HABITAT CONSERVATION PLAN
EDWARDS AQUIFER

Springflow Habitat Protection Work Group

August 6, 2020
2:00-4:00pm

Agenda Overview

- Confirm attendance
- Meeting logistics
- Public comment
- Approve meeting minutes
- Mentimeter Issue 1 prioritization poll results presentation
- Overarching Issue 1 discussion regarding prioritization
- Brief presentation on Comal Springs riffle beetle Work Group (CSRB) and CSRB in the San Marcos system
- Continuation of Meeting 6/Issue 2 (CSRB Themes) discussion
- Public comment
- Future meetings


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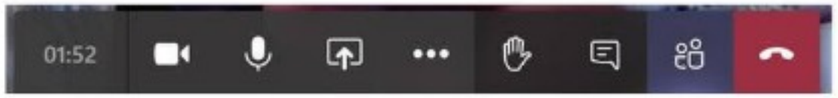
Confirm attendance

Meeting logistics

- Virtual meeting logistics
  - Meeting recording
  - Mute
  - Raise Hand
  - Chat / Asking questions



- Meeting points of contact
  - Meeting access
    - Kristina Tolman (ktolman@...)
  - Technical questions
    - Stephanie Rosendahl (srosendahl@...)
    - Jared Morris (jmorris@..)
  - Participant monitor
    - Kristy Kollaus (kkollaus@...)
  - Chat and Q&A monitor
    - Damon Childs (dchilds@...)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Public comment


Mentimeter
Consider
Meeting 4 Minutes


Mentimeter
Consider
Meeting 5 Minutes


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Mentimeter Issue 1
Prioritization poll results

How would you prioritize the topic areas (or themes) for technical evaluations related to the following (Issue 1):

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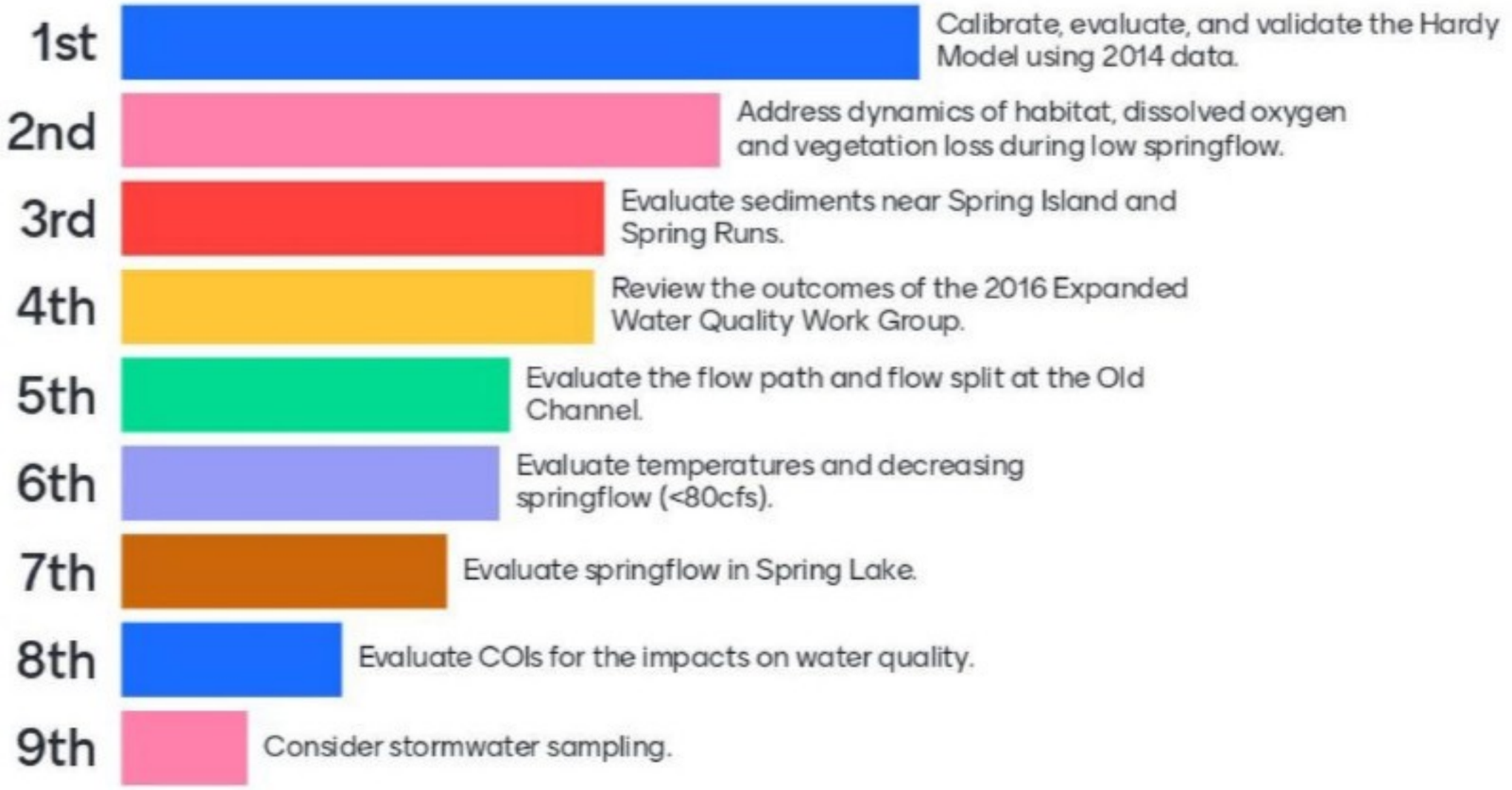

