by the Implementing Committee, for implementation of "*Review of the Edwards Aquifer Habitat Conservation Plan, Report 1*" by the National Academy of Sciences (Attachment 6).

Purpose: To provide the Stakeholders with information regarding the process to implement the recommendations.

Action: None required.
7. Consider future meetings, dates, locations, and agendas.
 - The next meeting of the Stakeholder Committee will be a Joint meeting on July 16, 2015 at the San Antonio Water Systems Offices.
8. Questions from the public.
9. Adjourn



STAKEHOLDER COMMITTEE MEETING MINUTES

March 19, 2015

Available at eahcp.org

1. **Call to order--Establish that all Committee members are present or represented- 1:00 p.m.**
Chairman Steve Raabe called roll and a quorum of the committee was present.
2. **Public Comment.**
No comment
3. **Approval of minutes from the August 21, 2014 Stakeholder Committee meeting.**
Dianne Wassenich moved to approve the minutes, Patrick Shriver seconded. There was no objection.
4. **Receive report from the Program Manager on general updates about the Habitat Conservation Plan.**
 - **Springflow and Index Well levels**
Nathan Pence, Program Manager, presented the current index well levels and springflows as well as the J-17 forecast. There were several questions pertaining to the Springflow protection measure - Voluntary Irrigation and Suspension Program Option - and its expected benefit throughout the year. Discussion followed.
 - **Rainfall Deficit**
Mr. Pence presented a current rainfall deficit map available at eahcp.org.
 - **Attorney General Opinion- Refugia contracting**
Roland Ruiz gave a brief summary and update on the opinion received from the Attorney General about pursuing a contract with USFWS. One member mentioned that he is uncomfortable with the direction the Implementing Committee is going with the Refugia program. He stated that he specifically voted for the Refugia program during the EARIP because USFWS was going to be the responsible party, not a private entity. Discussion followed.
 - **Newsletter Distribution**
Alicia Reinmund-Martinez solicited any emails that the committee may have for staff to add to the Steward Newsletter.
 - **2015 Stakeholder Meeting Schedule**
Mrs. Martinez gave a summary over the rest of the year's scheduled Stakeholder Committee meeting dates.
5. **Presentation of the 2014 Net Disturbance and Take Assessment Report.**
Ed Oborny, BIO-WEST Inc., presented the summary of the 2014 Net Disturbance and Take Assessment report. There were questions pertaining to the calculation of take and how the estimates were done. Discussion followed. Presentation can be found at eahcp.org.

DRAFT

6. **Receive report on the adopted review process by the Implementing Committee, for implementation of “*Review of the Edwards Aquifer Habitat Conservation Plan, Report I*” by the National Academy of Sciences.**

Mr. Pence presented the approved process developed to review the first report of the National Academy of Sciences. Presentation can be found at eahcp.org

7. **Consider future meetings, dates, locations, and agendas.**

- The next meeting of the Stakeholder Committee will be a Joint meeting on July 16, 2015 at the San Antonio Water Systems Offices.

8. **Questions from the public.**

No comment.

9. **Adjourn- 2:27 pm**

**NOTICE OF OPEN MEETING****Available at eahcp.org**

As required by Sections 7.8.4 and 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), a joint meeting of the **Stakeholder Committee** and of the **Science Committee** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **8:30 a.m. on Wednesday, April 22, 2015 at the San Antonio Water System building, 2800 U.S. Hwy 281 North, San Antonio, TX.** If you expect to attend, please RSVP at spayne@edwardsaquifer.org to help us with meeting planning. An RSVP is not necessary to attend.

The purpose of this meeting is to

- Receive comments from individual members of the EAHCP Stakeholder Committee and Science Committee and the general public to inform the Implementing Committee as it develops an implementation plan related to the National Academy of Science (NAS) report.
- Provide opportunity for participants to gain information about and discuss key recommendations in the NAS report.

At this meeting, the following business may be considered. **Times noted are approximate. Items may be taken up earlier or later than noted.**

8:00 Sign In

8:30 Call to order

Welcome, overview of NAS report and what it means to HCP, workshop purpose, agenda and format.

Information on NAS recommendations, small group discussion, and formal comments on the following topics from the NAS report:

- Hydrologic modeling (*at approximately 9:20*)
- Ecological modeling (*at approximately 11:00*)

12:25 Lunch available at SAWS cafeteria

1:10 Information on NAS recommendations, small group discussion, and formal comments on the following topics from the NAS report:

- Monitoring (*at approximately 1:10*)
- Applied research (*at approximately 2:50*)

4:15 Additional general comments: Committee members and public

4:45 Summary, next steps

The EAHCP Implementing Committee additionally welcomes written comments submitted to: info@eahcp.org. Comments received by May 1 will be included in the workshop report presented to the Implementing Committee on May 21.

Copies of the NAS report and additional background information on the NAS report may be found at <http://www.eahcp.org/>

Report to Edwards Aquifer Habitat Conservation Plan Implementing Committee

April 22, 2015 Workshop
To Receive Comments
on NAS Report 1

Submitted by:
Center for Public Policy Dispute Resolution
at The University of Texas School of Law

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Executive Summary

In February 2015, the National Research Council-National Academy of Science (NAS) published its first report in what will be a three phase review of the Edwards Aquifer Habitat Conservation Plan (EAHCP or HCP). The EAHCP Implementing Committee engaged NAS to act as its Science Review Panel to provide advice on various scientific aspects of the EAHCP as it is being implemented. This first report reviews the scientific efforts that are being conducted to help build a better understanding of the river-aquifer system and its relationship to the Endangered Species Act-listed species.¹ Specifically, this first report reviews and makes recommendations on four scientific initiatives in the HCP:

1. Hydrologic Modeling;
2. Ecological Modeling;
3. Biological and Water Quality Monitoring; and
4. Applied Research Program.

To allow for robust discussions and the receipt of comments concerning the NAS recommendations in this first report, the EAHCP Implementing Committee approved a process to inviting members of the Science and Stakeholder Committees of the EAHCP as well as members of the public to an open workshop. This workshop took place in San Antonio on April 22, 2015. The EAA retained the Center for Public Policy Dispute Resolution to plan and facilitate the workshop and record comments. Forty-one people signed in at the workshop with the following designations: 9 Science Committee members, 17 Stakeholder Committee members, 3 EAHCP staff, and 12 public members. The meeting was structured to provide participants with a brief background on the NAS report followed by small group discussions and formal comment period for each of the four specific areas of the NAS report. For the small group discussions, participants broke into small groups of five to eight participants, with a random distribution of science committee, stakeholder committee, and public members.

This meeting report captures comments made on the NAS recommendations during each of the small group discussions as well as formal individual comments, either written or oral, for each of the four areas. Written comments received through May 1 also are included in this report. Below are summaries of trends noted from the comments. The full report contains a more detailed analysis of the areas where trends are noted, as well as a summary of other comments. A full recordation of the comments may be found in the appendices to this report.

Hydrologic Modeling

The following trends were noted on NAS recommendations:

- *The EAA could gain efficiency by moving toward a single model that incorporates the best concepts from existing modeling efforts.* Participants from at least three small groups supported an analysis of the costs and benefits of using one model (as recommended by NAS) compared to two models, noting that consideration should be given to financial costs, learning curve, time needed to launch a new model, and whether there is an overlap of the model objectives.

¹ NAS Report 1 at vii

- *Model uncertainty needs to be quantitatively assessed and presented in formal EAA documents.* This recommendation garnered significant comment, most stressing the importance of conducting uncertainty analysis. Several comments focused on using uncertainty analysis to make decisions relative to future HCP efforts. Isolated comments expressed caution about focusing on uncertainty analysis at the cost of other factors.
- *Moving forward, more attention should be paid to the modeling of conduits.* The comments generally supported attention to conduits.
- *The hydrologic modeling should move toward making predictions on a daily time scale.* Almost all of the comments supported the idea of moving to a daily time step, but many expressed concerns, including cost and funding, the limited availability of data, the ability to gather data, increases of uncertainty with such a switch, and the time required for this effort relative to HCP phases. The main comments against the switch were that a monthly time scale is less variable and more predictable, and that daily data efforts should be focused on ecologic models for springs, not on hydrologic modeling.

Ecological Modeling

The following trends were noted on NAS recommendations:

- *Critical to have a much deeper understanding of the Comal Springs riffle beetle if it is to be an indicator species.* Comments reflected general agreement about the need for more information about the CSRB, but some concern was raised about whether its collection was worth the effort and was a responsible use of time and resources. Three small groups expressed support for obtaining this information; two small groups expressed some level of ambivalence about the NAS comment.
- *As a top priority, develop an ecosystem-based conceptual model(s), showing how species, water quality, water quantity, other biota, and restoration and mitigation activities are expected to interact with indicator and all covered species.* Five of the six small groups expressed support for development of ecosystem conceptual models or species specific conceptual models. Concern was raised by one small group about lack of transparency in ecosystem modeling due to its complexity.

Biological and Water Quality Monitoring

The following trends were noted on NAS recommendations:

- *Expand macroinvertebrate surveys.* All comments supported expanding macroinvertebrate surveys.
- *Provide a clear mechanism to scale results to entire spring and reach system.* The comments are all specific about methods that could be used to scale.
- *Increase coordination and integration of the biomonitoring and water quality (WQ) monitoring.* All comments supported increased coordination and integration of BM and WQ monitoring.
- *Enhance sampling for nutrients.* Comments differed on what enhanced sampling for nutrients should mean. Comments generally fell into the following categories: (1) be selective in monitoring; (2) sample at lower detection levels; and (3) consider a new focus on nutrient sampling.
- *New quantitative sampling methods are needed for the CSRB.* Comments all trended to support better sampling methods.

Applied Research Program

The following trends were noted on NAS recommendations:

- Major support for increasing transparency, collaboration with outside experts, and offering longer-term projects. Participants believed that research projects would benefit from a more diverse group of scientists, having results peer reviewed or at least reviewed internally, and making the data more readily available
- Many participants noted that current studies on the fountain darter, submerged aquatic vegetation, and Texas wild rice were sufficient given available resources.

Report

The workshop on April 22, 2015 brought together members of the Science and Stakeholder Committees of the Edwards Aquifer Habitat Conservation Plan as well as members of the general public. The stated purposes of the meeting were to: (1) receive comments from individual committee members and the general public to inform the Implementing Committee as it develops an implementation plan related to the NAS Report 1; and (2) to provide opportunity for participants to gain information about and discuss key recommendations from the NAS report. Forty-one people attended with the following designations: 9 Science Committee members, 17 Stakeholder Committee members, 3 EAHCP staff, and 12 public members. The meeting notice and agenda is attached as Appendix A.

The workshop opened with an overview of the purpose and main conclusions of the National Academy of Sciences - National Research Council *Review of the Edwards Aquifer Habitat Conservation Plan: Report 1* (NAS Report). Following that overview, the day was divided into four segments, each devoted to the NAS Report's four main areas of recommendation: hydrologic modeling, ecological modeling, monitoring, and the applied research program. Each segment consisted of:

- a short overview of the NAS Report's recommendations by Nathan Pence;²
- a 30-45 minute discussion of the NAS recommendations in groups of approximately five to eight people, with the goal of better understanding the views of other participants related to those recommendations. Small groups consisted of a mix of members of the science and stakeholder committees as well as the public and some EAHCP staff. Each small group was facilitated to assure the group stayed on topic and all participants had an opportunity to talk;³
- ten minutes for summary of major comments on the NAS recommendations. The goal during this time was not to seek agreement, but to record the major comments participants in each group wanted to make. Support of other group members to individual comments was noted. Facilitators captured the comments on flip charts, which were posted in the room for all participants to view. and
- a formal public comment period.

Participants also provided written comments on the NAS Report on comment cards available at the meeting, and in writing to info@eahcp.org by May 1, 2015. Participants could also leave general comments on a "parking lot" poster. Appendices to this report include the following recordation of comments:

- C. All comments received (small group comments, formal oral and written comments, and parking lot notes), organized by specific NAS recommendations under the four main NAS report categories;
- D. All comments received but not categorized by specific NAS recommendation;
- E. Formal oral and written comments and parking lot notes, organized by the four main NAS report categories.

The meeting concluded with the opportunity for general comment and a meeting evaluation from committee members and the public.⁴

² Executive Director, EAHCP Program. Participants received a summary of the NAS recommendations developed by EAHCP staff, which is provided as Appendix B.

³ Small groups were facilitated by staff from the Center of Public Policy Dispute Resolution, EAHCP staff, and staff from City of San Marcos.

⁴ Evaluation is found at Appendix F

Analysis of major commonalities and trends

The following provides a summary of the major issues and comments gathered at the workshop from the facilitator notes of small group discussion, formal oral comments, comment cards, and parking lot notes and from written comment submitted following the workshop (through May 1, 2015). This analysis does not capture each specific individual comment made, which may be accessed more completely in the appendices.

Hydrologic Modeling

NAS: The EAA could gain efficiency by moving toward a single model that incorporates the best concepts from existing modeling efforts.

Participants from at least three small groups supported an analysis of the costs and benefits of using one model (as recommended by NAS) compared to two models. These comments included financial costs, learning curve, time needed to launch a new model, and whether there is an overlap of the model objectives. Some more specific comments include:

- Compare uncertainties and assess differences in results to move toward one model.
- Support both models if benefits are commensurate with funds. The finite model is funded by EAA with non-HCP funds and is needed for other purposes.
- Have modelers explore MODFLOW (USGS).
- Respond with a five-year modeling plan.
- Focus on EAA MODFLOW model, which provides best calibration with observed data. But continue to finalize FEFLOW to provide new understanding of hydrology of EA.

NAS: Model uncertainty needs to be quantitatively assessed and presented in formal EAA documents.

This recommendation garnered significant comment, most stressing the importance of conducting uncertainty analysis. Some specific comments that refine this idea include:

- Use PEST to analyze uncertainty.
- Assessing uncertainty of model prediction of spring flow is a high priority.
- Need to understand uncertainties related to physical hydrologic parameters of models and related to external hydrologic inputs.
- Use of a model without uncertainty analysis is dangerous. We need to quantify the accuracy of the model making predictions to achieve a good outcome both for the species we're protecting and for rate-payer certainty.
- Uncertainty analysis is important in using output of one model into another.
- Uncertainties in each of the model inputs propagate through the model and induce uncertainty in the model output. The relationship of model input and output uncertainties can only be determined through rigorous uncertainty analysis. If credibility ranges are not reduced sufficiently, the simulated effects of conservation measures may be statistically much lower than spring discharge during drought of record.

Several comments focused on using uncertainty analysis to make decisions relative to future HCP efforts:

- Quantifying uncertainty in hydro modeling and identifying where to prioritize efforts is a high priority.
- Conduct uncertainty of PE and HSPF.
- Compare uncertainties and assess differences to move to one model.
- Conduct uncertainty analysis then migrate to a daily time-step model.

The following comments differ from support about uncertainty analysis:

- Don't manage uncertainty.
- Understanding how the current model works in the context of usage from and management of the aquifer is as critical as understanding uncertainty.
- Modeling pumpage at the total permitted amount adds to uncertainty of outcomes. Use actual pumping to see what's actually happening.

NAS: Moving forward, more attention should be paid to the modeling of conduits.

The comments generally supported attention to conduits.

- More dye-tracing and attention to conduits.
- Develop an understanding of the multiple porosity of the aquifer, the interaction between conduit and denser porous media of the aquifer.
- Conduits are important. Additional modeling may help refine their presence, location and importance. Additional hydrogeologic field studies of the importance of conduits versus the aquifer's porous matrix may be more insightful than additional modeling efforts.

One comment asked if enough is known, how to research and gather data?

NAS: The hydrologic modeling should move toward making predictions on a daily time scale.

Almost all of the comments supported the idea of moving to a daily time step, but expressed the following concerns:

- Cost and funding.
- Limited data is available, and concerns about ability to gather data.
- If feasible, pick one small area to try daily time scale.
- Uncertainty (range of error) increases with the switch.
- Consider time required relative to HCP phases, and the logistics of transition.
- Conduct predictive uncertainty before migrating to a daily time-step.
- Daily not critical but nice.

Comments not supporting move to daily time step:

- Monthly is less variable and more predictable.

- Current groundwater modeling is oriented toward regional scale and longer time periods. Collecting daily data is difficult and expensive. Ecologic models for springs will need daily flow data, but not necessarily derived from a regional model. Need more detailed groundwater data from the springs to understand interaction between groundwater and discharges. Not a modeling exercise.

Ecological Modeling

NAS: Goal of submerged aquatic vegetation (SAV) modeling should be clarified.

No trends are noted for this topic. Two small groups each addressed different aspects of the SAV recommendation:

- Agree with phased strategy for testing individual components in SAV model.
- Conflicting NAS recommendation (pg. 83) and observation (pg. 12) re lab/field.

NAS: The current habitat suitability analysis for Texas wild rice (TWR) should be treated as a hypothesis and tested for robustness throughout the San Marcos River.

No trends are noted on this topic. Two small groups addressed different aspects of this recommendation:

- Make restoration data and analysis available as it might change previous habitat suitability analysis; share criteria used to measure/determine habitat suitability.
- Look at the effects of M&M, which was not been accounted for initially.
- Develop model for TWR to get good predictive data.

NAS: Fountain darter (FD)

-- **Effort to build an individual-based model for the FD is a scientifically sound approach for modeling population dynamics that will require extensive data for model formulation, calibration and validation.**

-- **FD habitat suitability analyses could act as a “back-up” to individual-based modeling.**

Trends are not apparent on these two recommendations. Comments noted below are from small groups or individuals.

FD model

- Need more info on dynamics of parasitism for FD model.
- FD model approach is valid, but faces challenges that may restrict its predictions to relative abundances (not absolute). Thus, it cannot be calibrated in a conventional manner.
- Include contact recreation in FD model for its effects on vegetation and turbidity.
- Model, modelers recommendations are necessary to the extent that it's feasible.
- Potentially use a more system-wide ecosystem model.
- FD, CSRB - priorities can be set based on data available.

Fountain darter as an indicator species

- Concern about using the FD as an indicator species for low flows, noting it is a slack-water species. Perhaps another species should be identified. A more eco-system model.
- Revisit the estimation with current conditions.

Habitat suitability analysis

- It is important to have a habitat suitability analysis for FD.
- FD suitability curves: analysis of observed temp. data (2011-14) in lower flows for Comal compared to model predictions (Hardy model).

NAS: Critical to have a much deeper understanding of the Comal Springs riffle beetle if it is to be an indicator species.

Comments reflected general agreement about the need for more information about the CSRБ, but some concern were raised about whether its collection was worth the effort and a responsible use of time and resources. Three small groups expressed support for obtaining this information; two expressed some level of ambivalence about the NAS comment.

Three small groups expressed support for collection and evaluation of information:

- CSRБ data collection, determination of life history should be a priority.
- It is important to assess the quantitative effort of the silt on the CSRБ.
- High priority - improve understanding of the life history of the CSRБ.
- Resurrect and refine the conceptual (Gene Cochran) model of the CSRБ.
- The unknowns about the CSRБ may keep us from being able to responsibly dedicate resources to develop a model for HCP purposes within our timeframe.

Two small groups expressed some level of ambivalence about the NAS comment:

- Is studying CSRБ not important? FD, CSRБ - priorities can be set based on data available.
- Need widespread expertise of CSRБ: Time? Money? Worth the effort? Determine the process to gather data.

NAS: As a top priority, develop an ecosystem-based conceptual model(s) showing how species, water quality, water quantity, other biota, and restoration and mitigation activities are expected to interact with indicator and all covered species.

Five of the six small groups expressed support for development of ecosystem conceptual models or species specific conceptual models. Specific comments include:

- Include TWR, FD, SAV, other food items, invertebrates, etc.
- Time and money cost is cheaper than SPP model.
- Integrate management actions & external factors that need to be considered.
- Conceptual models are important for each species.
- Have a comprehensive conceptual model to help identify further research.
- Can the influence diagram be utilized to construct a conceptual model?
- Develop and continue to refine the conceptual model of each of the springs.

Concern was raised by one small group about lack of transparency in ecosystem modeling due to its complexity.

General

The following comments are general to the NAS ecological modeling recommendations or EAHCP ecological modeling process, rather than to specific NAS recommendations.

- Understand natural events in all systems. Too reductionist in terms of concerns for the HCP.
- Current model has deficiencies due to the limited components.
- Nutrient limits are very important.
- Habitat suitability analyses might be useful to compare with individual modeling.
- Does NAS have all the information necessary to make these recommendations?
- Transparency:
 - Coordinate information transparently between HCP contractors, agencies, staff and other related groups.
 - Ecosystem model being developed in isolation from the Science Committee.
- The low-flow objectives for Comal Springs were based largely on thermal modeling done by Hardy. This model included little to no low-flow data. The model's predictions for temperature- at low flows should be compared to observed thermal data during low flows from 2011-2014. If sufficient data was not gathered at low flows for such analysis, it should be planned to occur in the future during low flows.

Biological and Water Quality Monitoring

NAS: Increase sampling in Comal more often or randomize sampling locations for more accurate representation of SAV.

No trends are noted from the two comments received:

- Sensitivity of SAV to flow needs to be better defined/clarified in NAS. Pg. 106 para 2.
- Biomonitoring in the Comal is done frequently enough in terms of data collection & SAV.

NAS: Prioritize measuring CSRB distribution.

Comments on this topic were very specific:

- Include Spring Run 1 for CSRB bio monitoring index reaches.
- CSRB-Suggest an integrated program (overall strategy) of randomized studies (habitat-focused, cotton lures, etc.).
- CSRB-USFWS employs an aquatic entomologist who has done years of study - does he not have info on pg. 108 para 2?

NAS: Expand macroinvertebrate surveys.