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Items	1st place	2nd place	3rd place	4th place	5th place	6th place	7th place	8th place	9th place	
Calibrate, evaluate, and validate the Hardy Model using 2014 data.	**5**	3	1	0	0	0	0	0	0	
Address dynamics of habitat, dissolved oxygen and vegetation loss during low springflow.	1	**4**	2	0	0	0	0	1	0	
Review the outcomes of the 2016 Expanded Water Quality Work Group.	0	1	**5**	0	0	0	0	1	0	
Consider stormwater sampling.	0	0	0	1	0	0	1	0	3	
Evaluate springflow in Spring Lake.	1	0	0	1	2	1	0	1	0	
Evaluate sediments near Spring Island and Spring Runs.	**2**	1	0	0	2	2	0	1	0	
Evaluate the flow path and flow split at the Old Channel.	1	0	0	2	2	0	2	0	0	
Evaluate COIs for the impacts on water quality.	1	0	0	0	1	0	1	1	2	
Evaluate temperatures and decreasing springflow (<80cfs).	0	0	1	3	0	2	1	0	0	
Total responses	11	9	9	7	7	5	5	5	5	

Items	1st place #x9pts	2nd place #x8pts	3rd place #x7pts	4th place #x6pts	5th place #x5pts	6th place #x4pts	7th place #x3pts	8th place #x2pts	9th place #x1pt	Total
Calibrate, evaluate, and validate the Hardy Model using 2014 data.	**45**	24	7	0	0	0	0	0	0	76
Address dynamics of habitat, dissolved oxygen and vegetation loss during low springflow.	9	**32**	14	0	0	0	0	2	0	57
Evaluate sediments near Spring Island and Spring Runs.	**18**	8	0	0	10	8	0	2	0	46
Review the outcomes of the 2016 Expanded Water Quality Work Group.	0	8	**35**	0	0	0	0	2	0	45
Evaluate the flow path and flow split at the Old Channel.	9	0	0	12	10	0	6	0	0	37
Evaluate temperatures and decreasing springflow (<80cfs).	0	0	7	18	0	8	3	0	0	36
Evaluate springflow in Spring Lake.	9	0	0	6	10	4	0	2	0	31
Evaluate COIs for the impacts on water quality.	9	0	0	0	5	0	3	2	2	21
Consider stormwater sampling.	0	0	0	6	0	0	3	0	3	12
Total responses	99	72	63	42	35	20	15	10	5	

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Overarching Issue 1 discussion regarding prioritization

Theme	Calibrate, evaluate, and validate the Hardy Model using 2014 data.	Address dynamics of habitat, dissolved oxygen and vegetation loss during low springflow.	Review the outcomes of the 2016 Expanded Water Quality Work Group.	Consider stormwater sampling.	Evaluate springflow in Spring Lake.	Evaluate sediments near Spring Island and Spring Runs.	Evaluate the flow path and flow split at the Old Channel.	Evaluate COIs for the impacts on water quality.	Evaluate temperatures and decreasing springflow (<80cfs).
Comments	Modeling should incorporate predictions for future drought conditions using Dr. Hardy's models built for central Texas conditions.	WG virtual sessions one and two presentations reassured me that the current model and activities are protective. However, I am not opposed to the following suggestion of plugging the WQ data with 2011 lowest flow DO in as a means of sensitivity check.	The WQ Workgroup set the current parameters of what is available and has not been at all discussed in this process; it could provide context for questions regarding WQ.	Storm water sampling has mostly been incorporated during high flow events – should there be more concern of point sources during low flow contributions from localized runoff?	The springflow in Spring Lake also needs to be evaluated. Spring Lake staff have noticed historically that springs shift as flow decrease. the upper springs diminish.	Spring Island has highly sedimented over the decade and springs are covered in silt. Is anything going to be done to restore the habitat?	I believe the concern is two fold in regards to the old channel. 1) will the assumed flow reach the Culvert to Old Channel and 2) what habitat downstream in the ERPA will sustain temperatures. Have we compared data from 2014 drought to modeled temps?	I am not opposed to the potential of permit holders reinvigoratin g activities related to the COI (Certificate of Inclusions) as contemplate d and potential control regarding recreational activities that have the potential to adversely impact WQ	I think Chad answered the question for the short term that temps are not an issue for water quality down to 60cfs. the question is can WQ be sustained over the long run

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	Is the Hardy model adequate to evaluate the effects of <80cfs?	What is the effect on dissolved oxygen in spring runs and Landa Lake from vegetation die-off during extended periods (more than 6-months) with flow below 80 cfs in the Comal Springs system?	Planning for WQ activities of the permit, which was/is a pragmatic approach of constituent testing. The WQ Workgroup set the current parameters of what is available and has not been at all discussed in this process; context for questions regarding WQ	Should a more detailed analysis of Nutrient stormwater load contributions be investigated to evaluate algae blooms and DO swings?	Should changes in CO2 levels in SM be considered for low flow conditions related to water quality?	With extended periods of drought, rainfall events will occur periodically and wash sediments into habitat. Consider studying potential impacts.	If the flow rates identified in the flow split table are met, wouldn't temperatures be somewhat homogenous at the split between Old and New?		Providing flows of up to 80 cfs are not achievable both politically and monetarily.

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	One of the presenters (Hardy) seemed to confer that additional WQ data would be a complex for any current model or actually any modeling platform. This seems to align with the direction that our WQ Workgroup took during Phase I .	Impacts to habitat quality under low flow (e.g., increased sediment, algae, temperature, decreased dissolved oxygen). How suitable habitat for endangered species changes	Do we believe any conclusions of the Expanded Water Quality Workgroup in 2016 are applicable?	Storm water s	If there is an increase in vegetation in the San Marcos, would that impact DO at low flows?	Before you clean the silt out of Spring Island area make sure this is of benefit to the riffle beetle.	With regard to the concern of water temperatures in the OC during extended low-flow periods: bathymetric surveys and flow-path modeling may be needed to determine if springflow discharge from western shoreline will be able to enter Old Channel..		Is 80cfs the best value to use, or should it be lowered to reflect more recent findings?

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	Any model rebuild will contain some amount of uncertainty. What would the impacts of management be with new results?	What are the effects of extended low-flow (below 80cfs for six months) and vegetation die-off on DO levels in Landa Lake?					Does low temperature springflow bypass culverts to old channel during low flow?		I suspect the major issue at the springs is significant decrease flow in individual springs, and not a change in “chemistry” of the spring discharge. Spring chemistry should remain constant. During low flow, discharge would definitely decrease and points of discharge would change. Which springs go dry whether larger springs are at different elevations would be important. A proposed study would be to review of all previously

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	Using more than one model may be useful. Averaging over several models can help identify components that are not accounted for by any single model.	Evaluation of potential for vegetation die-off in Landa Lake during extended periods of low flow affecting DO					A simple modeling of flow through Landa Lake from the wall springs to the Old Channel culvert should provide enough information as to whether DO or temperature will decrease/increase to the point that it is critical for the species in the Old Channel. I do not anticipate that there will be a significant change in either DO or temperature as discharge from the		

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	Can the Hardy model tell us which spring/seep outlets will be flowing at 80 cfs and below?	Potential for low DO in Landa Lake					Whether surface water flow during an extended low flow (<80 cfs) period through Landa Lake to the culvert for the Old Channel will warm enough to cause temperature and DO issues for the fountain darters in Old Channel.		