All comments supported expanding macroinvertebrate surveys. Comments were specific about the reasons for such expansion:

- For a comprehensive biological model.
- To capture ecosystem changes that may impact FD food source.

- Because macroinvertebrates have been used as WQ indicators, expanding macroinvertebrate surveys can help integrate BM & WQ Monitoring programs.
- Macroinvertebrates could help provide info in conceptual model.
- To determine their correlation with the riffle beetle.

NAS: Continue monitoring index reaches to assess trends and build on existing databases.

Only one comment was noted:

- Conduct randomized testing to compare that to the index to determine correlations, differences.

NAS: Provide a clear mechanism to scale results to entire spring and reach system.

The comments are all specific about methods that could be used to scale. The following are comments generally supported by individual small groups, unless otherwise noted:

- The large data set should be analyzed in order to provide a clear mechanism to scale results up.
- Randomization techniques to scale results to entire spring system/habitat are important. *(One individual in the small group had a divergent view on the value of this statement.)*
- To a certain extent the net distribution/take estimate could be the mechanism to scale results throughout entire systems.

NAS: Increase coordination and integration of the biomonitoring and water quality (WQ) monitoring.

All small groups and individuals who provided comments on this topic supported increased coordination and integration of BM and WQ monitoring. Specific detailed comments include:

- Current design of bio & WQ monitoring are not compatible.
- Integration makes sense and saves money. Holistic view is important.
- Integration is important in time & space.
- Many macroinvertebrates have been used as WQ indicators. Expanding macroinvertebrate surveys can help integrate bio & WQ Monitoring programs, and provide info in conceptual model.
- Integration will help see what the relationship is, whether there is a closer correlation.
- The EAA needs to evaluate the overall water quality monitoring program to integrate better with the ecosystem monitoring program and integrate better with the restoration/mitigation programs being conducted by the cities of San Marcos and New Braunfels. A HCP committee should evaluate how the water quality program can be refined to better meet the goals of the HCP.

NAS: Enhance sampling for nutrients.

Comments differed on what enhanced sampling for nutrients should mean. Comments generally fell into the following categories:

Be selective in monitoring

- Evaluate parameters being monitored to see which are unchanging and no longer need to be monitored - or at least less frequently.
- Scaling back (not elimination) of contaminant sampling would increase efficiency.
- Evaluate whether all the numerous chemical nutrients need to be collected in the future sampling. Water quality sampling is expensive. Many nutrients are below levels of detection. It may be advisable to drop those analyses that do not provide insight into goals of the HCP.

Sample at lower detection levels

- Agree with enhanced sampling of nutrients - lower detection levels.
- There is no reason not to have a lower-detection limit of nutrients. Also improvements in sampling methods to properly reduce detection limits are needed.
- Enhanced nutrient sampling WRT lower detection limits.

New focus on nutrient sampling

- Need to evaluate human contribution to WQ, e.g. bacteria, optical brighteners, caffeine.

Seeking information

- Verifying NAS statement about use of unfiltered sampling...? (pg. 113) When & why? Is this an accurate statement...if so, with what constituents?

NAS: New quantitative sampling methods are needed for the CSRB.

Comments all supported better sampling methods:

- Assess methods used in deploying lures and expand sampling area for CSRB.
- Primary concern with the CSRB is to determine a quantitative way to collect them.
- We need a real-time method of CSRB collection to help determine population and abundance and distribution. We cannot answer the NAS questions about CSRB with cotton lures.
- Re cotton lure: Maybe if we tested that correlation to some of the macroinvertebrates in those same areas to see what kind of relationship there might be there.

General comments:

- Remember that the ecosystems are naturally dynamic, thus it is difficult to have a full range of conditions to sample.
- Need a clearinghouse for data. Expand SMOS concept - capture data - avoid replication - save money.
- Review analytic methods in context of HCP needs - frequency methods, constituent spatio-temporal.
- Integrate existing WQ databases into the HCP for the entire river system (outside the scope of the HCP).
- Expand the sampling by adding randomized sites for bio & WQ monitoring to more represent the spring systems.

Applied Research Program

NAS on transparency, collaboration, longer-term projects: All small groups commented on these recommendations, and participants generally supported having a more transparent process for prioritizing and funding projects; promoting greater participation by diverse outside scientists; expanding project terms to 2-5 years as a means to attract more researchers, and making the results/data subject to at least internal review and more readily available.

NAS on removing literature review: Two small groups disagreed with the removal.

NAS regarding fountain darter (FD): Two small groups disagreed that additional FD movement study was needed or beneficial. Two small groups commented that much is already known about FD. One small group offered that a turbidity study on FD was needed concerning of impact on feeding/breeding.

NAS regarding submerged aquatic vegetation (SAV): three small groups commented that there were already sufficient data between SAV and FD.

NAS regarding Texas wild rice: Three small groups commented that many studies have already been done or are currently under way. Two small groups indicated that the data should be analyzed to determine if the restoration was successful and what the causes of the success are.

NAS regarding Comal Spring riffle beetle (CSRB): Two small groups commented that any additional study should be considered based on resources and return on investment. One small group commented that the CSRB is not an indicator species – not abundant nor widely distributed and hard to collect.

NAS on phosphorous sources, cycling, and availability: Two small groups agreed that there's a need to better understand the nutrient budget in the springs system.

NAS on pursuing additional Applied Research topics: One small group agreed with pursuing additional research, especially for micro-invertebrates. One small group asked why there are no blind salamander studies. One small group offered that synthesizing all data across species and systems could be an additional project.

NAS on development of a general conceptual model for the Comal and San Marcos ecosystem: Only one small group commented on this recommendation and offered the following: use a wider-range of species, including the feasibility and accuracy of surrogate species, and consider a watershed analysis to determine health in addition to ecological modeling.

Appendix A: Meeting Notice and Agenda

EAHCP STAFF

April 15, 2015



NOTICE OF OPEN MEETING Available at eahcp.org

As required by Sections 7.8.4 and 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), a joint meeting of the **Stakeholder Committee** and of the **Science Committee** of the **Edwards Aquifer Habitat Conservation Plan Program** is scheduled for **8:30 a.m. on Wednesday, April 22, 2015 at the San Antonio Water System building, 2800 U.S. Hwy 281 North, San Antonio, TX**. If you expect to attend, please RSVP at spayne@edwardsaquifer.org to help us with meeting planning. An RSVP is not necessary to attend.

The purpose of this meeting is to

- Receive comments from individual members of the EAHCP Stakeholder Committee and Science Committee and the general public to inform the Implementing Committee as it develops an implementation plan related to the National Academy of Science (NAS) report.
- Provide opportunity for participants to gain information about and discuss key recommendations in the NAS report.

At this meeting, the following business may be considered. **Times noted are approximate. Items may be taken up earlier or later than noted.**

8:00 Sign In

8:30 Call to order

Welcome, overview of NAS report and what it means to HCP, workshop purpose, agenda and format.

Information on NAS recommendations, small group discussion, and formal comments on the following topics from the NAS report:

- Hydrologic modeling (*at approximately 9:20*)
- Ecological modeling (*at approximately 11:00*)

12:25 Lunch available at SAWS cafeteria

1:10 Information on NAS recommendations, small group discussion, and formal comments on the following topics from the NAS report:

- Monitoring (*at approximately 1:10*)
- Applied research (*at approximately 2:50*)

4:15 Additional general comments: Committee members and public

4:45 Summary, next steps

The EAHCP Implementing Committee additionally welcomes written comments submitted to: info@eahcp.org. Comments received by May 1 will be included in the workshop report presented to the Implementing Committee on May 21.

Copies of the NAS report and additional background information on the NAS report may be found at <http://www.eahcp.org/>

Appendix B: Summary of NAS Recommendations

| Hydrologic Model | | |
|---|------------------------------------|---|
| Recommendation | Reference (pg. #:line#) | Description |
| Don't use the term "verification" when describing model runs with changing parameters | 35:27 | EAA uses the term verification in several reports and presentations when describing model runs that started with existing parameters but allowed for changing parameters to update the model. These efforts should be described as "additional calibration runs". |
| MODFLOW should be considered a work in progress and not a final product | 43:20 | Due to the size and complexity of the aquifer and the data limitations, conceptual model issues will continue to arise |
| Continued development and testing of the Hydrological Simulation Program (HSPF) | 47:45 | There are large differences in the recharge estimates between HSPF and the Puente method |
| Do not compare results from MODFLOW and FEFLOW | 45:19 | The two models, developed using two separate codes, will each have their own inherent uncertainty, which cannot be understood by a comparison of the two |
| Move toward single model. | 57:19 | Gain efficiency by moving toward a single model that incorporates the best concepts from existing modeling efforts. |
| Display error bars on MODFLOW data | 49:12 | Use error bars or some other indication of uncertainty in predictions |
| Quantitatively assess model uncertainty. | 57:27 | Model uncertainty needs to be quantitatively assessed and presented in formal EAA documents... increase[s] in a model's defensibility and can provide a reasonable estimate of model error, which is important information when using a model for management decisions. |
| Modeling of conduits. | 58:1 | Moving forward, more attention should be paid to the modeling of conduits. |
| Move toward making predictions on a daily time scale. | 58:9 | The hydrologic modeling should move toward making predictions on a daily time scale, e.g., by developing telescoping models of smaller regions. |

| Ecological Model | | |
|--|------------------------------------|--|
| Recommendation | Reference (pg. #:line#) | Description |
| Revisit the estimation FD suitability curves | 77:35 | With the availability of the monitoring data and other info, a more formal estimation of the habitat suitability curves is warranted |
| Add nutrient limitation to the SAV model formulation | 82:40 | |
| Habitat suitability analyses for TWR | 83:55 | Continued efforts focus on Texas wild rice restoration, mitigation, public awareness and improving the existing habitat suitability analyses. |
| In developing a the FD model, modelers should pay attention to the following topics: | 85 | <ul style="list-style-type: none"> · How movement is represented · Clear documentation and justification for how flow, temperature, and vegetation are included in the growth, mortality, reproduction, and movement relationships · How density-dependence is included · Using the model to generate predictions of the population responses to various combinations of years with scour events and droughts · Calibration and validation, which are needed to ensure sufficient model credibility · Careful tracking of uncertainty · Expectations are high because much discussion has pushed things to the ecological modeling and the term “predictive” has been used. Clarification of what the darter modeling can do and cannot do would be wise. |
| FD model should include: | 86:38 | Analyses that support each of the major sub models of growth, mortality, reproduction, and movement. Such analyses should discuss how the effects of flow, temperature, and structural habitat on each of these major processes will be represented in the model. |
| Phased strategy for testing individual components in the SAV model | 83:24 | A phased strategy of first testing each of the components under known and predictable environmental conditions (e.g., growth under fixed light and temperature), then further testing each component under realistically varying conditions, and then finally calibrating and validating when combined with all of the other processes. Careful attention to formulating a calibration and validation approach that ensures confidence in model predictions for how they will be used in the fountain darter model, and that encompasses the range of conditions to be simulated in the fountain darter model, is needed. |
| AP research program should become more robust and quantitative projections of CSRB habitat | 87:27 | The Committee recommends that the Applied Research Program explicitly seek to provide essential data required by the models and that the HCP include an aquatic entomologist or freshwater invertebrate ecologist to help guide this research |

| | | |
|---|-------|---|
| AP research program should include more field studies to assess silt impacts and critical life history and habitat assessment is needed | 87:36 | <ul style="list-style-type: none"> · What is the basis for the assumption that silt deposition represents an important environmental effector of CSRB population densities? · How does siltation quantitatively affect the known habitats of CSRB, and are there habitats that may act as refugia during times of heavy deposition? · Are there quantitative relationships between silt-free gravel and cobble area with beetle population densities? · How many generations occur throughout the year for the CSRB and how does variable flow and sedimentation affect food availability and the beetle's population biology? · Are there invasive predators or competitors in these systems that might apply biotic control on the population numbers? · What other factors are likely to affect the population biology and ecology of CSRB? · How reliable is the cotton lure sampling method for quantitatively estimating densities of both adult and immature life stages of the CSRB? |
| Need a conceptual model | 89:22 | Develop a conceptual model, or a series of models of increasing resolution, that show how water quality and quantity, other biota, and restoration and mitigation activities are expected to interact with the indicator species, as well as with all covered species. |
| The goal of the SAV model should be clarified. | 90:36 | The goal of the SAV modeling, which is in its early stages, should be clarified. Whether the goal is to simulate SAV biomass dynamics or to simulate habitat for the FD model will affect how many models are needed and how each model is formulated. |
| The current habitat suitability analysis (TWR) should be tested for robustness. | 91:1 | Given the absence of a planned ecological model for Texas wild rice, the current habitat suitability analysis should be treated as an hypothesis and tested for robustness throughout the San Marcos River. |
| Ensure proper interpretation of the ongoing effort to build an individual-based model for FD. | 91:10 | The ongoing effort to build an individual-based model for fountain darter is a scientifically sound approach for modeling population dynamics that will require extensive data for model formulation, calibration, and validation. |
| Habitat suitability analyses as "back-up" to individual-based modeling. | 91:22 | The habitat suitability analyses done for fountain darter could act as a "back-up" to the individual-based modeling and provide additional quasi-independent results to support a weight of evidence approach for FD. |
| Critical to have a much deeper understanding of the CSRB. | 91:33 | If the CSRB is to be an adequate indicator of some of the other ESA-listed species, it is critical to have a much deeper understanding of the spatial distribution, range of potential habitats, and natural history of the CSRB. |
| Develop an ecosystem-based conceptual model. | 92:3 | It is recommended that as a top priority the EAA develop an ecosystem-based conceptual model, or a series of models of increasing resolution, that show how water quality and quantity, other biota, and restoration and mitigation activities are expected to interact with the indicator species, as well as with all covered species |

| Biological and Water Quality Monitoring | | |
|---|------------------------------------|---|
| Recommendation | Reference (pg. #:line#) | Description |
| Increase sampling in Comal more often | 106:7 | Because of the apparent sensitivity and variable response of SAV to flow conditions, particularly in the Comal River, it would be best to either sample the total river more frequently than every five years or increase and/or randomize the sampling locations if a more accurate representation of SAV throughout the river is desired. The above sampling methods do not include data needed for the SAV modeling efforts, i.e., plant biomass. For dominant species and species specifically used in the modeling process, biomass data should be collected annually (and may need to be collected multiple times during the growing season to estimate specific growth rates) to validate the percent cover data and to provide accurate data for the SAV model. |
| FD special studies | 106:47 | Consider special studies related to the use of index sites to indicate fountain darter trends. These special studies could be performed for a limited time to confirm or even improve the interpretation of the standard year-to-year monitoring. One set of studies could be designed to address the representativeness of the index reaches, and to benchmark the degree of uncertainty when index information is extrapolated to the regional or system level. |
| Prioritize measuring CSRB distribution | 108:32 | Measuring CSRB distribution should be a high priority, using a randomized or stratified randomized approach throughout Lake Landa, Spring Island and other areas of potential habitat. |
| Expand macroinvertebrate surveys | 110:5 | Committee recommends that the macroinvertebrate surveys be expanded to habitats that are not currently being evaluated to provide information on the overall health of the aquatic ecosystem, similar to what is done for surface waters throughout the United States as part of national bio-assessment programs |
| Continue monitoring index reaches. | 114:33 | The biomonitoring and water quality monitoring programs are generally well designed, comprehensive, and likely to be effective in providing information to meet the objective of the HCP...Monitoring of index reaches needs to continue in order to assess trends and build on existing databases. |
| Provide a clear mechanism to scale results to the entire spring and reach system. | 115:1 | The sampling programs do not provide a clear mechanism to scale results to the entire spring and reach system. If the EAA finds it is necessary to provide system-wide estimates of population densities ...it will need to invoke special studies or conduct sampling using randomization techniques. |

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| Increased coordination and integration of the biomonitoring and WQ monitoring. | 115:9 | The biomonitoring and water quality monitoring programs are only loosely integrated... Increased coordination and integration of the biomonitoring and water quality monitoring activities is needed. |
| Enhance sampling for nutrients. | 115:24 | Enhance sampling for nutrients is recommended... It is expected that nutrients and other urban background contaminants may be more important than many of the specific toxins that are currently included in the sampling program. The planned elimination of many of these parameters after one or two initial rounds of sampling if significant detections are not observed is supported by the Committee. |
| New quantitative sampling methods are needed for the CSRB. | 116:1 | New quantitative sampling methods are needed for the CSRB to complement and improve upon the cotton lure approach... The comprehensive survey of CSRB distribution proposed as part of the Applied Research Program should be given high priority. |

Applied Research

| Recommendation | Reference (pg. #:line#) | Description |
|--|-------------------------|---|
| Remove Literature Review tasks | 118:18 | Literature reviews are usually not part of an applied research project, but rather are done during preparation of the proposal to demonstrate that the proposal authors have a strong knowledge of the background information necessary to develop suitable hypotheses and propose appropriate methods for testing them. |
| Additional FD movement study | 119:39 | Follow-up study on movement should be considered, perhaps using tags that provide near-continuous information on the locations and temperatures experienced by the individually tagged fish. |
| Pursue additional Applied Research topics as provided. | 125-129 | Numerous projects for varying species are recommended |
| Fountain Darter: Additional studies on movement would be beneficial, preferably allowing for Lagrangian tracks to be estimated. | 125 | Various types of mark-recapture and tracking technologies should be investigated and tested to determine movement ranges and patterns under a range of environmental (e.g. springflow) conditions. Sampling should involve different sizes of fountain darter during each of the key seasons. Understanding the movement patterns of individuals will provide information on the movement exchanges among habitat areas, range size, and provide data for model calibration and validation. |
| Fountain Darter: Confront the persistent lack of a relationship found between flow and fountain darter metrics...it is critical to refine the relationship at low to moderate flows and also at high flows (scour events). | 125 | Changing flows can have effects on growth, mortality, and reproduction that can affect multiple life stages and accumulate over time, resulting in important effects at the population level...relationships need to be delineated based on empirical evidence and, in some cases, quantified...these measures could be further supported by studies that use lab and field measurements to ensure responses are recorded over a range of flows. |

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| Fountain Darter: Obtaining measurements related to individual fountain darter health that go beyond the densities and lengths of individuals measured in the current biomonitoring. | 125 | Densities have high variability and are difficult to extrapolate spatially, and lengths alone are a relatively insensitive indicator of fish responses to conditions...many bioindicators proposed that reflect the health of individual fish. |
| Submerged Aquatic Vegetation: Supplying data on SAV growth, dispersal, and recolonization for those SAV species that are the best habitat for the fountain darter. | 126 | New studies that elucidate the interactions between SAV and the fountain darter would be particularly helpful. |
| Submerged Aquatic Vegetation: Are the fish using SAV for protection, to find food, and/or as a nursery area for young? | 126 | |
| Submerged Aquatic Vegetation: Why do fountain darters prefer bryophytes and filamentous algae, which are not vascular plants? | 126 | |
| Texas wild-rice: Studies should focus on the restoration of this plant. | 126 | In particular in areas that are considered suitable habitat yet are devoid of this plant. |
| Texas wild-rice: Studies should focus on the restoration of this plant. | 126 | Planting Texas wild rice in suitable areas and monitoring for success. |
| Texas wild-rice: Studies should focus on the restoration of this plant. | 126 | Determining whether low flow conditions are more detrimental to TWR than recreation. |
| Texas wild-rice: Studies should focus on the restoration of this plant. | 126 | Determining the effects of restricting recreation from areas where Texas wild rice is growing under various flow rates. |
| Comal Springs Riffle Beetle: Life history, life cycle and spatial distribution information for CSRB is necessary for better modeling of this species. | 126-127 | ...including information on true densities of both immature and adult life stages throughout the year. |
| Comal Springs Riffle Beetle: life stages | 126-127 | Growth rates of the life stages. |
| Comal Springs Riffle Beetle: life stages | 126-127 | How many generations occur each year and are they synchronous? |
| Comal Springs Riffle Beetle: life stages | 126-127 | How fast the life cycle proceeds or how the life cycle and other life history attributes like fecundity might be affected by changing flow or sediment conditions? |
| Comal Springs Riffle Beetle: Cotton Lure sampling | 127 | Identify how representative the currently sampling method (i.e. cotton lures) is to quantitative densities of both adult and immature stages of the CSRB. |
| Comal Springs Riffle Beetle: life stages | 127 | Identify life history information important to better understanding how the populations, or portions of them, respond to changing habitat conditions related to flow or sedimentation. |
| Comal Springs Riffle Beetle: indicator species | 127 | Better assessment of how well the CSRB acts as an indicator species for the other listed species will be critical for more comprehensive management of all threatened or endangered species that are not currently being monitored. |

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| Phosphorus Sources, Cycling, and Availability | 127 | In addition to the physical impacts of low flow, there could be very important indirect effects of low flow on the overall productivity and food web dynamics of the spring/river ecosystems due to nutrients. |
| Development of a general conceptual model for the Comal and San Marcos ecosystem. | 130:1 | Project partners should be tasked with the development of a general conceptual model for the Comal and San Marcos System. |
| Increase transparency in prioritizing and funding research projects. | 130:6 | The Applied Research Program would benefit from a more transparent process for prioritizing and funding projects that includes stakeholder involvement, for example through the science committee and peer review. |
| Increase competition and collaboration with outside scientific experts. | 130:9 | The Applied Research Program would benefit from a greater competition and collaboration with outside scientific experts through open and widely disseminated solicitation for research. |
| Offer longer-term projects. | 130:13 | The program should offer some longer-term (two- to five-year) projects in order to maximize interest and collaboration from the region's leading researchers. |
| Increase transparency of research results. | 130:17 | Results from the Applied Research Program, Particularly from outside researchers, should be provided in a form that ensures transparency and accessibility to other researchers and to the EAA. |

Appendix C: Comments Grouped by NAS Recommendations⁵

Hydrologic Monitoring

| Small group | # in support ⁶ | Comment |
|---|---------------------------|--|
| NAS: Don't use the term "verification" when describing model runs with changing parameters 35:27 | | |
| 3 | GA ⁷ | Agree with NAS recommendation on verification as a term |
| NAS: MODFLOW should be considered a work in progress and not a final product 43:20 | | |
| 4 | UK ⁸ | While MODFLOW is a work in progress, we need to have agreed upon science in order to make decisions. Can be a continued process but management decisions are necessary |
| NAS: Continued development and testing of Hydrological Simulation Program (HSPF) 47:45 | | |
| 2 | 5 | Formal analysis to assess plus identify differences of HSPF & Puente |
| NAS: Do not compare results from MODFLOW and FEFLOW 45:19 | | |
| 4 | UK | Comparisons are valid - we learn when models agree and when they disagree |
| PL ⁹ | 1 | One of the activities associated with FEFLOW was a better understanding of the inter-formational relationship at Trinity-Edwards. |
| NAS: Gain efficiency by moving toward a single model 57:19 | | |
| 1 | 5 | The finite model is funded by EAA with non-HCP funds. EAA has other needs for the model. Both should be supported if benefits are commensurate with cost |
| 2 | 5 | Compare uncertainties and assess differences in results to move towards one model |
| 2 | 5 | Have modelers explore MODFLOW-USGS |
| 3 | UK | 1 or 2 models: need more evaluation/analysis of each model |
| 3 | UK | 1 or 2 models: cost/benefit of each model |
| 3 | UK | 1 or 2 models: learning curve for a new model |
| 3 | UK | 1 or 2 models: are objectives for each model overlapping |
| 3 | UK | 1 or 2 models: time consumption required for model "off-the-ground" |
| 5 | UK | We need a working model we can manage with before moving toward a single new model |
| 6 | UK | Evaluate the savings of going to one model. Base decision of going to one model with how much is saved. |
| 1 | 5 | Respond with a 5-year modeling plan to address NAS comments |
| <u>Formal written comment:</u> Charlie Kreitler, Science Com. | | The EAA should focus their modeling efforts associated with the HCP on their MODFLOW model, in that the MODFLOW model currently provides the best calibration with observed hydrologic data. The EAA, however, should not be discouraged in their continued efforts in finalizing and using their FEFLOW model. The FEFLOW model may provide new understandings of the hydrology of the Edwards Aquifer. |
| NAS: Display error bars on MODFLOW data 49:12 | | |

⁵ Appendix C reflects all comments made during small group discussions, formal oral and written comments, and parking lot notes grouped according to which NAS Recommendations they addressed. Comments are also preserved in "raw" data form without such categorization in Appendix D.