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	Use data collected in 2014 to validate WQ model results	what is the status of the vegetation modeling? Sounds as though it may be useful for evaluation of flows below 80cfs.					Surface flow (i.e residence time) through Landa Lake and potential increase in temperature and declines in DO is probably more critical. This should be a relatively easy back-of -the envelope calculation to determine whether there is a potential problem. If this is an issue, then more field measurements and additional surface water modelling may be needed. During LBG-		

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	How well does the Hardy model represent water quality when the 2014 drought is modeled?	to Thom's point: as flows decrease, pollution concentration increases, and CO2 increases in association (and DO decreases). Turbidity is likely to increase especially if recreation continues. There are many negative factors that will impact WQ							

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	Hardy's Qual2E report needs evaluation with regard to broader water quality modeling understanding. There are at least 3 recent reviews of water quality models strengths and weaknesses - context and comparison would be helpful for confidence and assumptions	We all understand this is a Take Permit? We know there are some species loss during instances. Since we got a glimpse of an empirical time 2014 for this in SM and another in Comal. Why not look at take trends.							

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	Can we calibrate the Hardy model to 2014 drought data to better understand if the accuracy of the model?	habitat loss, prey decrease, predator accessibility... The bottom line is that a dramatic change in springflow regime for 7 years is a hard hit on the ecosystem							
		Low flow/vegetation interactions at low flow may limit mixing in the lakes, isolating areas of dense vegetation from cool spring flows.							

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		Monitor changes to DO and Carbon Dioxide related to vegetation & nutrients etc. during lower flow over the next permit period in both lakes.							
		During earlier periods there were discussions of field level lab simulations to test concepts should resources be shifted to do this level of science for DO and vegetation? (And When)							

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		Including more protective measures for SSA's as they specifcally relate to low flow and total area protected. Evaluating current SSA boundaries, possibly expanding them during low flows,moving/shifting them, or maybe including more SSAs.							


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Comal Springs riffle beetle Work Group
(CSRB) and CSRB in the San Marcos system

Applied Research Program

1. Effect of low-flow on riffle beetle survival in laboratory conditions (BIO-WEST et al. 2014)
2. Determination of Limitations of Comal Springs Riffle Beetle Plastron Use During Low-Flow Study (Nowlin et al. 2014)
3. Comal Springs Riffle Beetle Habitat Connectivity Study (BIO-WEST and Texas State 2015)
4. Comal Springs riffle beetle occupancy modeling and population estimate within the Comal Springs system (ZARA et al. 2015)
5. Evaluation of the long-term, elevated temperature and low dissolved oxygen tolerances of the Comal Springs riffle beetle(Nowlin et al., 2017b)
6. Evaluation of the trophic level status and functional feeding group categorization of larvae and adult Comal Springs riffle beetle (Nowlin et al., 2017)
7. Comal Springs Riffle Beetle (Heterelmis comalensis): Life History and Captive Propagation Techniques (BIO-WEST 2018)

Refugia Research Program

8. Life-history aspects of the CSDB and notes on life-history aspects of the CSRB (2018 Annual Report).
9. *Captive population nutrition & longevity of the CSRB (USFWS)*
10. *Increasing pupation success in the CSRB in a captive setting (BIO-WEST)*
11. *Examination of the life history of the CSRB and assessment of factors affecting pupation (TxSt)*

TABLE 1 **Species Federally Listed Endangered:**	**Priority Ranking**
Comal Springs Riffle Beetle (*Heterelmis comalensis*)	1
Comal Springs Dryopid Beetle (*Stygoparnus comalensis*)	1
Pecks Cave Amphipod (*Stygobromus pecki*)	1
Texas Blind Salamander (*Eurycea rathbuni*)	2
San Marcos Salamander (*Eurycea nana*)	2
Fountain Darter (*Etheostoma fonticola*)	3
Texas Wild Rice (*Zizania texana*)	3
Species Petitioned for Listing as Endangered	
Texas Cave Diving Beetle (*Haideoporus texanus*)	4
Texas Troglobitic Water Slater (*Lirceolus smithii*)	4
Comal Springs Salamander (*Eurycea sp.*)	4