⁶ During small group discussion, participants engaged in up to 45 minutes of discussion among themselves, followed by a ten-minute period during which the group facilitator captured comments participants wanted to record. The intent was not to reach consensus, but the facilitators were asked to note how many in the small group generally supported a recorded comment. In some cases, the facilitator noted the number of participants who were in support (recorded with a specific #); in other cases, the facilitator noted that all were in general agreement (recorded as "GA" in this column); and in still other cases, the facilitator did not note whether a comment had any support (recorded as "UK" for unknown in this column). Small groups generally ranged in number from five to eight people. For the discussion on ecological modeling, Small group1 and Small group 2 consisted of approximately three people each.

⁷ GA indicates the small group was in general agreement with the comment.

⁸ UK means unknown.

⁹ PL stands for Parking Lot.

| Small group | # in support ⁶ | Comment |
|--|---------------------------|--|
| 2 | 5 | Agree with error bars and uncertainly recommendations |
| 3 | GA | Agree with NAS rec: Error bars on Modflow need to be used on model predictions |
| 5 | UK | Disconnect in recording display error bars for data v. model results |
| NAS: Quantitatively assess model uncertainty 57:27 | | |
| 1 | 5 | Conduct uncertainty analysis of the Puente and HSPF methods of recharge estimates |
| 2 | 5 | Compare uncertainties and assess differences in results to move towards one model |
| 4 | UK | When uncertainty exists in model results do not necessarily err on the side of action or extreme - work to narrow uncertainty. Use science to reduce uncertainty |
| 4 | UK | Don't manage uncertainty |
| 5 | UK | Use of PEST to analyze uncertainty |
| 5 | UK | Knowledge of uncertainty is important in developing a model |
| 6 | 5 | Highest priority - quantifying assessing uncertainty model prediction of spring flow |
| 6 | 5 | We should migrate to daily time-step with predictive uncertainty done first |
| <u>Formal oral comment summary:</u> Myron Hess, NWF & Stakeholder Com. | | The highest priority in this hydrologic modeling is to quantify uncertainty and use that quantification of uncertainty to help us identify where should we be prioritizing efforts. Where do we think that biggest uncertainty is coming from? How does that help us then focus on how we might narrow down that uncertainty as we move forward. That might help us make some of these other decisions: how do these other things help to address the uncertainty that's in this model? How small of a task that is is something I don't have a good feel for. . . . |
| <u>Formal written comment:</u> Charlie Kreitler, Science Com. | | Much of the modeling efforts have been based on the specific historic hydrologic conditions during the drought of record. A potential future drought that could severely impact the survival of endangered species may not look like the historic DOR. EAA needs to understand the uncertainties associated with the physical hydrologic parameters of the model as well as the uncertainties associated with various external hydrologic inputs to the aquifer. This might include: 1) short duration vs long duration droughts, 2) impact of various irrigation pumping scenarios, 3) impact of various municipal pumping scenarios, 4) impact of critical period management rules and the associated bottom up management strategies, and 5) the impact of aquifer storage and recovery by SAWS and the EAA. The EAA also needs to evaluate whether the CPM pumpage reduction strategies in the model adequately reflect the actual EAA CPM regulations. |
| <u>Formal oral comment summary:</u> Charlie Kreitler, Science Com. | | The current model is not designed or being used to prove or disprove particular hydrologic processes. It needs to be used in the context of testing various hydrologic management tools. The model is designed to figure out what goes on in the aquifer, which is half of what goes on related to the HCP. The other half is what happens in the springs. A daily time step of spring discharge is not really relevant to ecosystem modelling. The hydrologic model is there to test VISPO, ASR, regional conservation, etc. The current model is relatively well restrained, and calibration curves for flow observed to discharge from Comal and San Marcos versus the model is much better than five years ago for testing different scenarios used for water conservation (VISPO, ASR, regional conservation). Use the current model to understand how the system works rather than delaying several years. Uncertainty is important, but will be out there in the future to work with. We need to start looking at how the model works in the context of how SAWS pumps, and how the irrigators pump, how the aquifer is being managed. These are as critical issues for understanding how the model and how the aquifer works as worrying about the uncertainty as to whether there's an increase in the permeability in the rocks in Uvalde County or in Medina. |
| <u>Formal oral comment summary:</u> E. Conrad Lamon III, Science Com. | | . . . The use of a model without uncertainty analysis is a dangerous thing. Uncertainty and probabilistic distribution of where we think some measured state of nature is going to land is necessary to make a decision, if we value that state in nature. We've got a prediction of probability of where it falls and we can calculate some sort of expected value and make a decision, a rational decision, based on that. What we're talking about in terms of uncertainty analysis here is not whether there's a conduit here or a conduit there. What we're talking about is quantifying how wrong the model is in making prediction of what we care about. And without that, we really don't know how to deal with that, we don't know how to use this output as input into another model. And unless we can treat these outputs, or these predictions, probabilistically, treating these models as if they're known with certainty is . . . not going to be a good outcome for the species we're trying to protect or certainly for the rate-payers such as SAWS or any of the other partners. |
| <u>Formal oral comment excerpt:</u> Carol Patterson, self | | One thing that adds to uncertainty in the outcomes is that we are required to model the pumpage as if it was the total permitted 572,000 (ac-ft) when we're actually pumping annually about 340,000 or under 400,000 (ac-ft). This can be viewed as a conservative estimate that creates a safety net. It's a good idea to do the |

| Small group | # in support ⁶ | Comment |
|---|---------------------------|--|
| | | modeling based on actual pumping if we want to see what's actually happening. |
| <u>Formal written comment excerpt:</u> Jeremy White U.S. Geological Survey | | <p>The effect that the "bottom up" conservation measures have on Comal and San Marcos springflow is not known because there is uncertainty in the inputs to the hydrologic model used to simulate the conservation measures. We know that aquifer properties vary spatially, recharge varies spatially and temporally, and well pumpage is also somewhat uncertain (though better understood since metering has been implemented). When the uncertainty of each of the model inputs is propagated through the model, uncertainty is induced in the model outputs, which in this case is simulated response of springflow to each of the conservation measures. Unfortunately, the relationship between input uncertainty and output uncertainty is model specific and can only be determined through rigorous uncertainty analyses within a Bayesian statistical framework. Within this framework, uncertainty in model inputs and outputs are typically described with the familiar 95% credible (or confidence) limits so that the results of the analysis would be a range of simulated springflow conditions that are all equally likely.</p> <p>Ultimately, if the model inputs that control springflow have large 95% credible ranges, and those ranges are not reduced through the assimilation of observations (e.g. model calibration), then the simulated effect of the conservation measures may also have a large range of equally-likely springflow. This means that the simulated effect of the "bottom up" conservation measures may be statistically (much) lower than 30cfs at Comal springs during the drought-of-record period.</p> |
| NAS: Move toward making predictions on a daily time scale 58:9 | | |
| 1 | 5 | Consider where daily v. monthly time step is more important given the cost. The goal is to move to daily long-term modeling, but funding is a problem as is technical ability to gather data. |
| 2 | 5 | If feasible, pick one small area to try daily time scale |
| 3 | UK | Monthly/daily time step: Uncertainty ↑ to switch (range of error) |
| 3 | UK | Monthly/daily time step: Monthly is less variable, more predictable |
| 3 | UK | Monthly/daily time step: Cost-benefit of switching time step. How much time will it take to switch models relative to HCP phases |
| 3 | UK | Monthly/daily time step: daily is desired goal if achievable |
| 3 | UK | Monthly/daily time step: what are logistics of transition? |
| 5 | UK | Not critical to develop a daily time-step. Data is limited but it would be nice |
| 6 | 5 | Migrate to daily time-step with predictive uncertainty done first |
| <u>Formal written comment:</u> Charlie Kreitler, Science Com. | | Response: The EAA's groundwater model development and use have been oriented toward regional geographic scale management and longer periods of time (not daily time steps). Collecting daily data (e.g. daily pumpage or water level data from irrigation wells) would be logistically very difficult and expensive. The ecologic models for the Comal and San Marcos systems will need daily flow data, but not necessarily derived from a regional model. More specific, detailed groundwater data are needed around the two spring complexes to better understand the local interaction between the groundwater and discharges from specific parts of the Landa Lake and Spring Lake complexes. This is not a modeling exercise. |
| NAS: Modeling conduits becomes more important as the time step is reduced 58:1 | | |
| 2 | 5 | More dye-tracing; more attention to conduits |
| 3 | UK | Conduit modeling: is enough known? How would we research? What would be required to gather data? |
| 5 | UK | We need to develop an understanding of the multiple porosity of the aquifer. Interaction between conduit and porous media of the aquifer. |
| 1 | 5 | Models used give adequate consideration of varied conduit flow. |
| <u>Formal written comment:</u> Charlie Kreitler, Science Com. | | NAS Recommendation: More attention should be paid to the modeling of conduits. Response: There has been a multi-year discussion of the importance of conduits in groundwater flow in Edwards. Tracer studies conducted by the EAA and others on the Edwards clearly show the importance of conduits. Additional modeling may help further refine their presence, location and importance. Additional hydrogeologic field studies designed to study the importance of conduits versus the rest of the aquifer (the "porous" matrix) may prove more insightful than additional modeling efforts. |
| <u>Formal oral comment summary:</u> Carol Patterson, Self | | To know where the conduits are, you also need to know where the barriers to flow are and where the denser matrix is, which provides storage and allows continuous spring flow in drought. USGS has been interested for quite a few years in the dual, actually triple porosity of the aquifer. Farmers used to stop pumping at about July 4th and then the aquifer would stabilize by water that was continuing to flow even in drought into the conduits to the springs. |
| General | | |
| 1 | 5 | Need improved water flow data from existing and new wells |
| 4 | UK | Consider modeling in multilayers |

| Small group | # in support ⁶ | Comment |
|--|---------------------------|---|
| <u>Formal written comment excerpt:</u> Dianne Wassenich | | It is most important that the model be as accurate as possible in low flow times - if we have to focus on one part of the very complex aquifer water movement. |
| PL | 1 | Where does the HCP permit allow that recharge estimate methods can be changed or modified from one to another, i.e. Puente → HSPF? |
| PL | 1 | HSPF recharge - It has been related to me that some EAA staff believes the HCP compels the use of the Puente recharge estimates. That's not the case. The method can change if the HCP recharge triggers are revisited. |

Ecological Modeling

| Small group | # in support | Comment |
|---|-----------------------|---|
| NAS: Fountain Darter | | |
| Revisit the estimation FD suitability curves 77:35 | | |
| In developing the FD model, modelers should pay attention to various topics. 85 | | |
| FD model should include analyses that support submodels and impact of flow, temperature and structural habitat 86:38 | | |
| Ensure proper interpretation of the ongoing effort to build an individual -based model for FD 91:10 | | |
| Habitat suitability analyses for FD as "back-up" to individual-based modeling | | |
| 1 | GA | More info on dynamics of parasitism for FD model |
| 3 | GA | FD model approach is valid, but faces challenges that may restrict model predictions to relative abundances (not absolute) and thus cannot be calibrated in a conventional manner |
| 4 | 1 | FD model contact recreation should be included for effects on vegetation and turbidity |
| 4 | GA | FD - revisit the estimation with current conditions |
| 4 | GA | FD - Model, modelers recommendations are necessary to the extent that it's feasible |
| 5 | GA | Due to the limitations of the FD, another indicator species should be identified. Potentially a more system-wide ecosystem model |
| 5 | GA | Using the FD as an indicator species in terms of low-flow would not be wise. It is a slack-water species. Would need to incorporate other species. |
| 6 | 6 | It is important to have a habitat suitability analysis for FD |
| 2 | All (3) ¹⁰ | FD suitability curves: analysis of observed temp. data (2011-14) in lower flows for Comal compared to model predictions (Hardy model) |
| 4 | GA | FD, CSRB - priorities can be set based on data available |
| NAS: Submerged Aquatic Vegetation | | |
| Goal of the SAV model should be clarified 90:36 | | |
| Add nutrient limitation to the SAV model formulation 82:40 | | |
| Phase strategy for testing individual components of SAV model 83:24 | | |
| 2 | All (3) | Agree with phased strategy for testing individual comp in SAV model |
| 4 | GA | Conflicting recommendation for NAS on pg. 83 and observation on pg. 121 re lab/field |
| NAS: Texas Wild Rice | | |
| Update habitat suitability analysis for TWR to consider additional factors 83:55 | | |
| Current habitat suitability analysis (TWR) should be tested for robustness 91:1 | | |
| 2 | All (3) | TWR: make available restoration data and analysis as it might change previous habitat suitability analysis |
| 2 | All (3) | TWR: sharing of criteria currently used to measure /determine habitat suitability |
| 4 | GA | TWR - M&M had not been accounted for initially. Important to look at the effects |
| 1 | GA | Develop model for TWR to get good predictive data |
| NAS: Comal Springs Riffle Beetle | | |
| Critical to have a much deeper understanding of the CSRB if it is to be an indicator species 91:33 | | |
| AP research should become more robust projection of CSRB habitat 87:27 | | |
| AP research program should include more field studies to assess silt impacts and critical life history and habitat assessment of CSRB 87:36 | | |
| 2 | All (3) | CSRB data collection, determination of life history should be a priority |
| 3 | GA | Need widespread expertise of CSRB: Time? Money? Worth the effort? Determine the process to gather data. |
| 4 | GA | Is studying CSRB not important? |
| 5 | GA | The unknowns about the CSRB may keep us from being able to responsibly dedicate resources to develop a |

¹⁰ All(#) indicates the number of people at the small group and that they were all in general support of the comment.

| Small group | # in support | Comment |
|---|--------------|--|
| | | model for HCP purposes within our timeframe |
| 6 | 6 | It is important to assess the quantitative effort of the silt on the species (CSRB) |
| 6 | 6 | High priority - improve understanding of the life history of the CSRB |
| 6 | 6 | Resurrect and refine the conceptual (Gene Cochran) model of the CSRB |
| 4 | GA | FD, CSRB - priorities can be set based on data available |
| NAS: Develop an ecosystem-based conceptual model (showing how species, water quality and quantity and M&M measures interact 92:3, 89:22) | | |
| 1 | GA | Support overall ecosystem-based conceptual model, including TWR, FD, SAV, other food items, invertebrates, etc. |
| 3 | GA | Transparency: Ecosystem modeling has not been a transparent process due to its complexity |
| 3 | GA | Conceptual model: critical to have conceptual model as described by NAS report. Time and money cost/cheaper than SPP model |
| 3 | GA | Conceptual model would integrate management actions & external factors that need to be considered |
| 4 | GA | Conceptual models are important for each species |
| 5 | GA | It would be useful to have a comprehensive conceptual model in order to help identify further research. Can the influence diagram be utilized to construct a conceptual model? |
| 6 | 6 | Develop and continue to refine the conceptual model of each of the springs. Is critical to develop the conceptual model. |
| GENERAL | | |
| 5 | GA | Understanding natural events in all systems. What is the basis of understanding effects (#8). Too reductionist in terms of concerns for the HCP |
| 5 | GA | Current model has deficiencies due to the limited components. |
| 4 | GA | Nutrient limits are very important |
| 4 | GA | Habitat suitability analyses might be useful to compare with individual modeling |
| 5 | GA | Due to the limitations of the FD, another indicator species should be identified. Potentially a more system-wide ecosystem model |
| 5 | GA | Does NAS have all the information necessary to make these recommendations? |
| 3 | GA | Transparency: Coordinate information transparently between HCP contractors, agencies, staff and other related groups |
| 1 | GA | Better calibration and uncertainty analysis |
| <u>Formal written comment:</u> Chad Norris, TPWD, Science Com. | | The low-flow objectives for Comal Springs was based largely on thermal modeling done by Hardy. This model included little to no low-flow data. The models predictions for temp at low flows should be compared to observed thermal data during low flows from 2011-2014. If sufficient data was not gathered at low flows for such analysis, it should be planned to occur in the future during low flows. |
| PL | 1 | Ecosystem model being developed in isolation from the Science Cmte. |

Biological and Water Quality Monitoring

| Small group | # in support | Comment |
|--|--------------|--|
| NAS: Increase sampling in Comal more often | | |
| 4 | 4 | Sensitivity of SAV to flow needs to be better defined/clarified in NAS. Pg. 106 para 2. |
| 6 | 6 | Expand the sampling by adding randomized sites for bio & WQ monitoring to more represent the spring systems. |
| 5 | 6 | BM in the Comal is done frequently enough in terms of data collection & SAV. |
| NAS: Prioritize measuring CSRB distribution | | |
| 1 | 6 | Include Spring Run 1 for CSRB bio monitoring index reaches. |
| 3 | GA | CSRB-Suggest an integrated program (overall strategy) of randomized studies (habitat-focused, cotton lures, etc.) |
| 3 | GA | CSRB-USFLWS employs an aquatic entomologist who has done years of study - does he not have info on pg. 108 para 2? |
| NAS: Expand macroinvertebrate surveys | | |
| 1 | 6 | Need more macroinvertebrate sampling for a comprehensive biological model. |
| 3 | GA | Macroinvertebrate survey expansion is important to capture ecosystem changes that may impact FD food source. |
| 6 | 6 | Support the macroinvertebrate sampling. |

| Small group | # in support | Comment |
|--|--------------|---|
| 5 | 6 | Many macroinvertebrates have been used as WQ indicators thus expanding macroinvertebrate surveys can help integrate BM & WQ Monitoring programs. Macroinvertebrates could help provide info in conceptual model. |
| <u>Formal oral comment excerpt:</u> Bill Adams, TXSTATE | | ... to support the macroinvertebrate testing because there is the issue with the riffle beetle and to see what kind of correlation there is to those abundant species that are there, and how that might correlate with the riffle beetle... |
| NAS: Continue monitoring index reaches | | |
| <u>Formal oral comment excerpt:</u> Bill Adams, TXSTATE | | In our group, we thought that on the index testing that we needed to have randomized testing as well. And then compare that to the index to see what correlation is between that and see if it made any difference... |
| NAS: Provide a clear mechanism to scale results to entire spring and reach system | | |
| 3 | GA | The large data set needs to be analyzed in order to provide a clear mechanism to scale results up. |
| 4 | 4 | Randomization techniques to scale results to entire spring system/habitat are important. |
| 4 | 1 | Value of above not readily apparent. |
| 5 | 6 | To a certain extent the net dist/take estimate could be the mechanism to scale results throughout entire systems. |
| NAS: Increase coordination and integration of the biomonitoring and WQ monitoring | | |
| 1 | 6 | Current design of bio & WQ monitoring are not compatible, need to be redefined to increase coordination. |
| 3 | GA | WQ & bio monitoring integration makes sense and saves money. Holistic view is important. |
| 4 | 6 | Integration of bio & WQ is important in time & space. |
| 5 | 6 | More integration of BM & WQ monitoring. |
| 5 | 6 | Many macroinvertebrates have been used as WQ indicators thus expanding macroinvertebrate surveys can help integrate BM & WQ Monitoring programs. Macroinvertebrates could help provide info in conceptual model. |
| 6 | 6 | Support the integration of bio & WQ monitoring programs. |
| <u>Formal oral comment excerpt:</u> Bill Adams, TXSTATE | | ...to integrate the bio testing and the water quality testing, just to enhance that and see what the relationship is, because it indicated in some of the comments from NAS that those were loosely integrated. So there's bound to be more of a closer correlation... |
| <u>Formal oral comment excerpt:</u> Bill Adams, TXSTATE | | ...to tie in to that with our last one for Small group 6, we were talking integrating more of the bio testing with the water quality monitoring. Again, there's a distinct correlation between those two and we need to better understand that... |
| <u>Formal written comment excerpt:</u> Charlie Kreidler, Science Com. | | The EAA needs to evaluate the overall water quality monitoring program. This review needs to: 1) integrate better with the ecosystem monitoring program, 2) integrate better with the restoration/mitigation programs being conducted by the cities of San Marcos and New Braunfels...A HCP committee should evaluate how the water quality program can be refined to better meet the goals of the HCP. |
| NAS: Enhance sampling for nutrients | | |
| 3 | GA | Evaluate parameters being monitored to see which are unchanging and no longer need to be monitored - or at least less frequently. |
| 4 | 4 | Agree with enhanced sampling of nutrients - lower detection levels. |
| 4 | 5 | Need to evaluate human contribution to WQ, e.g. bacteria, optical brighteners, caffeine. |
| 5 | 6 | Verifying NAS statement about use of unfiltered sampling...? (pg. 113) When & why? Is this an accurate statement...if so, with what constituents? |
| 5 | 6 | There is no reason not to have a lower-detection limit of nutrients. Also improvements in sampling methods to properly reduce detection limits are needed. |
| 5 | 6 | Strategies- Scale back of contaminant sampling would increase efficiency (Not elimination). |
| 6 | 6 | Enhanced nutrient sampling WRT lower detection limits. |
| <u>Formal written comment excerpt:</u> Charlie Kreidler, Science Com. | | ...evaluate whether all the numerous chemical nutrients need to be collected in the future sampling. Water quality sampling is expensive. Many nutrients are below levels of detection. It may be advisable to drop those analyses that do not provide insight into goals of the HCP... |
| NAS: New quantitative sampling methods are needed for the CSRB | | |
| 1 | 6 | Assess methods used in deploying lures and expand sampling area for CSRB. |
| 5 | 6 | Primary concern with the CSRB is to determine a quantitative way to collect them. |
| 5 | 6 | We need a real-time method of CSRB collection to help determine population and abundance and distribution. We cannot answer the NAS questions about CSRB with cotton lures. |

| Small group | # in support | Comment |
|---|--------------|---|
| <u>Formal recorded comment excerpt:</u> Bill Adams, TXSTATE | | ...also talking about the cotton lure. Maybe if we tested that correlation to some of the macroinvertebrates in those same areas to see what kind of relationship there might be there... |
| General | | |
| PL | 1 | General consideration for NAS - Remember that the ecosystems are naturally dynamic, thus it is difficult to have a full range of conditions to sample. |
| 3 | GA | Need a clearinghouse for data. Expand SMOS concept - capture data - avoid replication - save money. |
| 4 | 6 | Review analytic methods in context of HCP needs frequency methods, constituent spatio-temporal |
| 6 | 4 | Integrate existing WQ databases into the HCP for the entire river system (outside the scope of the HCP) |

Applied Research Program

| Small group | # in support | Comment |
|--|--------------|--|
| NAS: Remove Literature Review tasks | | |
| 1 | 6 | No, do not remove: having literature review improves quality of project and research |
| 5 | UK | Do not remove literature review from AR requirement |
| PL | 1 | Perform literature review and survey agencies to identify existing data and scientific products of relevance to HCP. |
| NAS: Additional FD movement study | | |
| 1 | 6 | No additional study needed for FD movement; other priorities should be pursued. |
| 5 | UK | It is not clear how additional studies on FD movement would be beneficial |
| 5 | UK | FD tag that collects data would not be plausible |
| NAS: Pursue additional Applied Research topics as provided. | | |
| 1 | 6 | Agree with pursuing additional research, especially for micro-invertebrates |
| 3 | all | Why are there no blind salamander studies? Difficult to study in natural habitat? |
| 4 | 7 | Synthesizing all data that we have across species and systems is important and could be an applied research project |
| 4 | 7 | Assess what duplicate work is being done; coordinate among entities to avoid duplication (USGS phosphorous); saves money |
| NAS: Fountain Darter: Additional studies on movement would be beneficial, preferably allowing for Lagrangian tracks to be estimated; Confront the persistent lack of a relationship found between flow and fountain darter metrics...it is critical to refine the relationship at low to moderate flows and also at high flows (scour events); Obtaining measurements related to individual fountain darter health that go beyond the densities and lengths of individuals measured in the current biomonitoring. | | |
| 1 | 6 | Cannot manipulate flow; accept the fact that there is no relationship |
| 3 | all | FD studies: look at cost/benefit because so much is already known |
| 3 | all | Need a turbidity study on FD: does turbidity impact feeding/breeding |
| 5 | UK | The lack of relationship between low-flow and FD survival and reproduction confirms the species' slack-water association |
| 5 | UK | Understanding of the FD is broad and detailed enough for HCP purposes |
| NAS: Submerged Aquatic Vegetation: Supplying data on SAV growth, dispersal, and recolonization for those SAV species that are the best habitat for the fountain darter; Are the fish using SAV for protection, to find food, and/or as a nursery area for young?; Why do fountain darters prefer bryophytes and filamentous algae, which are not vascular plants? | | |
| 1 | 6 | Regarding SAV recs: there's already a lot of data between SAV and FD |
| 3 | all | SAV studies: fish using SAV for protection, prey, etc. ... this is already known; no need to study |
| 5 | UK | FD utilize SAV for all parts of life. Not clear additional info. would improve understanding |
| NAS: Texas wild-rice: Studies should focus on the restoration of this plant. | | |
| 1 | 6 | TWR: Tom Hardy is already doing studies on this |
| 1 | 6 | TWR: data needed to determine if restoration is successful and what is driving the success |
| 3 | all | TWR studies: no need for study. These questions have been answered through cons. measure implementation |
| 4 | 7 | TWR: many studies underway; need to see data to know if restoration successful: is it from restoration or natural regeneration? |
| 5 | UK | Planting of TWR in shallow water allows sexual reproduction and ultimately genetic diversity. Plantings are done in both deep and shallow water; suitable habitat is diverse and currently considered. |
| 5 | UK | TWR has persisted throughout years of fluctuation in flow; additionally, increases in Rec. and increase in TWR coverage. |

| Small group | # in support | Comment |
|---|--------------|---|
| 5 | UK | Importance of determination of low-flow vs. recreation on TWR is a good question but practicality of methods or testing is unclear. |
| NAS: Comal Springs Riffle Beetle: Life history, life cycle and spatial distribution information for CSRB is necessary for better modeling of this species; life stages; Cotton Lure sampling; indicator species; | | |
| 1 | 6 | CSRB: many studies already being done; could do more, if resources available |
| 3 | all | CSRB - previously discussed |
| 5 | UK | CSRB is absolutely not an indicator species for determining the health of other listed species (not abundant or widely distributed and is not easily collected) - "indicator criteria" |
| 5 | UK | Many studies need to be put into perspective of return on investment for the HCP. |
| NAS: Phosphorus Sources, Cycling, and Availability | | |
| 3 | all | Phosphorous sources: a better understanding of the nutrient budget in spring systems is important |
| 4 | 7 | Phosphorous item p. 127 - agree with NAS; collect existing data; are other nutrients important? |
| NAS: Development of a general conceptual model for the Comal and San Marcos ecosystem. | | |
| 5 | UK | Use a wider-range of species to better understand the system health |
| 5 | UK | Possibly look into a watershed analysis to determine health in addition to the Eco. Model |
| 5 | UK | Given the restriction and limitation of actual covered species, worthwhile to devote resources to investigating feasibility and accuracy of surrogate species |
| NAS: Increase transparency in prioritizing and funding research projects; Increase competition and collaboration with outside scientific experts; Offer longer-term projects; Increase transparency of research results. | | |
| 1 | 6 | Results from applied research projects should be subject to internal review at a minimum, or at least agree to accept the results. |
| 1 | 6 | Agree with recs on transparency, collaboration, and long-term projects |
| 3 | all | Transparency in priority and funding has increased since NAS observations |
| 3 | all | EAA is working hard to pull in a wider scope of expertise. |
| 3 | all | 2-5 years of funding as needed for research is common sense |
| 3 | all | Need studies that will inform success of conservation measures for evaluation prior to Phase II of HCP |
| 3 | all | Transparency needs to be expanded beyond even the EAA and other researchers. Need a clearinghouse for data and research results. |
| 3 | all | Researchers need to supply data along with results |
| 4 | 7 | Transparency: make data available and in format useful to multiple entities |
| 4 | 7 | Agree with NAS about long-term project; attracts more researchers from academia, enhancing peer review and publish |
| 5 | UK | More transparency, connectivity, and evaluation between programs (inside and outside the HCP) to improve HCP goals ... "bridging silos" |
| 5 | UK | We support a way to include longer-term projects. This is a specific necessity to continue the improvements to the AR program. |
| 6 | 5 | Support greater participation of research scientists (expand the diversity of scientists): -using existing bibliographies (with an emphasis on TAXA or stream system) to identify experts; - Google scholar; - scientific conference: presentation of research, keynote speakers; - a symposium |
| 6 | 5 | Support longer term research projects to incentivize greater participation |
| 6 | 5 | Proposals should be evaluated based in part on good/current literature review |
| PL | 1 | HCP should adopt a goal of having research studies published in peer reviewed, appropriate journals. |

Appendix D: Raw Data¹¹

Small Group Notes:

| Topic | Small group | # in support | Comment |
|------------------|-------------|--------------|---|
| HM ¹² | 1 | 5 | Respond with a 5-year modeling plan to address NAS comments |
| HM | 1 | 5 | Models used give adequate consideration of varied conduit flow. |
| HM | 1 | 5 | Need improved water flow data from existing and new wells |
| HM | 1 | 5 | The finite model is funded by EAA with non-HCP funds. EAA has other needs for the model. Both should be supported if benefits are commensurate with cost |
| HM | 1 | 5 | Consider where daily v. monthly time step is more important given the cost. The goal is to move to daily long-term modeling, but funding is a problem as is technical ability to gather data. |
| HM | 1 | 5 | Conduct uncertainty analysis of the Puente and HSPF methods of recharge estimates |
| HM | 2 | 5 | Agree with error bars and uncertainly recommendations |
| HM | 2 | 5 | If feasible, pick one small area to try daily time scale |
| HM | 2 | 5 | Compare uncertainties and assess differences in results to move towards one model |
| HM | 2 | 5 | Formal analysis to assess plus identify differences of HSPF & Puente |
| HM | 2 | 5 | Have modelers explore MODFLOW-USGS |
| HM | 2 | 5 | More dye-tracing; more attention to conduits |
| HM | 3 | ? | 1 or 2 models: need more evaluation/analysis of each model |
| HM | 3 | ? | 1 or 2 models: cost/benefit of each model |
| HM | 3 | ? | 1 or 2 models: learning curve for a new model |
| HM | 3 | ? | 1 or 2 models: are objectives for each model overlapping |
| HM | 3 | ? | 1 or 2 models: Time consumption required for model "off-the-ground" |
| HM | 3 | GA | Agree with NAS recommendation on verification as a term |
| HM | 3 | ? | Error bars on Modflow need to be used on model predictions |
| HM | 3 | ? | Conduit modeling: is enough known? How would we research? What would be required to gather data? |
| HM | 3 | ? | Monthly/daily time step: Uncertainty ↑ to switch (range of error) |
| HM | 3 | ? | Monthly/daily time step: Monthly is less variable, more predictable |
| HM | 3 | ? | Monthly/daily time step: Cost-benefit of switching time step. How much time will it take to switch models relative to HCP phases |
| HM | 3 | ? | Monthly/daily time step: daily is desired goal if achievable |
| HM | 3 | ? | Monthly/daily time step: what are logistics of transition? |
| HM | 4 | ? | Consider modeling in multilayers |
| HM | 4 | ? | Comparisons are valid - we learn when models agree and when they disagree |
| HM | 4 | ? | When uncertainty exists in model results to not necessarily err on the side of action or extreme - work to narrow uncertainty. Use science to reduce uncertainty |
| HM | 4 | ? | Don't manage uncertainty |
| HM | 4 | ? | While MODFLOW is a work in progress, we need to have agreed upon science in order to make decisions. Can be a continued process but management decisions are necessary |
| HM | 5 | ? | Disconnect in recording display error bars for data v. model results |
| HM | 5 | ? | Use of PEST to analyze uncertainty |
| HM | 5 | ? | Knowledge of uncertainty is important in developing a model |
| HM | 5 | ? | Not critical to develop a daily time-step. Data is limited but it would be nice |
| HM | 5 | ? | We need a working model we can manage with before moving toward a single new model |
| HM | 5 | ? | We need to develop an understanding of the multiple porosity of the aquifer. Interaction between conduit and porous media of the aquifer. |

¹¹ Appendix D reflects all comments made during small group discussions, formal oral and written comments, and parking lot notes, as written without categorizing them into a particular NAS recommendation. Because CPPDR used its judgment in Appendix C when grouping the comments according to which NAS Recommendations they addressed, the original comments are also preserved in "raw" data form in Appendix D.

¹² HM stands for Hydrologic Modeling.

| | | | |
|------------------|--------------------|---------------------|---|
| HM | 6 | 5 | Highest priority - quantifying assessing uncertainty model prediction of spring flow |
| HM | 6 | 5 | We should migrate to daily time-step with predictive uncertainty done first |
| HM | 6 | 5 | Evaluate the savings of going to one model. Base decision of going to one model with how much is saved. |
| Topic | Small group | # in support | Comment |
| EM ¹³ | 1 | GA | Develop model for TWR to get good predictive data |
| EM | 1 | GA | Support overall ecosystem-based conceptual model, including TWR, FD, SAV, other food items, invertebrates, etc. |
| EM | 1 | GA | More info on dynamics of parasitism for FD model |
| EM | 1 | GA | Better calibration and uncertainty analysis |
| EM | 2 | All (3) | FD suitability curves: analysis of observed temp. data (2011-14) in lower flows for Comal compared to model predictions (Hardy model) |
| EM | 2 | All (3) | TWR: make available restoration data and analysis as it might change previous habitat suitability analysis |
| EM | 2 | All (3) | TWR: sharing of criteria currently used to measure /determine habitat suitability |
| EM | 2 | All (3) | CSRB data collection, determination of life history should be a priority |
| EM | 2 | All (3) | Agree with phased strategy for testing individual comp in SAV model |
| EM | 3 | GA | Need widespread expertise of CSRB: Time? Money? Worth the effort? Determine the process to gather data. |
| EM | 3 | GA | Transparency: Coordinate information transparently between HCP contractors, agencies, staff and other related groups |
| EM | 3 | GA | Transparency: Ecosystem modeling has not been a transparent process due to its complexity |
| EM | 3 | GA | Conceptual model: critical to have conceptual model as described by NAS report. Time and money cost/cheaper than SPP model |
| EM | 3 | GA | Conceptual model would integrate management actions & external factors that need to be considered |
| EM | 3 | GA | FD model approach is valid, but faces challenges that may restrict model predictions to relative abundances (not absolute) and thus cannot be calibrated in a conventional manner |
| EM | 4 | GA | Conflicting recommendation for NAS on pg. 83 and observation on pg. 121 re lab/field |
| EM | 4 | GA | Is studying CSRB not important? |
| EM | 4 | GA | Conceptual models are important for each species |
| EM | 4 | GA | Habitat suitability analyses might be useful to compare with individual modeling |
| EM | 4 | 1 | FD model contact recreation should be included for effects on vegetation and turbidity |
| EM | 4 | GA | FD - revisit the estimation with current conditions |
| EM | 4 | GA | Nutrient limits are very import |
| EM | 4 | GA | TWR - M&M had not been accounted for initially. Important to look at the effects |
| EM | 4 | GA | FD - Model, modelers recommendations are necessary to the extent that it's feasible |
| EM | 4 | GA | FD, CSRB - priorities can be set based on data available |
| EM | 5 | GA | Due to the limitations of the FD, another indicator species should be identified. Potentially a more system-wide ecosystem model |
| EM | 5 | GA | The unknowns about the CSRB may keep us from being able to responsibly dedicate resources to develop a model for HCP purposes within our timeframe |
| EM | 5 | GA | Using the FD as an indicator species in terms of low-flow would not be wise. It is a slack-water species. Would need to incorporate other species. |
| EM | 5 | GA | Current model has deficiencies due to the limited components. |
| EM | 5 | GA | Does NAS have all the information necessary to make these recommendations? |
| EM | 5 | GA | Understanding natural events in all systems. What is the basis of understanding effects (#8). Too reductionist in terms of concerns for the HCP |
| EM | 6 | 6 | It is important to have a habitat suitability analysis for FD |
| EM | 6 | 6 | It is important to assess the quantitative effort of the silt on the species (CSRB) |
| EM | 6 | 6 | High priority - improve understanding of the life history of the CSRB |
| EM | 6 | 6 | Resurrect and refine the conceptual (Gene Cochran) model of the CSRB |
| EM | 6 | 6 | Develop and continue to refine the conceptual model of each of the springs. Is critical to develop the conceptual model. |

¹³ EM stands for Ecological Modeling.

| | | | |
|-------------------|--------------------|---------------------|--|
| Mon ¹⁴ | 1 ¹⁵ | 6 | Include Spring Run 1 for CSRB bio monitoring index reaches. |
| Topic | Small group | # in support | Comment |
| Mon | 1 | 6 | Need more macroinvertebrate sampling for a comprehensive biological model. |
| Mon | 1 | 6 | Current design of bio & WQ monitoring are not compatible, need to be redefined to increase coordination. |
| Mon | 1 | 6 | Assess methods used in deploying lures and expand sampling area for CSRB. |
| Mon | 3 | GA | CSRB-Suggest an integrated program (overall strategy) of randomized studies (habitat-focused, cotton lures, etc.) |
| Mon | 3 | GA | CSRB-USFLWS employs an aquatic entomologist who has done years of study - does he not have info on pg. 108 para 2? |
| Mon | 3 | GA | Macroinvertebrate survey expansion is important to capture ecosystem changes that may impact FD food source. |
| Mon | 3 | GA | Need a clearinghouse for data. Expand SMOS concept - capture data - avoid replication - save money. |
| Mon | 3 | GA | The large data set needs to be analyzed in order to provide a clear mechanism to scale results up. |
| Mon | 3 | GA | WQ & bio monitoring integration makes sense and saves \$. Holistic view is important. |
| Mon | 3 | GA | Evaluate parameters being monitored to see which are unchanging and no longer need to be monitored - or at least less frequently. |
| Mon | 4 | 4 | Sensitivity of SAV to flow needs to be better defined/clarified in NAS. Pg. 106 para 2. |
| Mon | 4 | 6 | Review analytic methods in context of HCP needs frequency methods, constituent spatio-temporal |
| Mon | 4 | 4 | Randomization techniques to scale results to entire spring system/habitat is important. |
| Mon | 4 | 1 | Value of above not readily apparent. |
| Mon | 4 | 6 | Integration of bio & WQ is important In time & space. |
| Mon | 4 | 4 | Agree with enhanced sampling of nutrients - lower detection levels. |
| Mon | 4 | 5 | Need to evaluate human contribution to WQ, e.g. bacteria, optical brighteners, caffeine. |
| Mon | 5 | 6 | BM in the Comal is done frequently enough in terms of data collection & SAV. |
| Mon | 5 | 6 | To a certain extent the net dist/take estimate could be the mechanism to scale results throughout entire systems. |
| Mon | 5 | 6 | More integration of BM & WQ monitoring. |
| Mon | 5 | 6 | Many macroinvertebrates have been used as WQ indicators thus expanding macroinvertebrate surveys can help integrate BM & WQ Monitoring programs. Macroinvertebrates could help provide info in conceptual model. |
| Mon | 5 | 6 | Verifying NAS statement about use of unfiltered sampling...? (pg. 113) When & why? Is this an accurate statement...if so, with what constituents? |
| Mon | 5 | 6 | There is no reason not to have a lower-detection limit of nutrients. Also improvements in sampling methods to properly reduce detection limits are needed. |
| Mon | 5 | 6 | Strategies- Scale back of contaminant sampling would increase efficiency (Not elimination). |
| Mon | 5 | 6 | Primary concern with the CSRB is to determine a quantitative way to collect them. |
| Mon | 5 | 6 | We need a real-time method of CSRB collection to help determine population and abundance and distribution. We cannot answer the NAS questions about CSRB with cotton lures. |
| Mon | 6 | 6 | Expand the sampling by adding randomized sites for bio & WQ monitoring to more represent the spring systems. |
| Mon | 6 | 6 | Support the macroinvertebrate sampling. |
| Mon | 6 | 4 | Integrate existing WQ databases into the HCP for the entire river system (outside the scope of the HCP) |
| Mon | 6 | 6 | Support the integration of bio & WQ monitoring programs. |
| Mon | 6 | 6 | Enhanced nutrient sampling WRT lower detection limits. |
| AR ¹⁶ | 1 | 6 | No, do not remove: having literature review improves quality of project and research |
| AR | 1 | 6 | No additional study needed for FD movement; other priorities should be pursued. |
| AR | 1 | 6 | Agree with pursuing additional research, especially for micro-invertebrates |
| AR | 1 | 6 | Rec. #5: cannot manipulate flow; accept the fact that there is no relationship |

¹⁴ Mon stands for Monitoring.¹⁵ Small groups 1 and 2 merged for the Monitoring and Applied Research discussions and are represented as Small group 1.¹⁶ AR stands for Applied Research.