TABLE 2 **Research Topics**	**Priority Ranking**
Collection Methods and Techniques	1
Species Husbandry	2
Species Propagation	3
Species Genetics	4
Species Reintroduction Methods	4

CSRB Work Group

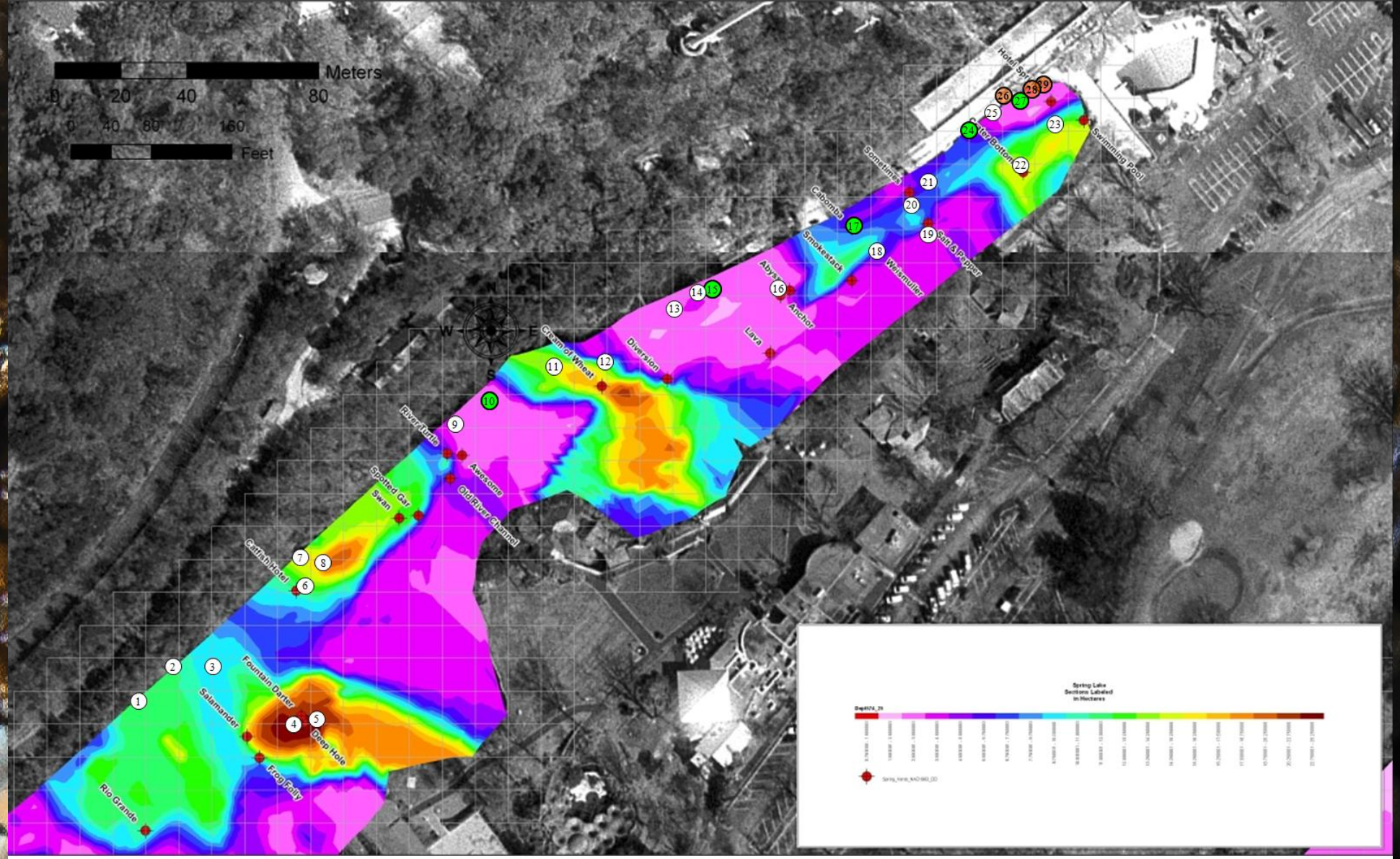
- 2018-2019 Work Group addressed topics concerning sampling methodology, field efforts, and LTBGs.

12. CSRB cotton luring analysis

13. CSRB population surveys 2022 and 2025

CSRB in San Marcos

- Luring efforts conducted in 2006, 2015, and 2018.
- CSRBs recovered in the ‘Hotel Springs’ area in all three surveys.
- No CSRBs recovered in deeper springs at bottom of lake.



Riffle beetle Survey by USFWS and TSU: 29 cotton cloth lures placed in springs on 7 March were retrieved 4 April 2006 – 28 *Heterelmis* captured in headwater region

10 – 2 *Stenelmis*
15 – 1 *Stenelmis*
17 – 1 *Stenelmis*
24 – 4 *Microcylloepus*

26 – **8 *Heterelmis*** (4 adults, 4 larvae); 45 *Microcylloepus*; 1 *Stenelmis*
27 – 2 *Microcylloepus*; 5 *Stenelmis*
28 – **19 *Heterelmis*** (12 adults, 7 larvae); 47 *Microcylloepus*
29 – **1 *Heterelmis*** larvae; 4 *Microcylloepus*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Continuation of Meeting 6/Issue 2
(CSRB Themes) discussion

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Issue 2 Themes

- Issue 2 should be given to the CSRB Work Group.
- Low springflow and impacts on CSRB survival and life stage development.
- Genetic testing
- Subsurface well investigation on CSRB habitat
- Study CSRB in San Marcos
- Regular monitoring rather than “experimental habitats”
- Adaptive Management Process

Not yet prioritized from members

All comments received and organized by theme will be provided in the chat. If you can not access the chat and want a copy of the comments by theme please request a copy at EAHCP@edwardsaquifer.org.

Theme	Issue 2 should be given to the CSRB Work Group.	Low springflow and impacts on CSRB survival and life stage development	Genetic testing	Subsurface well investigation on CSRB habitat	Study CSRB in San Marcos	Regular monitoring rather than “experimental habitats”	Adaptive Management Process
Comments	We may have heard from participants of the Beetle (CSRB) during these sessions I am much more inclined to leave the science up to the specialized consideration of this groups work - Can someone update for the group?	Why do we make the assumption that the CSRB are fragile and not able to handle low? They survived the drought of the 50's. We truly do not know near enough about the CSRB to make assumptions	The Genetics work that lends itself to the population level understanding appears promising to follow-up on	Subsurface wells investigation for habitat extent and impacts subsurface understanding were suggested during WG sessions	What about CSRB at San Marcos Springs? Why have they never been considered or mentioned?	Data analysis of regular monitoring and special study data could provide insights on survival of CSRB adults and larvae. "Experimental habitats" have limited potential in comparison to analysis of existing / forthcoming data.	USFWS regs. require HCP and ITP's to include adaptive management processes. Is it fair to say or ask that studies on CSRB that are being done may require time before AMP.
	CSRB issues should go to CSRB work group	Does the low flow condition affect the reproduction or life stage development of the beetles even if they can migrate to subsurface layers? Population studies should look at more than just if they can live under those conditions.	Though I am supportive of shallow bio-wells investigations I would like to see some of the less invasive genetic or modeled habitat extent calculations of population before proceeding.	Which spring openings will still be flowing below 80cfs and what is CSRB habitat like at those locations/flows?			