| | | | |
|--------------|--------------------|---------------------|--|
| AR | 1 | 6 | Regarding SAV recs: there's already a lot of data between SAV and FD |
| AR | 1 | 6 | TWR: Tom Hardy is already doing studies on this |
| Topic | Small group | # in support | Comment |
| AR | 1 | 6 | TWR: data needed to determine if restoration is successful and what is driving the success |
| AR | 1 | 6 | CSRB: many studies already being done; could do more, if resources available |
| AR | 1 | 6 | Results from applied research projects should be subject to internal review at a minimum, or at least agree to accept the results. |
| AR | 1 | 6 | Agree with recs on transparency, collaboration, and long-term projects |
| AR | 3 | all | FD studies: look at cost/benefit because so much is already known |
| AR | 3 | all | Why are there no blind salamander studies? Difficult to study in natural habitat? |
| AR | 3 | all | Need a turbidity study on FD: does turbidity impact feeding/breeding |
| AR | 3 | all | SAV studies: fish using SAV for protection, prey, etc. ... this is already known; no need to study |
| AR | 3 | all | TWR studies: no need for study. These questions have been answered through cons. measure implementation |
| AR | 3 | all | CSRB - previously discussed |
| AR | 3 | all | Phosphorous sources: a better understanding of the nutrient budget in spring systems is important |
| AR | 3 | all | Transparency in priority and funding has increased since NAS observations |
| AR | 3 | all | EAA is working hard to pull in a wider scope of expertise. |
| AR | 3 | all | 2-5 years of funding as needed for research is common sense |
| AR | 3 | all | Need studies that will inform success of conservation measures for evaluation prior to Phase II of HCP |
| AR | 3 | all | Transparency needs to be expanded beyond even the EAA and other researchers. Need a clearinghouse for data and research results. |
| AR | 3 | all | Researchers need to supply data along with results |
| AR | A | 7 | Synthesizing all data that we have across species and systems is important and could be an applied research project |
| AR | 4 | 7 | Assess what duplicate work is being done; coordinate among entities to avoid duplication (USGS phosphorous); saves money |
| AR | 4 | 7 | Transparency: make data available and in format useful to multiple entities |
| AR | 4 | 7 | TWR: many studies underway; need to see data to know if restoration successful: is it from restoration or natural regeneration? |
| AR | 4 | 7 | Agree with NAS about long-term project; attracts more researchers from academia, enhancing peer review and publish |
| AR | 4 | 7 | Phosphorous item p. 127 - agree with NAS; collect existing data; are other nutrients important? |
| AR | 5 | ? | Do not remove literature review from AR requirement |
| AR | 5 | ? | It is not clear how additional studies on FD movement would be beneficial |
| AR | 5 | ? | FD tag that collects data would not be plausible |
| AR | 5 | ? | The lack of relationship between low-flow and FD survival and reproduction confirms the species' slack-water association |
| AR | 5 | ? | FD utilize SAV for all parts of life. Not clear additional info. would improve understanding |
| AR | 5 | ? | Understanding of the FD is broad and detailed enough for HCP purposes |
| AR | 5 | ? | Planting of TWR in shallow water allows sexual reproduction and ultimately genetic diversity. Plantings are done in both deep and shallow water; suitable habitat is diverse and currently considered. |
| AR | 5 | ? | TWR has persisted throughout years of fluxuation in flow; additionally, increases in Rec. and increase in TWR coverage. |
| AR | 5 | ? | Importance of determination of low-flow vs. recreation on TWR is a good question but practicality of methods or testing is unclear. |
| AR | 5 | ? | CSRB is absolutely not an indicator species for determining the health of other listed species (not abundant or widely distributed and is not easily collected) - "indicator criteria" |
| AR | 5 | ? | Many studies need to be put into perspective of return on investment for the HCP. |
| AR | 5 | ? | Use a wider-range of species to better understand the system health |
| AR | 5 | ? | Possibly look into a watershed analysis to determine health in addition to the Eco. Model |
| AR | 5 | ? | More transparency, connectivity, and evaluation between programs (inside and outside the HCP) to improve HCP goals ... "bridging silos" |
| AR | 5 | ? | Given the restriction and limitation of actual covered species, worthwhile to devote resources |

| | | | to investigating feasibility and accuracy of surrogate species |
|-------|-------------|--------------|--|
| Topic | Small group | # in support | Comment |
| AR | 5 | ? | We support a way to include longer-term projects. This is a specific necessity to continue the improvements to the AR program. |
| AR | 6 | 5 | Support greater participation of research scientists (expand the diversity of scientists): - using existing bibliographies (with an emphasis on TAXA or stream system) to identify experts; - Google scholar; - scientific conference: presentation of research, keynote speakers; - a symposium |
| AR | 6 | 5 | Support longer term research projects to incentivize greater participation |
| AR | 6 | 5 | Proposals should be evaluated based in part on good/current literature review |

Appendix E: Oral, Written and Parking Lot Comments

Formal Oral Comments:

| Topic | Name | Affiliation | Comment |
|-------|------------------|--|--|
| HM | Myron Hess | National Wildlife Federation, Stakeholder Com. | One of the things we talked about, and this is sort of my articulation of it, the way I was thinking about it is that for me the highest priority in this hydrologic modeling is to quantify uncertainty and use that quantification of uncertainty to help us identify where should we be prioritizing efforts, where do we think that biggest uncertainty is coming from, how does that help us then focus on how we might narrow down that uncertainty as we move forward. So in terms of thinking about a really high priority, for me that's how I think about it. That seemed to make a lot of sense in that that might help us make some of these other decisions, how do these other things help to address the uncertainty that's in this model. How small of a task that is is something I don't have a good feel for, but it just seemed like a really important thing that could help us make better informed decisions on other things as we move continue to move forward on the modeling and that sort of thing. |
| HM | Charlie Kreidler | Science Committee | I sit on the Science Committee and have been involved in the modeling efforts on the Edwards or the hydrogeology of the Edwards since the late 70s. We've gone through multiple iterations on these models and the model you are seeing that the NAS has commented on is just the most recent on that, so this has been going on from all sorts of different efforts on that. Uncertainty is a very interesting problem in our modern days of understanding. Physical processes are moving more in the stochastic side of things and trying to understand the variability and that's pervasive across the science business. This model is not being designed or being used in this HCP in the context of trying to prove or disprove particular hydrologic processes. It needs to be used in the context of testing various hydrologic management tools, whether it's VISPO or ASR or water conservation or how much SAWS pumps or how much the irrigators pump. I mean that's what the model is supposed to be being used for. And as to whether there's kind of half of the picture in the HCP is what happens in the springs and the other half of the HCP is what happens in the aquifer, and the model is designed to figure out what goes on in the aquifer. And in talking with people, I don't see Ed O'Borne (?) here, talking electronically to him over the weekend, I asked him specifically is the model going to be used within the ecosystem model? And his answer was "not really." I mean they will put in a variety of different hydrologic numbers of spring flow to be able to see how their model works, but they don't necessarily need to see a model that is there on a daily time step that accurately portrays how much discharge is coming out of the springs. That's not relevant to their ecosystem modeling. The model is there to be able to test VISPO, to test ASR whether it's EAASR, or SAWSASR, regional water conservation, etc. etc. And there's a model there now that is relatively well restrained and if you look at their calibration curves for the amount of flow that is observed to discharge from Comal and San Marcos versus their model, it's a heck of a lot better than it was five years ago. And so we now have a tool that is better than it was five years ago for testing the different scenarios that are being used for water conservation. Let's go ahead and use it. Uncertainty is important, but it's something that will be out there in the future that needs to be worked with. We can spend another three or four years working on uncertainty on the model and never use the model. We can use the model today without the uncertainty and we can have some better understandings as to how this system works. Now, the other thing that we don't really understand is we don't really understand how the pumpage varies through the model or through the aquifer. Whether it's the irrigators, whether it's the City of San Antonio and their pumpage. And we compare everything back to a drought of record in the 50's, ok, a long time ago. We need to start looking at how the model works in the context of how SAWS pumps, how the irrigators pump, on shortened time periods. And these are the areas that the model will be of value to us to understand. Because we don't really understand how the aquifer is being managed. We don't really understand how critical period management works. We don't really understand how the irrigators pump and they don't pump, and what pool they're in, all this sort of thing. And these are as critical issues for understanding how the model and how the aquifer works as worrying about the uncertainty as to whether there's an increase in the permeability in the rocks in Uvalde County or in Medina. They are incidental in comparison to understanding better how the aquifer's being used. And I've obviously exceeded my time. |

| | | | |
|-----|---------------------|-------------------|--|
| HM | E. Conrad Lamon III | Science Committee | Well, thank you, but I couldn't disagree more. The use of a model without uncertainty analysis is a dangerous thing. Uncertainty and probabilistic distribution of where we think some measured state of nature is going to land is necessary to make a decision, if we value that state in nature. We've got a prediction of probability of where it falls and we can calculate some sort of expected value and make a decision, a rational decision, based on that. What we're talking about in terms of uncertainty analysis here is not whether there's a conduit here or a conduit there. What we're talking about is quantifying how wrong the model is in making prediction of what we care about. And without that, we really don't know how to deal with that, we don't know how to use this output as input into another model. And unless we can treat these outputs, or these predictions, probabilistically, treating these models as if they're known with certainty is going to just be, I don't want to go overboard, but it's not going to be a good outcome for the species we're trying to protect or certainly for the rate-payers such as SAWS or any of the other partners. Anyway, that's three minutes. |
| HM | Carol Patterson | self | With regard to uncertainty, one of the things that adds to uncertainty in the outcomes is that we are required in the modeling to model the pumpage as if it was the total permitted amount, the whole 572 when we're actually pumping annually about 340,000 or under 400,000. So, in one way that can be looked at as a kind of safety net if you're overestimating the pumping then you can feel like there's a little more margin of error there for the springs, as it's more conservative. But it might be a good idea to actually do the modeling as best we can on the actual pumping, if we really want to see what's actually happening. The second issue that I'd like to address has to do with the conduits that may be the size of a pinky finger or less or quite larger in some other places. But to know where the conduits are, you also need to know where the denser matrix is. Because in managing the model, if it were only conduits there would be no storage. We wouldn't have continuous spring flow in drought at this point. We couldn't. So we need to know where the barriers to flow are as well. You can't just know one end of that equation without knowing the other. And USGS I think has been interested for quite a few years in the dual, actually triple porosity of the aquifer. And we have an example of what happens maybe when the big conduits have drained, but there's still drainage from the secondary porosity into the conduits that continues to feed the springs in times of drought. And we've seen that when say the farmers stop pumping, or they used to, they've changed their cropping patterns now and that's something else we need to understand, but they used to stop at about July 4th and then the aquifer would stabilize. And it maybe that the major conduits had drained, but we were able to keep the aquifer from then falling and the springs still up because we had water that was continuing to flow even in drought into the conduits to the springs. So both are important. |
| Mon | Bill Adams | TXSTATE | In our group, we thought that on the index testing that we needed to have randomized testing as well. And then compare that to the index to see what correlation is between that and see if it made any difference. And then to integrate the bio testing and the water quality testing, just to enhance that and see what the relationship is, because it indicated in some of the comments from NAS that those were loosely integrated. So there's bound to be more of a closer correlation. And then to support the macroinvertebrate testing because there is the issue with the riffle beetle and to see what kind of correlation there is to those abundant species that are there, and how that might correlate with the riffle beetle. And also talking about the cotton lure. Maybe if we tested that correlation to some of the macroinvertebrates in those same areas to see what kind of relationship there might be there. And to tie in to that with our last one for Small group 6, we were talking integrating more of the bio testing with the water quality monitoring. Again, there's a distinct correlation between those two and we need to better understand that. |

Formal Written Comments:

| | | | |
|----|------------------|---|---|
| HM | Dianne Wassenich | San Marcos River Fndtn/Stakeholder Com. | Our whole table agreed but we forgot to put in our table comments on hydro model that: it is most important that the model be as accurate as possible in low flow times - if we have to focus on one part of the very complex aquifer water movement. |
|----|------------------|---|---|

| | | | |
|------------------|----------------------|--------------------------|---|
| EM | Chad Norris | TPWD/ Science Com. | The low-flow objectives for Comal Springs was based largely on thermal modeling done by Hardy. This model included little to no low-flow data. The models predictions for temp at low flows should be compared to observed thermal data during low flows from 2011-2014. If sufficient data was not gathered at low flows for such analysis, it should be planned to occur in the future during low flows. |
| OI ¹⁷ | Adam Yablonski | | Report 1 validates the direction of our effort thus far, and offers a large number of suggested tweaks and changes to improve. While this is a nice wish list of things to do with unlimited resources and time, we now need to take a look and decide which ones will be practically implemented. During the combined Stakeholder/Science Committee NAS Report workshop, we went through and considered each suggestion and offered comments on the suggestions individually. However, the structure and time limits of the workshop were not conducive to weighing the relative costs and benefits of the suggested changes against one another. As we consider changing our scientific programs, every effort should be made to prioritize spending our limited funds and time on those changes which directly help achieve compliance with US Fish and Wildlife under the Incidental Take Permit. There are several sections of the "Overarching Issues" chapter that should be disregarded, as the subject matter discussed is outside the scope of this requested scientific report. For example, the "Possible Scenarios of Future Concern and Scenario Planning" section beginning on page 136 contains several "scenarios" that involve legislative and legal analysis which the NAS is neither qualified nor well-informed enough to offer. |
| EM | Glenn Longley | Science Com. | There seems to be a need for Community invertebrate composition. For an ecological model without treatment of this portion of the community - I see major shortcomings. The invertebrates are particularly important in understanding food chain dynamics. |
| HM | Charlie Kreitler | Science Com. | NAS Recommendation: EAA should move toward a single model. Response: The EAA should focus their modeling efforts associated with the HCP on their MODFLOW model, in that the MODFLOW model currently provides the best calibration with observed hydrologic data. The EAA, however, should not be discouraged in their continued efforts in finalizing and using their FEFLOW model. The FEFLOW model may provide new understandings of the hydrology of the Edwards Aquifer. |
| HM | Charlie Kreitler | Science Com. | NAS Recommendation: Model uncertainty needs to be quantitatively assessed and presented in formal EAA documents. Response: Agreed. Much of the modeling efforts have been based on the specific historic hydrologic conditions during the drought of record. A potential future drought that could severely impact the survival of endangered species may not look like the historic DOR. EAA needs to understand the uncertainties associated with the physical hydrologic parameters of the model as well as the uncertainties associated with various external hydrologic inputs to the aquifer. This might include: 1) short duration vs long duration droughts, 2) impact of various irrigation pumping scenarios, 3) impact of various municipal pumping scenarios, 4) impact of critical period management rules and the associated bottom up management strategies, and 5) the impact of aquifer storage and recovery by SAWS and the EAA. The EAA also needs to evaluate whether the CPM pumpage reduction strategies in the model adequately reflect the actual EAA CPM regulations. |
| HM | Charlie Kreitler | Science Com. | NAS Recommendation: More attention should be paid to the modeling of conduits. Response: There has been a multi-year discussion of the importance of conduits in groundwater flow in Edwards. Tracer studies conducted by the EAA and others on the Edwards clearly show the importance of conduits. Additional modeling may help further refine their presence, location and importance. Additional hydrogeologic field studies designed to study the importance of conduits versus the rest of the aquifer (the "porous" matrix) may prove more insightful than additional modeling efforts. |
| HM | Charlie Kreitler | Science Com. | NAS Recommendation: Hydrologic modeling should move toward making predictions on a daily time scale, e.g., by developing telescoping models of smaller regions. Response: The EAA's groundwater model development and use have been oriented toward regional geographic scale management and longer periods of time (not daily time steps). Collecting daily data (e.g. daily pumpage or water level data from irrigation wells) would be logistically very difficult and expensive. The ecologic models for the Comal and San Marcos systems will need daily flow data, but not necessarily derived from a regional model. More specific, detailed groundwater data are needed around the two spring complexes to better understand the local interaction between the groundwater and discharges from specific parts of the Landa Lake and Spring Lake complexes. This is not a modeling exercise. |
| OI | E. Conrad Lamon, III | Science Com. | While the workshop convened in San Antonio was helpful it was limited in scope to just four chapters of the NAS report. I urge that the Implementing committee pay special attention to Chapter 6 regarding the Overarching Issues facing the HCP. In this chapter, the report lists the |

¹⁷ OI stands for Overarching Issues

| | | | |
|-----|------------------|--------------|---|
| | | | <p>benefits of integration of "...monitoring, modeling and various individual experiments and field studies", and identifies the need for additional data analysis and performance monitoring of MM measures, and the development of possible scenarios of future concern. The review panel identified several steps to enhance integration, including 1) development of an overall conceptual model of the system, 2) development of a unified data/information management system and 3) convening an annual science meeting. I would point out that the conceptual model (step 1) could serve as the means to accomplish several of the committee's suggestions regarding the overarching issues above, particularly the additional data analysis and the evaluation of MM measure performance. A start at the conceptual models (by species, for TWR and FD) has been made, and appears as influence diagrams in several exhibits from Science Committee meetings on the EAA website. The influence diagram (probability network) approach has many advantages for managers, as it can be estimated rapidly (relative to alternative modeling frameworks) and updated readily when new information (in the form of data) becomes available. The statistical analyses involved in such models could identify spatio-temporal trends important in the evaluation of MM measures. Such models provide a natural way to measure and communicate uncertainty regarding any portion of the model. This will facilitate better discussions between managers and scientists at the annual science meeting (step 3 above), when gaps in understanding may be identified and plans for future studies and monitoring may be made. Such a model, populated by the best statistical data analyses of all the available data, can provide for rapid knowledge acquisition from new information (learning) and can provide the information landscape with which to evaluate actions or policies in an adaptive management framework.</p> |
| Mon | Charlie Kreidler | Science Com. | <p>NAS Recommendation: The biomonitoring and water quality monitoring programs are only loosely integrated. Response: The EAA needs to evaluate the overall water quality monitoring program. This review needs to: 1) integrate better with the ecosystem monitoring program, 2) integrate better with the restoration/mitigation programs being conducted by the cities of San Marcos and New Braunfels, and 3) evaluate whether all the numerous chemical nutrients need to be collected in the future sampling. Water quality sampling is expensive. Many nutrients are below levels of detection. It may be advisable to drop those analyses that do not provide insight into goals of the HCP. A HCP committee should evaluate how the water quality program can be refined to better meet the goals of the HCP.</p> |
| HM | Jeremy White | USGS | <p>The effect that the "bottom up" conservation measures have on Comal and San Marcos springflow is not known because there is uncertainty in the inputs to the hydrologic model used to simulate the conservation measures. We know that aquifer properties vary spatially, recharge varies spatially and temporally, and well pumpage is also somewhat uncertain (though better understood since metering has been implemented). When the uncertainty of each of the model inputs is propagated through the model, uncertainty is induced in the model outputs, which in this case is simulated response of springflow to each of the conservation measures. Unfortunately, the relationship between input uncertainty and output uncertainty is model specific and can only be determined through rigorous uncertainty analyses within a Bayesian statistical framework. Within this framework, uncertainty in model inputs and outputs are typically described with the familiar 95% credible (or confidence) limits so that the results of the analysis would be a range of simulated springflow conditions that are all equally likely. Ultimately, if the model inputs that control springflow have large 95% credible ranges, and those ranges are not reduced through the assimilation of observations (e.g. model calibration), then the simulated effect of the conservation measures may also have a large range of equally-likely springflow. This means that the simulated effect of the "bottom up" conservation measures may be statistically (much) lower than 30cfs at Comal springs during the drought-of-record period. For example, in this image: <i>[Inline image 2]</i> Imagine a (potentially) thicker line for each of the different conservation measures, where the thickness of the line represents the 95% credible range. If the line is thick enough to intercept 0cfs, then statistically, the spring flow is 0cfs. Let me know if any of this is unclear or needs better explanation.</p> |

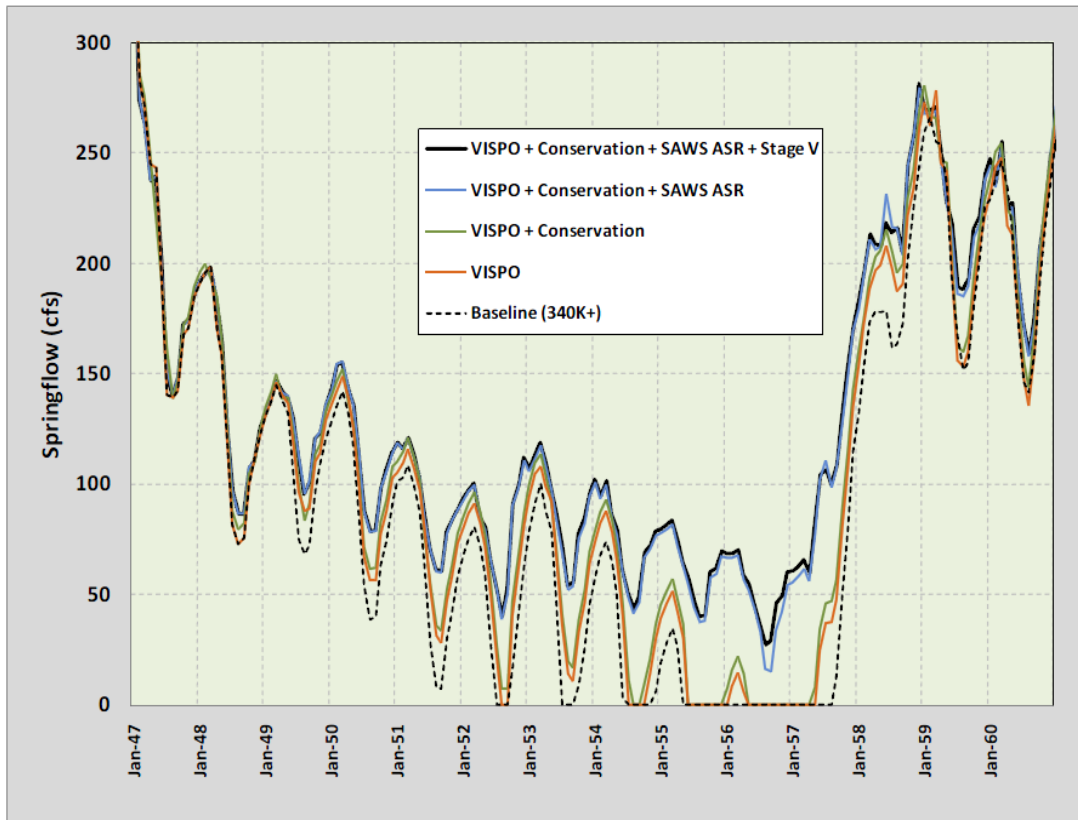


Figure 3-9. Simulated Springflow at Comal Springs (1947-1960)

18

Parking Lot Comments:

| | |
|--|---|
| Not related to NAS, general comment on ESA | Lack of information about riffle beetle points to concern of ESA listing protocol. More information should be required for listing. |
| HM | One of the activities associated with FEFLOW was a better understanding of the interinformational (sic) relationship at Trinity-Edwards. |
| HM | Where does the HCP permit allow that recharge estimate methods can be changed or modified from one to another, i.e. Puente → HSPF? |
| Mon | General consideration for NAS - Remember that the ecosystems are naturally dynamic, thus it is difficult to have a full range of conditions to sample. |
| EM | Ecosystem model being developed in isolation from the Science Cmte. |
| AR | Perform literature review and survey agencies to identify existing data and scientific products of relevance to HCP. |
| AR | HCP should adopt a goal of having research studies published in peer reviewed, appropriate journals. |
| HM | HSPF recharge - It has been related to me that some EAA staff believes the HCP compels the use of the Puente recharge estimates. That's not the case. The method can change if the HCP recharge triggers are revisited. |

¹⁸ Inline image 2.