Theme	Issue 2 should be given to the CSRB Work Group.	Low springflow and impacts on CSRB survival and life stage development	Genetic testing	Subsurface well investigation on CSRB habitat	Study CSRB in San Marcos	Regular monitoring rather than “experimental habitats”	Adaptive Management Process
	Don't we have a CSRB science committee that handles studies for this species?	I'm unclear on the sedimentation concern below 80cfs, since at those low flows it hasn't rained for a while and if it does won't there be a flushing effect?	Before we have the ability to determine CSRB retreat into orifices and re-emergence as safeguard against low-flow, we need to wait for some of the genetics/capturing studies to be advanced.	Unclear on the substrate survival concern for CSRB at low flows given survival for months during the drought of the 50's?			
		Spring Island has highly sedimented over the decade and springs are covered in silt. Is anything going to be done to restore the habitat?		Investigate substrates in spring runs			
		With extended periods of drought, rainfall events will occur periodically and wash sediments into habitat. Consider studying potential impacts.		Evaluate flow paths for major spring features at Comal Springs			

Theme	Issue 2 should be given to the CSRB Work Group.	Low springflow and impacts on CSRB survival and life stage development	Genetic testing	Subsurface well investigation on CSRB habitat	Study CSRB in San Marcos	Regular monitoring rather than “experimental habitats”	Adaptive Management Process
		Need to understand how riffle beetles can survive extended periods in substrate		Installing shallow well for CSRB habitat evaluations has the potential to connect conduits that were not previously connected. What safeguards would be appropriate?			
		Refer to Dr. Nair's dissertation chapter on CSRB water temp and DO limits		Hydrogeologic investigations of the shallow subsurface at Comal Spring/ Landa Lake.			

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				(1) Develping a spatial-temporal map of which springs stop flowing as spring flow decreases, (2) evaluate how these changes influence CSRB suitable habitat availability, and (3) measuring/modeling CSRB habitat availability and connectivity between springs which cease to flow and more persistent spring flow orifices as spring flow decreases.			

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				Additional detailed geology could be obtained with shallow geophysical surveys run along both the down thrown and upthrown blocks. A similar survey was conducted at Barton Springs and showed some interesting anomalies. Most of the CSRBs appear to be associated with springs directly discharging from Edwards Limestone on the western wall of the lake (upthrown block). CSRBs do not appear to be prolific in the surface alluvial sediments on the downthrown side. Geophysical surveys on the upthrown block along the lake front would be difficult, but possible. Electrical anomalies			

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				Monitoring groundwater levels from the upthrown and downthrown blocks during low spring flow. I am not sure whether water level data are still being collected from the LCRA well or the Panther Canyon well. Both of these wells, however, monitor relatively deep conditions of both fault blocks, and do not monitor shallow groundwater conditions where CSRB may live. A shallow monitoring well on the upthrown block could be installed in Panther Canyon. A shallow monitoring well of the surface geology/ soils overlying the downthrown block could be installed in a			

All: What questions related to Issue 2 should the Work Group consider:

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Prior to knowing the results of CSRB work group how do we address this? The HCP assumes some wet area and not all will be de-watered meaning likely recovery. I am not sure what more can be done other than study.

Undertake flow assessments of flow at individual spring openings in Comal system during low flow periods

subsurface flow paths of the areas CSRB could "retreat" to; food resources when flows are low; monitoring of flow rates during low flow conditions; appropriate salvage take during low flows

calibrate the Hardy model with most recent extended low flow data

conduct forward modeling of low flow using future climate change predictive models for conditions within the CS and SM segments of the Edwards Aquifer

What happens to individual spring openings as flows drop below 80?

Where do the beetles go during low flow?

Based on NAS shouldn't focus be on appropriate take assessment/accounting? - again not withholding we are still studying a lot.

spatial habitat modeling to evaluate changes in spring flow orifices and flow conditions from declining flows below 80cfs, with CSRB habitat and connectivity between CSRB habitats.

All: What questions related to Issue 2 should the Work Group consider:

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How do subsurface flow paths change? Where do the beetles go?

Are the limited beetles in San Marcos same as Comal?

The current modeling being done with the occupancy survey data will be hard pressed to say mcuh about low spring flows, or the relationships between flow and abundance/ CSRB count.

Consider how best to partner with CSRB work group to help us work through interpretation of scientific studies

monitoring spring flow output in spring lake proximal to CSRB habitat - how do these springs respond to low flow conditions?

Use of the monitoring database could add insights unavailable from the well dsigned but temporally limited studies currently being conducted by TSU.

looking forward to CSRB WG results to be able to better program!

What are the 'normal' beetle population fluctuations, and how do low flow (<80cfs) alterations differ from this? Are the beetles dying off or are beetles simply migrating deeper into the springs?