Appendix F: Evaluations

**Edwards Aquifer HCP
Workshop on National Academy of Science Report 1
April 22, 2015**

| | Strongly agree | Agree | Neutral | Disagree | Strongly Disagree | N/A |
|---|----------------|-------|---------|----------|-------------------|-----|
| The meeting achieved the goal of receiving comments on the NAS report to inform the Implementing Committee. | 7 | 10 | 1 | | | |
| The meeting provided an opportunity to gain information about the NAS report. | 4 | 11 | 3 | | | |
| The meeting provided an opportunity to discuss key recommendations in the NAS report. | 9 | 9 | | | | |
| The small group discussion about NAS report topics was beneficial. | 10 | 6 | 2 | | | |
| There was sufficient time to discuss the topics. | 9 | 6 | 3 | | | |
| The meeting allowed me to understand the views of others related to the NAS report. | 4 | 12 | 2 | | | |
| *I had sufficient opportunity to make formal comments. | 11 | 6 | | | | |
| The meeting was well organized and run. | 11 | 7 | | | | |
| The notice for the meeting was timely and sufficient. | 8 | 9 | 1 | | | |

*One person did not rate this statement.

Please elaborate on any of the answers above:

- I enjoyed the interactive participation and the chance to float between groups.
- Would have been useful to have more discussion/dialogue on some topics (Hydro Model).
- Seemed like much of the comments were just regurgitated from the NAS report rather than expanding on them or providing insight into issues w/achieving the recommendations.
- Time for Hydro Model was limited.
- Plenty of opportunity provided to provide input or voice opinions.

What was most useful about the meeting?

- The discussion with those involved with the HCP was enlightening as to progress being made to date.
- Small group discussions.
- Hearing other points of view.
- Table discussion.
- Hearing others viewpoints.
- Hearing everyone's point of view.
- Appointing a table monitor. The brief presentation before discussion and the recommendation with the report cite was quite helpful.
- Hearing a variety of opinions on the recommendations.
- Brainstorming ideas.

What would you change about the meeting?

- Good stuff – hope we have added significant contribution to the HCP.
- Better opportunity to discuss/understand recommendations from other group discussions.
- It would have been useful for each work group to summarize comments for the entire group.

- The meeting was very well organized and recommend no change.
- It is my expectation that there will be a wide diversity & conflicting comments on the NAS recommendations. Therefore, it would have been beneficial to vet the differing points of view to assist in forging a unified recommendation.
- Nothing.
- More time and detail on overviews.

Appendix I5

Adaptive Mangement Science Committee

| | |
|-------------------|--|
| February 11, 2015 | Meeting Agenda |
| | Meeting Minutes |
| March 11, 2015 | Meeting Agenda |
| | Meeting Minutes |
| April 7, 2015 | Meeting Agenda |
| | Meeting Minutes |
| April 22, 2015 | Joint Workshop with the Stakeholder Committee Agenda |
| | Report on April 22 Workshop to Implementing Committee |
| May 6, 2015 | Meeting Agenda |
| | Meeting Minutes |
| June 10, 2015 | Meeting Agenda |
| | Meeting Minutes |
| September 9, 2015 | Meeting Agenda |
| | Meeting Minutes |
| November 10, 2015 | Meeting Agenda |
| | Meeting Minutes |
| December 17, 2015 | Joint Implementing, Stakeholder and Science Committee Meeting Agenda |
| | Meeting Minutes |



NOTICE OF OPEN MEETING

Available at eahcp.org

As required by 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), a meeting of the **Science Committee** for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **9am on Wednesday, February 11th at the San Marcos Activity Center, 501 E. Hopkins St., San Marcos, TX**. Lunch will be available to purchase for \$10. Please RSVP to spayne@edwardsaquifer.org.

Members of this committee include: Tom Arsuffi, Doyle Mosier, Charles Kreidler, Jacquelyn Duke, Jackie Poole, Floyd Weckerly, Chad Norris, Glenn Longley, Janis Bush, Conrad Lamon, and Robert Mace. At this meeting, the following business may be considered and recommended for committee action:

1. Call to Order.
2. Public Comment.
3. Approval of minutes from the November 5th Science Committee meeting and presentation of December 18th Joint Committee meeting as approved by the Implementing Committee (Attachment 1 and 2).
4. Receive Report from the EAHCP Program Manager.
 - Newsletter Distribution list
 - January 22nd Stormwater Sampling Event in the Comal system
 - NAS Process (Attachment 3)
 - Springflows and J-17 Index Well Level Forecast
5. Presentation of the 2014 Applied Research Results: Fountain Darter Movement Under Low-Flow Conditions in the Comal Springs/River Ecosystem (Attachment 4).
Purpose: To present the results of the 2014 Fountain Darter Applied Research project.
Action: None required
6. Presentation of the 2014 Applied Research Results: Effects of Low Flow on Fountain Darter Reproductive Effort (Attachment 5).
Purpose: To present the results of the 2014 Fountain Darter Applied Research project.
Action: None required
7. Presentation of the 2014 Applied Research Results: Effects of Predation on Fountain Darters Study (Attachment 6).
Purpose: To present the results of the 2014 Fountain Darter Applied Research project.

Action: None required

8. Presentation of and possible action to recommend the results of the 2014 Net Disturbance and Take Assessment Report for adoption by the Implementing Committee (Attachment 7).

Purpose: To allow the Science Committee the opportunity to comment on the amended methods for calculating Take.

Action: To recommend the results of the 2014 Net Disturbance and Incidental Take Assessment Report for adoption by the Implementing Committee.

9. Presentation of and possible action to provide input on the proposed 2015 Sediment Impacts on Texas wild-rice Applied Research methods (Attachment 8).

Purpose: To provide the Science Committee the opportunity to review and comment on the methodologies for the Sediment Impacts on Texas wild-rice Applied Research project.

Action: Provide contractor input to methodology and experimental design.

Lunch

10. Presentation of the 2014 Water Quality Monitoring Report (Attachment 9)

Purpose: To provide the Science Committee the opportunity to review the results of the 2014 Water Quality Monitoring program.

Action: None required

11. Presentation of details on the development of the Ecological Model.

Purpose: To provide the Science Committee with an update on the development of the Ecological Model.

Action: None required

12. Future agenda items.

- Ecological Modeling follow-up
- 2014 CSRB Applied Research Results
 - CSRB Plastron
 - CSRB Baseline Population
 - CSRB Extended Low Flow Effects
- 2014 Hydrological Modeling Report
- 2014 Biological Monitoring Report
- 2015 Applied Research Methods
 - Algae Dynamics
 - Ludwigia Plant Competition
 - CSRB Habitat Connectivity
- 2016 Applied Research Prioritization and Key Elements

13. Questions and comments from the public.

14. Adjourn



MEETING MINUTES

February 11, 2015

Available at eahcp.org

1. Call to Order. 9:05 am

Members present include: Tom Arsuffi, Doyle Mosier, Charles Kreitler, Jacquelyn Duke, Jackie Poole, Floyd Weckerly, Chad Norris, Glenn Longley, Janis Bush, Conrad Lamon, and Robert Mace.

2. Public Comment.

No comment.

3. Approval of minutes from the November 5th Science Committee meeting and presentation of December 18th Joint Committee meeting as approved by the Implementing Committee.

Charlie Kreitler moved for approval. Jackie Poole seconded. There was no objection.

4. Receive Report from the EAHCP Program Manager.

- Alicia Reinmund-Martinez discussed the Newsletter Distribution and if the committee had any suggestions for additional email on our list.
- Gizelle Luevano, EAA Hydrologic Data Coordinator, presented the results of the January 22nd Stormwater Sampling Event in the Comal system.
- Nathan Pence, EAHCP Program Manager, presented the National Academy of Science report process to the committee.
- Shaun Payne, EAHCP Coordinator, gave a presentation on Springflows and J-17 Index Well Level update.

5. Presentation of the 2014 Applied Research Results: Fountain Darter Movement Under Low-Flow Conditions in the Comal Springs/River Ecosystem.

Jake Jackson presented the results of Fountain Darter Movement Applied Research project. Discussion about variables and overall questions pertaining to the implications of the results followed. Presentation can be found under February 11th Science Committee Documents on eahcp.org.

6. Presentation of the 2014 Applied Research Results: Effects of Low Flow on Fountain Darter Reproductive Effort.

Harland Nichols presented the results of the Fountain Darter Reproduction Applied Research project. Discussion about variables and overall questions pertaining to the implications of the results followed. Presentation can be found under February 11th Science Committee Documents on eahcp.org.

7. Presentation of the 2014 Applied Research Results: Effects of Predation on Fountain Darters Study.

Myranda Clark presented the results of the Fountain Darter Predation Applied Research project. Discussion about variables and overall questions pertaining to the implications of the results

followed. Presentation can be found under February 11th Science Committee Documents on eahcp.org.

8. Presentation of and possible action to recommend the results of the 2014 Net Disturbance and Take Assessment Report for adoption by the Implementing Committee.

Ed Oborny presented the 2014 Net Disturbance and Take Assessment Report to the committee. Discussion pertaining to methods and general state of the system followed. Presentation can be found under February 11th Science Committee Documents on eahcp.org.

Todd Vottler asked if we could show a comparison to the overall population of the species.

Glen Longley made a motion to recommend the report for adoption by the Implementing Committee. Floyd Weckerly seconded. There was no objection.

9. Presentation of and possible action to provide input on the proposed 2015 Sediment Impacts on Texas wild-rice Applied Research methods.

Dr. Thom Hardy presented the objectives and methodology for the 2015 Sediment Impacts Applied Research study. Conrad Lamon asked specifically about assumptions for empirical relationships to be developed from the data gathered. Discussion about the methods followed. Presentation can be found under February 11th Science Committee Documents on eahcp.org.

10. Presentation of the 2014 Water Quality Monitoring Report.

Phil Pearce, SWCA, presented the summary of the Water Quality Monitoring program for 2014. Charlie Kreidler discussed that the analysis of the Water Quality data should reflect the impact on the Covered Species and not the purpose of TCEQ regulations. Glenn Longley mentioned a possible analysis of toxicity in species of concern. A general comment was to continue the monitoring, but to be less intensive.

Ed Oborny mentioned the findings in the Biological Monitoring effort and what the effects are on the species. Floyd Weckerly mentioned limiting the presentations of the Water Quality Monitoring program. Some more general discussion on collection and analysis followed and could the monitoring program stay as robust or be paired down. Dr. Hardy mentioned pursuing efforts being done by other entities.

Ms. Gizelle Luevano, EAA staff, gave a presentation about the Real Time Monitoring system portion of the Water Quality Monitoring program.

Presentations can be found under February 11th Science Committee Documents on eahcp.org.

11. Presentation of details on the development of the Ecological Model.

Ed Oborny introduced the Ecological Modeling Team, Dr. Grant, Dr. Wang, Dr. Doyle, Dr. Swannack, Dr. Hardy, and Dr. Ward.

Dr. Swannack presented about the agent based model.

Dr. Hardy presented the hydrologic and water quality parameters of the model.

Dr. Doyle presented the percent cover to biomass study for input into the Ecological Model.

Dr. Swannack presented the Aquatic Vegetation portion of the model.

Dr. Jackson presented the Food Source Analysis for input into the model.

Dr. Wang and Dr. Grant presented the Fountain Darter Modeling.

Dr. Ward Overview of Key Decisions.

Ed Oborny presented the Ecological Model schedule and next steps.

Throughout presentations, committee members asked several questions. Since many members had to leave before the end of the presentation Ms. Reinmund-Martinez told the committee that she would follow-up requesting members to provide input on the models spatial scope and data needs.

Presentations can be found under February 11th Science Committee Documents on eahcp.org.

12. Future agenda items.

13. Questions and comments from the public.

No Comment

14. Adjourn: 4:55 pm



NOTICE OF OPEN MEETING

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As required by 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), a meeting of the **Science Committee** for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Wednesday, March 11, 2015, at 9:00 a.m. at the San Marcos Rec Hall (Lions Club Tube Rental at City Park), 170 Charles Austin Dr., San Marcos, TX.** Lunch will be available for \$10. Please RSVP to spayne@edwardsaquifer.org.

Members of this committee include: Tom Arsuffi, Doyle Mosier, Charles Kreidler, Jacquelyn Duke, Jackie Poole, Floyd Weckerly, Chad Norris, Glenn Longley, Janis Bush, Conrad Lamon, and Robert Mace. At this meeting, the following business may be considered and recommended for committee action:

1. Call to Order.
2. Public Comment.
3. Approval of minutes from the February 11th Science Committee meetings (Attachment 1).
4. Receive Report from the EAHCP Program Manager.
 - Springflow and Index Well update
 - National Academy of Sciences update
5. Presentation of “2014 Report on: Borehole Colonization Traps within Spring Run 1 of the Comal River” (Attachment 2).
Purpose: To provide the Science Committee information regarding the recent Borehole study report.
Action: None required
6. Presentation of the 2014 Applied Research results: Comal Springs Riffle Beetle (CSRB) Plastron Use During Low-Flow (Attachment 3).
Purpose: To provide the Science Committee the results/data gathered through the 2014 Applied Research.
Action: None required
7. Presentation of the 2014 Applied Research results: Effects of Low-Flow on CSRB Survival (Attachment 4).
Purpose: To provide the Science Committee the results/data gathered through the 2014 Applied Research.
Action: None required

8. Presentation on the development of the Finite Element and MODFLOW Hydrologic models (Attachment 5 & 6).
Purpose: To provide the Science Committee information regarding the Hydrologic Modeling effort.
Action: None required

Lunch

9. Presentation and possible action to recommend the 2015/2016 Ecological Model Scope of Work for the Implementing Committee approval and presentation on capabilities of the Ecological Model (Attachment 7 & 8).
Purpose: To provide the Science Committee the opportunity to recommend the plans for the Ecological Model Scope of Work and to provide the opportunity to discuss the Ecological Model's capabilities.
Action: To recommend to the Implementing Committee approval of the 2015/2016 Ecological Modeling Scope of Work.
10. Presentation of the 2014 Biological Monitoring Reports (Attachment 9 & 10).
Purpose: To present the 2015 Biological Monitoring reports for the San Marcos and Comal Springs.
Action: None required.
11. Presentation and possible action to provide input on the proposed 2015 Applied Research methods: Ludwigia Plant Competition (Attachment 11).
Purpose: To provide the opportunity for the Science Committee to give input into the development of the 2015 Applied Research methodology.
Action: Provide input on the proposed methodology.
12. Presentation and possible action to provide input on the proposed 2015 Applied Research methods: CSRB Habitat Connectivity (Attachment 12).
Purpose: To provide the opportunity for the Science Committee to give input into the development of the 2015 Applied Research methodology.
Action: Provide input on the proposed methodology.
13. Presentation and possible adoption of the Process to Select Applied Research Studies (Attachment 13).
Purpose: To present to the Science Committee the process to select the 2016 Applied Research studies.
Action: Adopt the proposed Process to Select Applied Research Studies.
14. Future agenda items.
- 2014 Applied Research study – CSRB Occupancy Modeling and Population Estimate Within the Comal Springs System, New Braunfels, Texas
 - 2015 Applied Research methods – Algae Dynamics
 - Summary of NAS Review of the Edwards Aquifer Habitat Conservation Plan: Report 1
 - San Marcos Water Quality Protection Plan and Sessoms Creek Remediation Plan
 - 2016 Applied Research prioritization
15. Questions and comments from the public.
16. Adjourn.



MEETING MINUTES

March 11, 2015

Available at eahcp.org

1. Call to Order: 9:00 am

Members of this committee include: Tom Arsuffi, Doyle Mosier, Charles Kreidler, Jacquelyn Duke, Jackie Poole, Floyd Weckerly, Chad Norris, Glenn Longley, Janis Bush, Conrad Lamon, and Robert Mace.

Robert Mace was unable to attend. A quorum was present.

2. Public Comment.

No Comment

3. Approval of minutes from the February 11th Science Committee meetings.

Charlie Kreidler moved to approve the February 11th minutes. Conrad Lamon seconded. There was no objection.

4. Receive Report from the EAHCP Program Manager.

- Springflow and Index Well update
Shaun Payne, HCP Coordinator, presented the month's springflow and index well levels.
- National Academy of Sciences update
Nathan Pence, Program Manager, explained the NAS report and the process to review the report. Conrad Lamon asked specific questions about implementation details and the Ecological Model.

5. Presentation of "2014 Report on: Borehole Colonization Traps within Spring Run 1 of the Comal River."

Chad Norris and Randy Gibson presented information about a study done in partnership with USFWS to analyze the presence of Comal Springs Riffle Beetles in interstitial spaces. Presentation can be found on the eahcp.org website.

Conrad Lamon asked specifically about how this study will provide valuable information to the goals of the EAHCP. Discussion followed.

6. Presentation of the 2014 Applied Research results: Comal Springs Riffle Beetle (CSRB) Plastron Use During Low-Flow.

Parvathi Nair gave a presentation summarizing the results of the CSRB Plastron study. Full presentation can be found on the eahcp.org website.

Various questions pertaining to the findings were asked by the Science Committee. The results showed a better understanding of the appropriateness of surrogate use in CSRB studies and general resistance of the plastron.

7. Presentation of the 2014 Applied Research results: Effects of Low-Flow on CSRB Survival.

Michael Edwards and Taylor Jones presented the results of the CSRB survival study. Full presentation can be found on the eahcp.org website.

Questions pertaining to specific events including a die-off of beetles were discussed.

- 8. Presentation on the development of the Finite Element and MODFLOW Hydrologic models.**
Jim Winterle, EAA staff, presented the details of the Hydrologic modeling development. Full presentation can be found on the eahcp.org website.

First, Mr. Winterle presented the details produced by the MODFLOW model at this point. The Committee asked various questions and had comments about details. Charlie Kreidler and Conrad Lamon mentioned their approval of the significant improvements this model has experienced.

Second, a summary of the Finite Element report was given. The Committee asked questions pertaining to the number of goals that were not met.

General comments were made about the future of the development of the models as well as how certain NAS recommendations will be addressed. Discussion followed.

- 9. Presentation and possible action to recommend the 2015/2016 Ecological Model Scope of Work for the Implementing Committee approval and presentation on capabilities of the Ecological Model.**

Ed Oborny, BIO-WEST Inc., presented their Ecological Modeling Scope of Work. Presentation can be found on the eahcp.org website.

The Committee discussed the next steps for the Ecological Model.

Dr. Longley moved to recommend to the Implementing Committee to approve the 2015/2016 Ecological Modeling Scope of Work. Dr. Lamon mentioned that as long as the NAS recommendations are given reasonable consideration for further model development, he has no real issue. Dr. Arsuffi seconded. There was no objection.

- 10. Presentation of the 2014 Biological Monitoring Reports.**

Ed Oborny, BIO-WEST Inc., provided the Science Committee a summary of the Biological Monitoring Report for the Comal system and San Marcos system. Mr. Oborny provided data for specific species being monitored throughout 2014. Presentation can be found on eahcp.org website.

- 11. Presentation and possible action to provide input on the proposed 2015 Applied Research methods: Ludwigia Plant Competition.**

Casey Williams, BIO-WEST Inc., presented the objectives and proposed methods for the Ludwigia Plant Competition study.

Dr. Arsuffi mentioned the important terminology clarification with using “interference competition” rather than “resource competition.” Discussion followed.

Presentation can be found on the eahcp.org website.

Janis Bush asks several questions about the spacing and details about competition details. Discussion followed.

- 12. Presentation and possible action to provide input on the proposed 2015 Applied Research methods: CSRB Habitat Connectivity.**

Taylor Jones, BIO-WEST Inc., and Weston Nowlin, Texas State University, presented the objectives and proposed methods for the CSRB Habitat Connectivity study. Presentation can be found on the eahcp.org.

Dr. Nowlin described a preliminary study attempting to compare the Freeman Aquatic Building at Texas State University and San Marcos Aquatic Resource Center as well as testing surrogates for appropriateness.

Ms. Jones presented the details to the Habitat Connectivity study. Dr. Longley and Dr. Kreidler made commits to clarify the assumptions made about the survival and habitat preferences. Discussion followed.

Dr. Nowlin described lateral habitat connectivity as well as a riffle beetle diet studies. Discussion about appropriateness of “connectivity” as a study title and necessity of specific study requirements in the HCP compared to scientific opinion on possible studies. Discussion followed.

There was a conversation about the Science Committee supporting a resolution to increase numbers of individuals placed on a USFWS permit for a contractor.

13. Presentation and possible adoption of the Process to Select Applied Research Studies.

EAHCP Program Manager, Nathan Pence, presented a proposed process change in developing Applied Research studies for bid. Discussion about potential brainstorming opportunity as well as various edits to the process proposed. Discussion followed.

Additionally, Melani Howard, City of San Marcos, mentioned a potential change in the level of detail the Science Committee will receive about specific mitigation and minimization measures.

14. Future agenda items.

- 2014 Applied Research study – CSRB Occupancy Modeling and Population Estimate Within the Comal Springs System, New Braunfels, Texas
- 2015 Applied Research methods – Algae Dynamics
- Summary of NAS *Review of the Edwards Aquifer Habitat Conservation Plan: Report 1*
- San Marcos Water Quality Protection Plan and Sessoms Creek Remediation Plan
- 2016 Applied Research prioritization
- Applied Research Development Process

15. Questions and comments from the public.

16. Adjourn. 4:26 pm



NOTICE OF OPEN MEETING

Available at eahcp.org

As required by 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), a meeting of the **Science Committee** for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Tuesday, April 7th at 9:00 a.m. at the San Marcos Activity Center, 501 E. Hopkins St., San Marcos, TX.** Lunch will be available for \$10. Please RSVP to spayne@edwardsaquifer.org.

Members of this committee include: Tom Arsuffi, Doyle Mosier, Charles Kreidler, Jacquelyn Duke, Jackie Poole, Floyd Weckerly, Chad Norris, Glenn Longley, Janis Bush, Conrad Lamon, and Robert Mace. At this meeting, the following business may be considered and recommended for committee action:

1. Call to Order.
2. Public Comment.
3. Approval of minutes from the March 11th Science Committee meetings (Attachment 1).
4. Receive Report from the EAHCP Program Manager.
 - Springflow and Index Well update
 - Comal Springs riffle beetle Recovery Sampling
 - Use of surrogate species in Applied Research
5. Presentation of 2014 Applied Research results – CSRB Occupancy Modeling and Population Estimate Within the Comal Springs System, New Braunfels, Texas (Attachment 2).
Purpose: To present the 2014 Applied Research results of the CSRB Occupancy study.
Action: None required.
6. Presentation and possible action to provide input on the proposed 2015 Applied Research methods – Algae Dynamics (Attachment 3).
Purpose: To provide an opportunity for the Science Committee to comment on and provide input towards development of the 2015 Applied Research methodology.
Action: Provide input on the proposed methodology.
7. Presentation on the summary of NAS Review of the Edwards Aquifer Habitat Conservation Plan: Report 1 (Attachment 4).
Purpose: To present a summary of the information received about the NAS Report 1.
Action: None required.

8. Presentation on the San Marcos Water Quality Protection Plan (WQPP) and Sessoms Creek Remediation Plan.
Purpose: To provide the Science Committee information regarding water quality protection efforts in San Marcos.
Action: Provide input on the City of San Marcos WQPP.
9. Open Committee Discussion: Applied Research
Purpose: To provide the Science Committee the opportunity to brainstorm on various aspects of the proposed Applied Research Fundamental Questions.
Action: None required

Lunch

10. Presentation and prioritization of potential 2016 Applied Research Fundamental Questions (Attachment 5).
Purpose: To allow the Science Committee to prioritize the Fundamental Questions for 2016 Applied Research program.
Action: Review and provide prioritization of Fundamental Questions for 2016 Applied Research Program.
11. Staff Report: Next Steps on the 2016 Applied Research Process.
Purpose: To provide the Science Committee with necessary information and resources to submit Key Elements for the 2016 Applied Research Program.
Action: None required
12. Staff report: 2016 Work Plan approval process (Attachment 6).
Purpose: To provide the Science Committee an overview of the process for the 2016 Work Plans.
Action: None required.
13. Presentation of the EAA Work Plans and possible action to recommend to the Implementing Committee (Attachment 7-9).
Purpose: To provide the Science Committee the opportunity to review and comment on the science related aspects of the EAA's 2016 Work Plans.
Action: Consider recommending the work plans for Implementing Committee approval.
14. Future agenda items.
 - The next Science Committee Meeting is scheduled for May 6th and the San Marcos Activity Center.
15. Questions and comments from the public.
16. Adjourn.



MEETING MINUTES

April 7, 2015

Available at eahcp.org

1. **Call to Order.**

Members of this committee include: Tom Arsuffi, Doyle Mosier, Charles Kreidler, Jacquelyn Duke, Jackie Poole, Floyd Weckerly, Chad Norris, Glenn Longley, Janis Bush, Conrad Lamon, and Robert Mace.

Floyd Weckerly and Robert Mace were unable to make the meeting. A quorum was present.

2. **Public Comment.**

No comment

3. **Approval of minutes from the March 11th Science Committee meetings.**

Jacquelyn Duke motioned to approve the minutes. Chad Norris seconded. There were no objections or edits.

4. **Receive Report from the EAHCP Program Manager.**

- Springflow and Index Well update
Shaun Payne, EAHCP Coordinator, presented the April J-17 index well levels and springflow conditions.
- Comal Springs riffle beetle Recovery Sampling
Bob Hall, EAA, presented the sampling results of CSRB Recovery
- Use of surrogate species in Applied Research
Nathan Pence provided an update on discussions with USFWS about using CSRB in Applied Research.
- Refugia Research presentation
Weston Nowlin, Texas State University, provided a presentation about the proposed Refugia Research. A more detailed presentation regarding Research Methods will be brought to the committee in May.

5. **Presentation of 2014 Applied Research results – CSRB Occupancy Modeling and Population Estimate Within the Comal Springs System, New Braunfels, Texas.**

Rachel Barlow, Zara Environmental, presented the results of the 2014 Applied Research study.

Questions pertaining to the statistical modeling were made by the committee. There were issues with the data and determining the significance for understanding the CSRB.

The full presentation is available at eahcp.org.

6. **Presentation and possible action to provide input on the proposed 2015 Applied Research methods – Algae Dynamics**

Casey Williams, BIO-WEST, presented the proposed methodology for the 2015 Applied Research study.

The committee had questions pertaining the information proposed to be gathered and in what way this will inform the HCP and the Ecological Modeling effort.

The full presentation is available at eahcp.org.

7. Presentation on the summary of NAS Review of the Edwards Aquifer Habitat Conservation Plan: Report 1.

Nathan Pence, Program Manager, gave the committee an overview of the NAS Review and the next steps in developing an Implementation Plan.

The full presentation is available at eahcp.org.

8. Presentation on the San Marcos Water Quality Protection Plan (WQPP) and Sessoms Creek Remediation Plan.

Melanie Howard, City of San Marcos/Texas State University, presented the Sessom Creek Remediation Plan with the assistance of Tom Hegemier, RPS-ESPEY and John Gleason, John Gleason LLC, presented the details of the WQPP.

There were many questions pertaining to the budget and differentiation of these two efforts by the committee.

The full presentation is available at eahcp.org.

9. Open Committee Discussion: Applied Research.

Mr. Pence introduced the brainstorming session and the continued inclusion of an open discussion in future meetings.

Alicia Reinmund-Martinez began the discussion by introducing each individual who provided their question for possible Applied Research Fundamental Questions.

First, the committee discussed aspects of the proposed questions relating primarily on the Comal Springs Riffle Beetle.

The committee decided to identify the gaps in knowledge about the species of interest for future studies:

- Food source of the Comal Springs Riffle Beetle (CSRB) (possibly a stable isotope study).
- Dissolved Oxygen and Temperature tolerance (over a long term for adult and larval stages).
- CSRB Genetics- Potential differentiation in various springs in the Comal spring system based on hydrologic separation (potential effects and/or distinctions of system hydrology and species genetics).
- Voltinism aspects of the CSRB (number of instars)

Following the discussion, the committee recommended these topics be combined into one study question that encompasses factors that influence the CSRB as well as observe its life history. Tom Arsuffi motioned to approve the recommendation. Glenn Longley seconded. There were no objections.

The committee continued to discuss various aspects of the information necessary to better understand the CSRB and what factors to include in the RFPs.

The committee began to discuss the Comal Springs Salamander and the information necessary to better understand this covered species.

A primary point of discussion is to settle the genetic make-up of the Comal Springs Salamander before a population estimate is attempted.

Tom Arsuffi moved to approve the question to specify a concentration on analyzing the taxonomic status of the Comal Springs Salamander. Janis Bush seconded. There were no objections.

The remaining Fundamental Questions were discussed in terms of how existing data could be analyzed to acquire important information through a model. Thus, no further questions were determined as necessary for Applied Research funding through the discussion.

A comment was made that the restoration and monitoring happening in the system could be utilized as ways to collect and analyze data to measure success and or fill information gaps about the covered species.

A request to have a separate meeting to discuss and determine what statistical analysis can be done with existing data and what questions could be answered.

Dr. Longley moved to make a recommendation to utilize some of the Applied Research Funding. Seconded by Janis Bush. No objection by the committee. Additionally, the committee mentioned those who are awarded the monitoring and restoration contracts should be expected to analyze their findings.

10. Presentation and prioritization of potential 2016 Applied Research Fundamental Questions.

This agenda item was successfully achieved during the previous item.

11. Staff Report: Next Steps on the 2016 Applied Research Process.

Alicia Reinmund-Martinez gave the committee a summary of the next steps of the Applied Research program.

12. Staff report: 2016 Work Plan approval process.

Mrs. Reinmund-Martinez provided the Committee a brief reminder of the process necessary in approving the 2016 Work Plans.

13. Presentation of the EAA Work Plans and possible action to recommend to the Implementing Committee.

Bob Hall presented the 2016 Applied Research and Biological Monitoring Work Plans.

Chad Norris mentioned that he would like to see Spring Run 1 added in the monitoring program for CSRB for low-flow as well as routine.

Geary Schindel, EAA, presented the 2016 Water Quality Monitoring Work Plan.

There were several questions pertaining to the Water Quality Monitoring Work Plan and how Science Committee recommendations, as well as the recommendations found in the NAS Report 1, will be included in 2016.

The full presentations are available on the eahcp.org website.

Dr. Longley moved to approve the 2016 EAA Work Plans. Charlie Kreidler seconded. There were no objections.

Charlie Kreidler mentioned that he would like to see additional analysis of the findings of the Water Quality monitoring program. It was determined that additional data would be required for a proper trend analysis.

14. Future agenda items.

- The next Science Committee Meeting is scheduled for May 6th and the San Marcos Activity Center.
- Discussion pertaining to the necessary analysis of existing data.
- Committee input on the draft Applied Research RFPs.
- City of San Marcos/Texas State and City of New Braunfels 2016 Work Plans.

15. Questions and comments from the public.

Dianne Wassenich mentioned that Saturday will be the Texas wild rice festival and the film Yakona will be shown accompanied by a live orchestra.

16. Adjourn.



NOTICE OF OPEN MEETING

Available at eahcp.org

As required by 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), a meeting of the **Science Committee** for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Wednesday, May 6th at 9:00 a.m. at the San Marcos Activity Center, 501 E. Hopkins St., San Marcos, TX**. Lunch will be available for \$10. Please RSVP to spayne@edwardsaquifer.org.

Members of this committee include: Tom Arsuffi, Janis Bush, Jacquelyn Duke, Charles Kreidler, Conrad Lamon, Glenn Longley, Robert Mace, Doyle Mosier, Chad Norris, Jackie Poole, and Floyd Weckerly. At this meeting, the following business may be considered and recommended for committee action:

1. Call to Order.
2. Public Comment.
3. Approval of minutes from the April 7th Science Committee meetings (Attachment 1).
4. Receive Report from the EAHCP Program Manager.
 - Springflow and Index Well update
 - City of New Braunfels Spring-fed Pool update
 - Update on the evaluation of National Academy of Sciences (NAS) Report 1 Recommendations.
5. Presentation and possible action to provide input on the proposed methods for the Refugia Captive Propagation Research study.
Purpose: To provide an opportunity for the Science Committee to comment on and provide input towards the Refugia Captive Propagation Research methods.
Action: Provide input on the proposed methodology.
6. Presentation of the proposed 2016 Applied Research Program Scopes of Work (SOW).
(Attachments 2-7)
Purpose: To present five draft SOW for additional comment and review.
Action: Provide input to the SOWs.
7. Open discussion on the potential next steps in developing an EAHCP Data Analysis effort.
Purpose: To provide the opportunity for the Science Committee to recommend various options for data analysis of existing biological data that enhances the achievement of the EAHCP biological goals and objectives.
Action: None required.

Lunch

8. Presentation on the City of New Braunfels' (CONB) 2016 Work Plan. (Attachment 8)
Purpose: To provide the Science Committee the opportunity to review and comment on the science related aspects of the CONB 2016 Work Plans.
Action: Consider recommending the Work Plans for Implementing Committee approval.
9. Presentation on the City of San Marcos and Texas State University's (COSM/TXSTATE) 2016 Work Plan. (Attachment 9)
Purpose: To provide the Science Committee the opportunity to review and comment on the science related aspects of the COSM/TXSTATE 2016 Work Plans.
Action: Consider recommending the Work Plans for Implementing Committee approval.
10. Future agenda items.
 - A special meeting of Science Committee is scheduled for June at the Old Channel in New Braunfels.
 - A Science Committee Meeting is scheduled for August 4th and the San Marcos Rec Hall (City Park-Lions Club Tube Rental).
11. Questions and comments from the public.
12. Adjourn.



SCIENCE COMMITTEE MEETING MINUTES

May 6, 2015

1. Call to Order: 9:02 am

Members of this committee include: Tom Arsuffi, Janis Bush, Jacquelyn Duke, Charles Kreidler, Conrad Lamon, Glenn Longley, Robert Mace, Doyle Mosier, Chad Norris, Jackie Poole, and Floyd Weckerly. Robert Mace and Doyle Mosier were not present. Dr. Arsuffi chaired the meeting in Mr. Mosier's absence.

2. Public Comment.

No Comment

3. Approval of minutes from the April 7th Science Committee meetings.

Conrad Lamon requested a quote by him recorded on page 3 to be removed. There were no objections to the edit.

Glen Longley motioned to approve. Janis Bush seconded. There was no objection.

4. Receive Report from the EAHCP Program Manager.

- Springflow and Index Well update
Shaun Payne, EAHCP Coordinator, gave a presentation on current Springflow and Index Well levels.
- City of New Braunfels Spring-fed Pool update
Mark Enders provided the committee an update on the work done in New Braunfels regarding removal of invasive plant species from the Spring-fed Pool.
- Update on the evaluation of National Academy of Sciences (NAS) Report 1 Recommendations
Mrs. Reinmund-Martinez presented the timeline of the NAS Report to remind the committee of the development of an implementation plan.

5. Presentation and possible action to provide input on the proposed methods for the Refugia Captive Propagation Research study.

Dr. Weston Nowlin, Texas State University, presented the methods to the Science Committee for overall comment and feedback.

Some questions and comments were made on various aspects of the methodology. Presentation, Literature Review, and Methods are available at eahcp.org.

6. Presentation of the proposed 2016 Applied Research Program Scopes of Work (SOW).

Bob Hall, EAHCP Project Coordinator, presented the draft Scopes of Work for five proposed studies. Discussion and comments provided are as follows:

- a. Comal Springs Riffle Beetle (CSRB) Trophic Level Status and Food Source Study- There was a conversation regarding the importance of understanding CSRB food source in

protection of the species. Further discussion on cost vs. benefit and level of information potentially obtainable. A decision was made to separate the food source study and trophic level study. A literature review should be expanded to include possible literature about the genus/family rather than specifically the CSRB only. Regarding Sub-Task 2.1, the stable isotope analysis was determined to be sufficient but not specifically stating just gut contents but also animal tissue. There was some discussion about including language specifying using experimental design and statistical analysis.

- b. Comal Springs Riffle Beetle Tolerance Study- A discussion on clarifying “long-term” and what the criteria should be in regards to previous “short-term studies. There were comments regarding the interaction between DO and Temperature using real-time data, when available. Comments were also provided that the study should also analyze the effects of DO and Temperature together.

Additionally, there was a discussion about these ranges and how they mimic what happens in the natural environment. Dr. Longley mentioned the inconsistency between CSRB habitat requirements and the importance of DO and Temperature variances in spring dwelling organisms (springs keep temperature and DO constant). Ms. Reinmund-Martinez asked the committee to propose the RFP as it is currently written (after committee edits) and determination of funding will be made as proposals are received.

- c. Comal Springs Riffle Beetle Life History- The committee asked Randy Gibson, USFWS, to comment on the Scope of Work question presented. Discussion pertaining to the appropriateness of this study followed.
- d. Comal Springs Salamander Taxonomic Status Study- Chad Norris explained that there has been an Evolutionary Biology Study published which established the Comal Springs Salamander as a more wide-spread species than previously thought. The committee thought it unnecessary to do any further study on this topic in 2016.
- e. Comal Springs Salamander Population Estimate- There was a conversation about this study still being necessary despite genetic testing. The committee discussed changing the question to reflect changes in population on seasonal variations in abundance and distribution.

The committee continued to discuss various edits and adjustment to the Scope of Works, including specific methodology development and other details.

7. Presentation on the City of New Braunfels’ (CONB) 2016 Work Plan.

Zac Martin and Mark Enders, The City of New Braunfels, presented their 2016 Work Plan with the help of various contractors. The presentation is available at eahcp.org.

The committee discussed each measure individually and provided specific pieces of feedback for each.

The committee agreed with the CONB about including an additional 14” culvert to be used as a back-up flow regulator for the Old Channel.

The riparian restoration and aquatic vegetation restoration efforts are currently done independently and the committee agreed with the CONB about integrating the effort to provide adequate light penetration to newly established aquatic vegetation. Additionally, Nathan Pence, EAHCP Program

Attachment 1

Manager, communicated that the continued decrease in the total coverage of *Hygrophila* would require an amendment to the HCP.

There was conversation about Dissolved Oxygen Management (DO) and the natural swings in the ecosystem. Additionally, the committee communicated with the CONB that they think the 4.0 mg/L of DO should be maintained as an instantaneous level goal not a daily or long-term average.

There was additional conversation regarding measuring success of these mitigation measures.

Glen Longley motioned to recommend the City of New Braunfels 2016 Work Plan to the Implementing Committee for final approval. Doyle Mosier seconded. There was no objection.

8. Presentation on the City of San Marcos and Texas State University's (COSM/TXSTATE) 2016 Work Plan.

Melani Howard and her contractors presented details about the 2016 Work Plan in regards to the goals established in the HCP and work done to date. The presentation is available at eahcp.org.

The committee commented on proper requirements and general necessities for Texas wild- rice in seed production and sexual reproduction. Discussion followed.

There was a request to see a map showing plantings and gardening locations throughout the system.

There was a discussion about riparian plant choices as well as propagation methods and maintenance.

9. Future agenda items.

The next Science Committee Meeting is scheduled for June 10th in New Braunfels.

- Statistical Analysis Discussion
- Re-vegetation plan for the Old Channel Bank Stabilization Project – Landa Haus

10. Questions and comments from the public.

Mr. Reinmund-Martinez forwarded an announcement from Lynn Fahlquist about the upcoming USGS Webinar.

11. Adjourn. 3:55 pm



NOTICE OF OPEN MEETING

Available at eahcp.org

As required by 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), a meeting of the **Science Committee** for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Wednesday, June 10th at 9:00 a.m. at the Landa Haus and Old Channel of the Comal River, 360 Aquatic Circle, New Braunfels, TX.**

Members of this committee include: Tom Arsuffi, Janis Bush, Jacquelyn Duke, Charles Kreidler, Conrad Lamon, Glenn Longley, Robert Mace, Doyle Mosier, Chad Norris, Jackie Poole, and Floyd Weckerly. At this meeting, the following business may be considered and recommended for committee action:

1. Call to Order. (Landa Haus)
2. Public Comment. (Landa Haus)
3. Approval of minutes from the May 6th Science Committee meetings. (Landa Haus) (Attachment 1)
4. Presentation of and discussion on the Re-vegetation plan of the Old Channel Bank Stabilization Project. (Landa Haus) (Attachment 2)
Purpose: To provide the committee an opportunity to receive a summary on the Re-vegetation plan of the Old Channel Bank Stabilization Project.
Action: Provide input on the City of New Braunfels' Re-vegetation plan; no formal action required.
5. On-site visit to the Bank Stabilization project location. (Old Channel of the Comal River)
Purpose: To provide the committee an opportunity to review on-site the Re-vegetation plan of the Old Channel Bank Stabilization Project.
Action: Provide input on the City of New Braunfels' Re-vegetation plan; no formal action required.
6. Discussion on the questions for an EAHCP Data Analysis effort. (Landa Haus) (Attachments 3 and 4)
Purpose: To provide the opportunity for the Science Committee to recommend questions to be answered through an analysis of existing data that will enhance the achievement of the EAHCP biological goals, and objectives.
Action: No formal action required.
7. Future agenda items. (Landa Haus)
 - The next Science Committee Meeting is scheduled for August 4th and the San Marcos Rec Hall (City Park-Lions Club Tube Rental).
 - Review of 2016 Applied Research project submittals.
8. Questions and comments from the public. (Landa Haus)
9. Adjourn.