Wasn't there work to attract or look at broader beetle work and or experts - did this result in any that looked at their dependence to wetted regimes?


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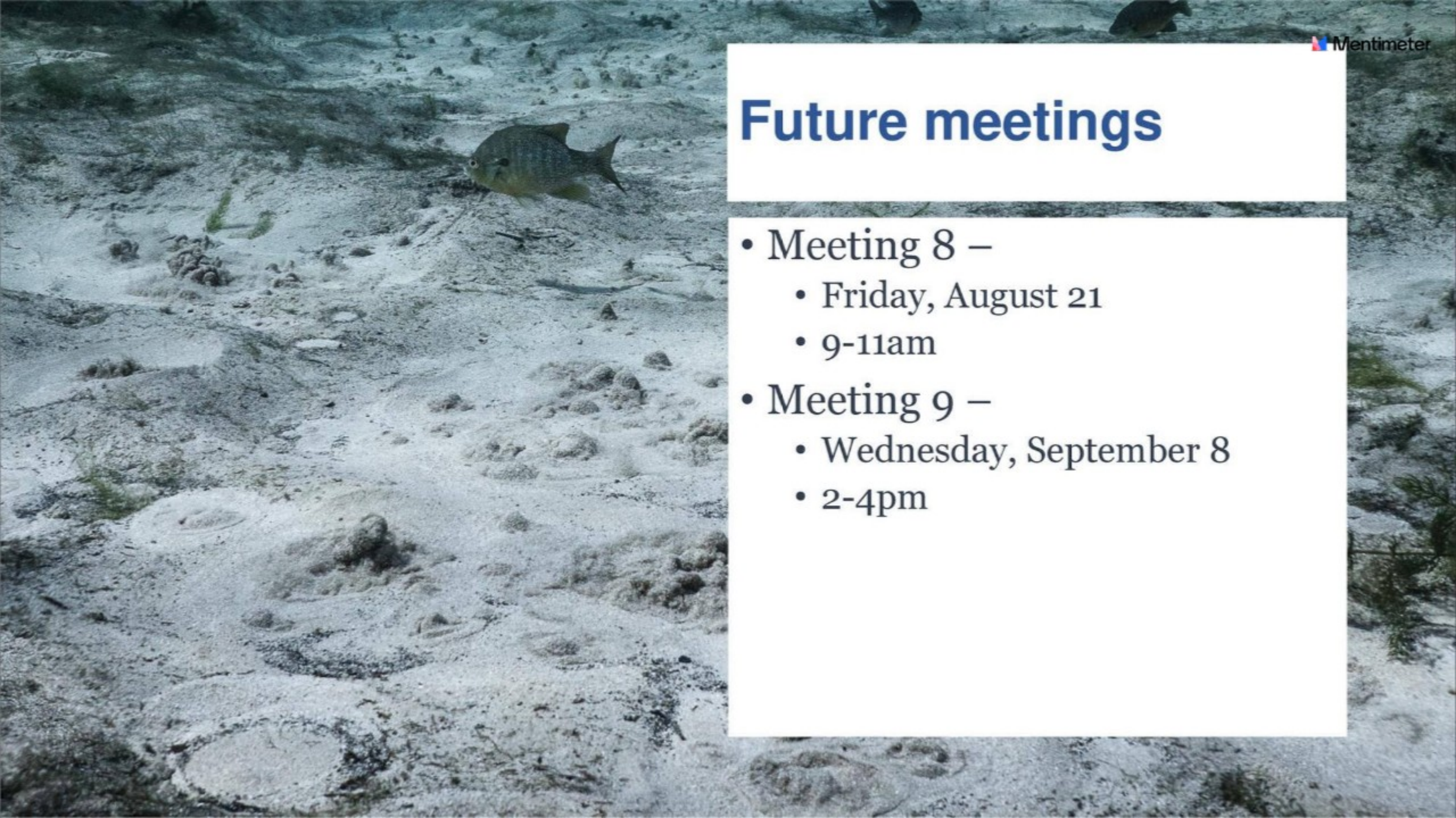
Public comment



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Future meetings

- Meeting 8 –
  - Friday, August 21
  - 9-11am
- Meeting 9 –
  - Wednesday, September 8
  - 2-4pm


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Thank you!
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