SCIENCE COMMITTEE MEETING MINUTES

June 10, 2015

1. Call to Order. - 9:09 am

Members of this committee include: Tom Arsuffi, Janis Bush, Jacquelyn Duke, Charles Kreidler, Conrad Lamon, Glenn Longley, Robert Mace, Doyle Mosier, Chad Norris, Jackie Poole, and Floyd Weckerly.

Tom Arsuffi and Glenn Longley were unable to make the meeting.

2. Public Comment.

No public comment

3. Approval of minutes from the May 6 Science Committee meeting.

Floyd Weckerly moved to approve the minutes. Jackie Poole seconded. There was no objection.

4. Presentation, discussion and possible action pertaining to the Re-vegetation Plan of the Old Channel Bank Stabilization Project.

Doyle Mosier introduced the schedule of this item. The committee received a presentation from the City of New Braunfels then a guided tour of the site was conducted. Alicia Reinmund-Martinez reminded the committee that the overall plan has been approved by the committee. This presentation and site visit was intended to satisfy a request to have the re-vegetation plan of the Bank Stabilization Project come back to the committee for comment and suggestion.

Zac Martin and Mark Enders, the City of New Braunfels, began by presenting the details of the re-vegetation plan. The committee was guided to the project site on the Old Channel of the Comal River. The committee commented that shade tolerant plants will need to be considered primary in re-vegetation. General support was expressed by the committee.

The full presentation is available on eahcp.org.

5. Open discussion on the potential next steps in developing an EAHCP Data Analysis effort.

Mrs. Reinmund introduced the rationale for the discussion on data analysis.

A general brainstorming session began by determining the criteria of the data that has been collected. A discussion about developing questions that can be asked to analyze existing data continued.

6. Future agenda items.

The next Science Committee Meeting is scheduled for August 4th and the San Marcos Rec Hall (City Park-Lions Club Tube Rental).

7. Questions and comments from the public.

8. Adjourn.



NOTICE OF OPEN MEETING

Available at eahcp.org

As required by 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), a meeting of the **Science Committee** for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Wednesday, September 9, 2015, at 9 a.m. at the San Marcos Recreation Hall (Lions Club Tube Rental at City Park), 170 Charles Austin Drive, San Marcos, Texas, 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this committee include: Tom Arsuffi, Janis Bush, Jacquelyn Duke, Charles Kreidler, Conrad Lamon, Glenn Longley, Robert Mace, Doyle Mosier, Chad Norris, Jackie Poole, and Floyd Weckerly.

At this meeting, the following business may be considered and recommended for committee action:

1. Call to order.
 2. Public comment.
 3. Approval of minutes from the June 10 Science Committee meeting (Attachment 1).
 4. Receive report from the EAHCP Program Manager.
 - Introduction of Daniel Large, HCP Coordinator
 - Springflow and index well update
 - National Academy of Sciences update
 - Standard operating procedures (SOP) for the flow-split project (Attachment 2)
 - Standard operating procedures (SOP) for the aerators in Landa Lake (Attachment 3)
 - 2015 Applied Research Work Group (Attachment 4)
 5. Presentation and discussion of the procedure for Science Committee review of proposals received for the 2016 Applied Research RFPs (Attachments 5 and 6):
 - *Evaluation Of The Long-Term Elevated Temperature And Low Dissolved Oxygen Tolerances Of Larvae And Adult Comal Springs Riffle Beetle*
 - *Evaluation Of The Trophic Level Status And Functional Feeding Group Categorization Of Larvae And Adult Comal Springs Riffle Beetle*
 - *Evaluation Of The Life History Of The Comal Springs Riffle Beetle From Egg To Adult*
- Purpose: To prepare Science Committee for review of 2016 Applied Research RFP proposals.
Action: None required.

6. Brainstorming discussion on a statistical analysis project that evaluates progress towards accomplishing EAHCP Biological Goals. (Attachment 7).
Purpose: To provide the Science Committee the opportunity to provide input on the statistical analyses needed to evaluate accomplishment of EAHCP Biological Goals.
Action: To provide input on the questions to be asked in a statistical data analysis project.
7. Presentation on EAHCP Phase II Strategic Adaptive Management Decision Making.
Purpose: To provide information regarding Phase II Strategic Adaptive Management
Action: None required.
8. Future agenda items (November 10, San Marcos Rec Hall).
 - Update on the Ecological Model
 - Research Plan for the Salvage Refugia Program
 - Summary of the National Academy of Sciences October meeting
 - Proposed 2016 Science Committee meeting dates
9. Questions and comments from the public.
10. Adjourn.



NOTICE OF OPEN MEETING

Available at eahcp.org

MINUTES

As required by 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), a meeting of the **Science Committee** for the Edwards Aquifer Habitat Conservation Plan Program is scheduled for **Wednesday, September 9, 2015, at 9 a.m. in Meeting Room 1 of the San Marcos Activity Center, 501 E. Hopkins, San Marcos, Texas 78666**. Lunch will not be provided; the meeting is expected to end before lunchtime. Please RSVP to dlarge@edwardsaquifer.org.

Members of this committee include: Tom Arsuffi, Janis Bush, Jacquelyn Duke, Charles Kreitler, Conrad Lamon, Glenn Longley, Robert Mace, Doyle Mosier, Chad Norris, Jackie Poole, and Floyd Weckerly.

Charles Kreitler did not attend the meeting.

At this meeting, the following business may be considered and recommended for committee action:

1. Call to order.

9:02 a.m.

2. Public comment.

Dianne Wassenich: Expressed concern about EAHCP refugia project not taking place at San Marcos Aquatic Resource Center (SMARC). Ms. Wassenich stated she feels the SMARC has a proven track record and expertise for working with the EAHCP Covered Species, and that she is worried about the fact that they are not involved in the EAHCP refugia project.

3. Approval of minutes from the June 10 Science Committee meeting.

Approved.

4. Receive report from the EAHCP Program Manager.

1. Introduction of Daniel Large, HCP Coordinator – *Alicia Reinmund-Martinez introduced Daniel to the Committee.*
2. Springflow and index well update – *Shaun Payne gave the update to the Committee.*
3. National Academy of Sciences update. – *Nathan Pence provided an update to the Committee.*
4. Standard operating procedures (SOP) for the flow-split project – *Presented by Mark Enders.*
5. Standard operating procedures (SOP) for the aerators in Landa Lake – *Presented by Mark Enders.*

Mr. Norris asked a question about aerator placement, noting that although aerators were on during the latest drought, no testing was done. Dr. Arsuffi asks about volume of water relative to aerator production and efficacy, asking, "Wouldn't you want to test aerators before DO drops to below adequate levels?" Mr. Enders answered that this is exactly what is being done, using 14 mini sondes, and that data should be available by the end of the year.

6. 2015 Applied Research Work Group – *Alicia Reinmund-Martinez presented about the 2015 ARWG.*
5. Presentation and discussion of the procedure for Science Committee review of proposals received for the 2016 Applied Research RFPs.
Summary of main points from discussion:
Dr. Longley asked if the information provided to the Science Committee can include details about offerors' level of experience with the study topics in question. Mrs. Reinmund-Martinez stated the Science Committee will be provided with a de-identified summary of this information for each proposal received. Dr. Bush asks whether the Science Committee will be asked about reasonableness of proposal budgets; Mrs. Reinmund-Martinez states that the Science Committee is being asked for input about the scientific aspects of the proposals received, not budgetary considerations. Dr. Lamon points out that scientific differences between projects can be evaluated independently of budget considerations.
6. Brainstorming discussion on a statistical analysis project that evaluates progress towards accomplishing EAHCP Biological Goals.
Summary of main points from discussion:
 1. *A majority of the Science Committee members agreed that, as a long-term investment in EAHCP performance evaluation, transparency, and efficiency, a central, comprehensive, publicly-accessible database for EAHCP-related data should be built, although there was disagreement as to particular data sources to be included.*
 2. *Several Science Committee members agreed that database-building and analysis of existing data would need to take place as a two-part process, with the construction of the database occurring in the first year, and data analysis in the second year. However, some concern was expressed that without pre-defined questions to be asked of the data, building a database would be a moot point, or at least lack needed direction—the suggestion emerged that database construction would need to be guided by anticipated questions to be asked.*
 3. *A majority of the Science Committee members agreed with the list of questions to be posed in the analysis of existing EAHCP data which was presented by staff, although there was some disagreement as to whether the questions asked addressed EAHCP Biological Objectives and Goals.*
 4. *As a next step, a subcommittee comprised of Dr. Arsuffi, Dr. Mosier, and Mr. Norris, in conjunction with EAHCP staff Mrs. Reinmund-Martinez and Mr. Hall, will be convened in the next month to refine the list of questions to be asked for the statistical analysis of existing EAHCP-related data. Subcommittee recommendations will be reported at the November 10th meeting of the Science Committee. The members agreed with this plan of action.*
7. Presentation on EAHCP Phase II Strategic Adaptive Management Decision Making.
Nathan Pence presented on Phase II.
8. Future agenda items (November 10, San Marcos Rec Hall).
9. Questions and comments from the public.
Mrs. Wassenich's comment from the beginning of the meeting was brought back for discussion at the recommendation of Dr. Arsuffi, who wished to learn more about the development of the refugia program and whether the Science Committee has reason for concern. Mr. Pence explained the course of events leading to the award of the EAHCP contract to the team led by SWCA, including that the USFWS approved this change to the HCP. Mrs. Wassenich reiterated her concern that losing SMARC's expertise in the husbandry of the Covered Species represents a major risk to the EAHCP program.

ATTACHMENT 1

10. Adjourn.
11:56 a.m.



NOTICE OF OPEN MEETING

Available at eahcp.org

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Members of this committee include: Tom Arsuffi, Janis Bush, Jacquelyn Duke, Charles Kreidler, Conrad Lamon, Glenn Longley, Robert Mace, Doyle Mosier, Chad Norris, Jackie Poole, and Floyd Weckerly. Committee members, please RSVP to dlarge@edwardsaquifer.org.

At this meeting, the following business may be considered and recommended for committee action:

1. Call to order.
2. Public comment.
3. Approval of September 9, 2015 Science Committee meeting minutes (Attachment 1).
4. Receive report from the Program Manager.
 - Springflow and index well update
 - Update on 2016 CSRB Applied Research projects
 - National Academy of Sciences October 2015 meeting summary
5. Presentation and possible recommendation on delaying implementation of the flow manipulation in the Old Channel of the Comal River per EAHCP Table 5-3.
Purpose: To provide the opportunity for the Science Committee to recommend delaying increases in flow in the Old Channel of the Comal River.
Action: To make a recommendation on delaying increases in flow above 65 cfs in the Old Channel of the Comal River.
6. Presentation and discussion on the concept for a proposed SOW to evaluate methodologies and timelines for native vegetation restoration in the San Marcos and Comal ecosystems.
Purpose: To provide an opportunity for the Science Committee to comment on the concept for a proposed SOW.

Action: To obtain input on the concept for a proposed SOW.

7. Presentation and possible endorsement of the *2015 Applied Research Work Group Report* (Attachment 2).

Purpose: To provide the opportunity for the Science Committee to comment on and possibly endorse the draft *2015 Applied Research Work Group Report*.

Action: To obtain input and possibly endorse the report as drafted.

8. Presentation on a proposed Scope of Work (SOW) for a 2016 Applied Research project on the CSRB quantitative sampling methods (Attachment 3).

Purpose: To present a draft SOW on a project to evaluate the efficacy of the CSRB quantitative sampling methods.

Action: To obtain input on the draft SOW.

9. Presentation and discussion on the concept for a proposed SOW for the creation of an integrated database for the EAHCP.

Purpose: To provide an opportunity for the Science Committee to comment on the concept for a proposed SOW.

Action: To obtain input on the concept for a proposed SOW.

10. Presentation on the Research Plan for the Salvage Refugia Program (Attachment 4).

Purpose: To provide an opportunity for the Science Committee to comment on the 2015-2016 Salvage Refugia Program Research Plan.

Action: To obtain input on the Plan.

11. Presentation on an update of the Ecological Model.

Purpose: To provide information regarding the status of the Ecological Model.

Action: None required.

12. Presentation and approval of the proposed 2016 Science Committee meeting schedule (Attachment 5).

Purpose: To present the Science Committee with proposed meeting dates for 2016.

Action: To obtain approval from the Science Committee for the proposed meeting schedule for 2016.

13. Meetings:

- Joint Meeting, December 17, 2015 at the Edwards Aquifer Authority.
- Science Committee Meeting, January 13, 2016, location to be determined.

14. Questions and comments from the public.

15. Adjourn.



NOTICE OF OPEN MEETING

Available at eahcp.org

NOVEMBER 10 2015 MEETING MINUTES

1. **Call to order.**

9:02 a.m.

2. **Public comment.**

Herman Harris addressed the Committee. Mr. Harris stated he is seeking assistance with removing a diesel storage tank from the Guadalupe River which runs through his property. Alicia Reinmund-Martinez offered to send him the contact information for TCEQ Austin and/or San Antonio offices who may be able to assist him with the matter. No other public comments.

3. **Approval of September 9, 2015 Science Committee meeting minutes.**

Tom Arsuffi requested that the phrase, "Dr. Arsuffi asks about volume of water relative to aerator production and efficacy" be reworded to state "water volume efficiency" instead of "efficacy." No other comments. Jacquelyn Duke motioned to approve the minutes with Arsuffi's requested edit, Arsuffi seconded, no opposition.

4. Receive report from the Program Manager.

- **Springflow and index well update**

- *Daniel Large provided the update.*

- **Update on 2016 CSRB Applied Research projects**

- *Reinmund-Martinez presented on the 2016 Comal Springs Riffle Beetle (CSRB) Applied Research projects, announcing the contractors whom were selected to conduct each of the three projects, and provided an overview of the recommendations of the Science Committee concerning their scientific review of the proposals received. The Science Committee was thanked for their contribution to the selection process.*

- **National Academy of Sciences October 2015 meeting summary**

- *Nathan Pence provided a summary of National Academy of Sciences October 2015 meetings, along with the current status of the National Academy of Sciences Report 2 review process.*

5. **Presentation and possible recommendation on delaying implementation of the flow manipulation in the Old Channel of the Comal River per EAHCP Table 5-3.**

Mark Enders and Edmund Oborny gave a presentation titled, "Flow Split Management Comal River" presenting background information on the need to delay implementation of

Table 5-3 flow prescriptions to avoid scouring vegetation in the Old Channel. The adaptive function of pulse events in stream systems as well as the lack of data on which to base this decision were raised as concerns by Science Committee members. Reinmund-Martinez clarifies that the request before the Committee asks for their recommendation to delay the implementation of this table until such an evaluation, which would take the role of pulses and be based on data, can be conducted. Arsuffi motioned that the Committee recommend delaying the implementation of Table 5-3 until the analysis could be conducted; Glenn Longley seconded the motion, no opposition.

6. Presentation and discussion on the concept for a proposed SOW to evaluate methodologies and timelines for native vegetation restoration in the San Marcos and Comal ecosystems.

Pence gave a presentation titled, "Adaptive Management – Veg Restoration Information Gathering/Analysis" providing information concerning the proposed evaluation of EAHCP native vegetation restoration efforts. Committee input included the following points:

- Arsuffi recommended the literature on community assembly rules for aquatic vegetation to possibly inform this effort.*
- Janis Bush suggested that including a literature review as a contract task could help direct the evaluation; the literature on disturbance ecology in particular could be informative.*
- Arsuffi suggested that it might be worthwhile as part of this exercise to list possible interacting or compounding factors to take under consideration (e.g. removing trees may hurt riffle beetles).*
- Conrad Lamon suggested that trend analysis would be important to take under consideration to provide a basis for management recommendations.*
- Arsuffi recommended taking ecosystem succession into account. It is not productive to get hung up on specific states when realistically, the system is in flux; suggested it may be helpful to incorporate ranges (+/-) to manage for, to better accommodate this reality.*

7. Presentation and possible endorsement of the 2015 Applied Research Work Group Report.

Arsuffi provided a presentation on the 2015 Applied Research Work Group Report. Chad Norris suggests combining the CSRB, Comal Springs Dryopid Beetle, and Peck's Cave Amphipod projects, listed separately on the schedule, into one project. Doyle Mosier motioned that the Committee endorse the report as presented; Duke seconded the motion, no opposition.

8. Presentation on a proposed Scope of Work (SOW) for a 2016 Applied Research project on the CSRB quantitative sampling methods.

Reinmund-Martinez gave a presentation on the proposed SOW for a 2016 Applied Research project on the CSRB quantitative sampling methods. Ultimately, it was decided that Arsuffi will work with Bob Hall to identify three methodologies to be included as part of the SOW for this project. Committee input included the following points:

- *Arsuffi recommends that the term “standardizing” should be reflected in the title, since establishing standardized methods is necessary to enable the evaluation of trends over time, and ultimately, for sampling to be biologically meaningful.*
- *Lamon makes the point that quantifying uncertainty inherent in the sampling method is an important component of this monitoring activity; Mosier states that this can help inform selecting a method that is actually meaningful—i.e. which method emerges as best relative to variability and or uncertainty*
- *Lamon recommends that a count model be used, and that existing CSRB data should be analyzed.*
- *Norris suggests sampling should be system-based, not just in representative reaches, to evaluate tool in multiple environments.*
- *Arsuffi recommends for the contractor to justify proposed procedures based on the literature.*

9. Presentation and discussion on the concept for a proposed SOW for the creation of an integrated database for the EAHCP.

Reinmund-Martinez gave a presentation on the proposed SOW for the creation of an integrated database for the EAHCP. Lamon emphasizes the importance of including metadata as part of the database to provide necessary context to data users. Robert Mace suggests final reports be included as a metadata component.

10. Presentation on the Research Plan for the Salvage Refugia Program.

Chris Collins provided a presentation on the Research Plan for the Salvage Refugia Program on behalf of the project team, discussing collection methods study for the CSDB, including cloth lures, Hester-Dendy, and novel air bubble trap methods. Arsuffi asked how reintroduction (as part of the refugia program) can be accomplished for the primary aquifer species.

11. Presentation on an update of the Ecological Model.

Oborny provided a presentation updating the Committee on the latest progress in the development of the Ecological Model.

12. Presentation and approval of the proposed 2016 Science Committee meeting schedule.

Duke stated certain dates may pose a schedule conflict for her; it was decided to send a revised schedule to the Committee.

13. Meetings:

- Joint Meeting, December 17, 2015 at the Edwards Aquifer Authority.
- Science Committee Meeting, January 13, 2016, location to be determined.

14. Questions and comments from the public.

None.

15. Adjourn.

12:25 p.m.

Appendix I6

Science Review Panel/National Academy of Sciences

October 28-30, 2015 Meeting Agenda

The National Academies of
SCIENCES • ENGINEERING • MEDICINE

PUBLIC AGENDA

Committee to Review the Edwards Aquifer Habitat Conservation Program—Phase 2

**First Meeting (Fifth Meeting Overall)
October 28–30, 2015**

Edwards Aquifer Authority Headquarters
900 E. Quincy, San Antonio, TX 78215

Thursday, October 29

Closed Session

8:30–10:15 **Committee and NAS staff only**

Open Session

10:15–10:30 **Introductions, Review of Meeting Agenda**
Danny Reible, Committee Chair, NAE, Texas Tech

10:30–12:00 **Prioritized Implementation Plan from First NAS Report**
Nathan Pence, Executive Director Habitat Conservation Program, EAA

- Review of the response process used on the first NAS report
- Present Implementation Committee's adopted schedule
- Present the feedback from Science Committee, Workshop
- Present the Prioritized Matrix by category
- Next steps/Timeline

12:00–1:00 **Working Lunch/Continue Prioritized Implementation Plan**

1:00–2:15 **Minimization and Mitigation (M&M) Measures: Description and Implementation**
Nathan Pence and Alicia Reinmund-Martinez, EAA; Melanie Howard, City of San Marcos; and Zac Martin, City of New Braunfels

- Tour Recap – questions and answers
- Discuss the conservation measures which the Permittees need input on, e.g., springflow and/or habitat restoration measures
- Evaluate the methods of implementation for the specified measures
- Are these measures achieving maximum benefit to the Covered Species?

2:15–3:15

Update on the Ecological Model

Ed Oborny, BLOWEST Consulting, and Nathan Pence, EAA

- Progress made in past year
- Which Report 1 recommendations have already been addressed in the model
- Discussion on the model's capability to run different scenarios
- Discuss NAS role on developing the biological questions that will be used to determine which scenarios the ecological model needs to run
- Present an example of scenario run

3:15–3:30

Break

3:30–4:45

Update on the Hydrologic Model

Jim Winterlee and Mark Hamilton, EAA

- Presentation on progress made in past year
- Which Report 1 recommendations have already been addressed in the model
 - Uncertainty analysis
 - Present the framework for the 5-year hydrologic modeling plan
- Discussion on the model's capability to run different scenarios
- Discuss NAS role on developing the hydrologic questions that will be used to answer which scenarios the hydrologic model needs to run
- Present an example of a scenario run

4:45–5:30

Open Mike Session

Friday, October 30

Closed Session

8:15–10:15

Committee and NAS staff only

Open Session

10:15–12:00

Discussion with Sponsor

- Give thoughts on programs to date
- Ask additional questions/get clarification
- Request materials/information
- Discuss agenda of 2nd meeting, including field trip
- Future of ecological and hydrologic modeling runs per scenario questions

Closed Session

12:00–4:00

Committee and NAS staff only