Springflow Habitat Protection Work Group

May 20, 2020
2:00-4:00pm
Agenda Overview

• Confirm attendance
• Meeting logistics
• Public comment
• 80 cfs pulse flow component overview
• EARIP water quality modeling effort presentation and discussion
• 2019 VISPO AMP low flow scenarios presentation and discussion
• Public comment
• Future meetings
Confirm attendance
Meeting logistics

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

- Meeting points of contact
  - Meeting access
    - Jared Morris (jmorris@...)
  - Technical questions
    - Jared Morris (jmorris@...)
    - Victor Hutchison (vhutchison@..)
  - Participant monitor
    - Kristy Kollaus (kkollaus@...)
  - Chat and Q&A monitors
    - Kristina Tolman (ktolman@...)
    - Damon Childs (dchilds@...)
Meeting logistics

- Work Group logistics
  - Members use Chat
  - Everyone can raise hands
  - Email public comments

- Meeting Minutes
  - April 22, 2020
Today’s Meeting

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


Hardy
- Technical Assessments in Support of the Edwards Aquifer Science Committee “J Charge” Flow Regime Evaluation for the Comal and San Marcos River Systems

Hardy et al
- Evaluation of the Proposed Edwards Aquifer Recovery Implementation Program Drought of Record Minimum Flow Regimes in the Comal and San Marcos River Systems

1998  2009  2010  2017
Temperature Simulations: Comal: What Matters

- Seven Defined Headwaters:
  - The NE Branch (Reach 1 – Bleeders Creek),
  - NW Branch (Reach 2),
  - Spring Run 1 (Reach 6),
  - Spring Run 2 (Reach 9),
  - Spring Run 3 (Reach 8),
  - Old Channel outlet (Reach 17) and,
  - The Spring Fed Pool outlet (Reach 16).

- 44 Point Loads (Springs in Landa Lake)
| Total Comal Discharge (cfs) | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 |
|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| HeadWater Discharge (cfs) |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| NW Branch                 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| NE Branch                 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Spring Run 1              | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Spring Run 2              | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| OC-Woods (culvert)        | 10.50 | 14.00 | 17.50 | 21.00 | 24.50 | 28.00 | 31.50 | 35.00 | 38.50 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 | 42.00 |
| OC-Spring fed_pool         | 4.50 | 6.00 | 7.50 | 9.00 | 10.50 | 12.00 | 13.50 | 15.00 | 16.50 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 |
| Print Load Flow (cfs)     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
Lowest level of Landa Park Well is 613.34' on 8/21/56

Lake level rises 4-5' over few days 9/11/56, Landa Park well = 616.95

Total Comal Spring flow = 0 at Landa Lake level = 619' and Landa Park water level = 619'

Spring #1 and #2 stop flowing at Landa Park water level = 620', LCRA = 628'

Spring #3 stops flowing at Landa Park water level = 620', LCRA = 621.6'

Data from USGS and TWDB

LBG-GUYTON ASSOCIATES
2017 Ecosystem Model:
Updated Meteorological Data (2003 – 2013)
Used 2010 defined headwater/point load contributions for daily flows over this period
HARDY (2017)

WATER QUALITY AND TEMPERATURE SIMULATION SYSTEM (WQTSS)
Comal Temperatures: IMHO

- Fountain Darters
  - At the drought of record type flow regimes
    - The **only suitable areas** of darter habitat will be:
      - Landa Lake between the Spring Island area through Mid to Lower Landa Lake
      - Old Channel upstream of Schlitterbahn Park.
  - No additional calibration/simulations of temperature modeling is going to change this results for these areas of the Comal System.
Comal Temperatures: IMHO

- **Riffle Beetles (Headwater Springs or Point Loads)**
  - There will be periods in which the phreatic surface results in surface or near surface flows and water temperature will ‘rapidly’ react with air temperatures. During ‘summer periods’ they will likely exceed the 26 C threshold established by Weston Nowlin’s research.
  - Below this elevation when spring no longer provide surface or near surface flows there will be a phreatic surface where the capillary fringe of the hyporheic flows is at a depth in which it is no longer influenced by air temperatures. Temperatures of the hyporheic flows will be the same as the aquifer and below 26 C.
  - The physics of hydrostatic pressure of these hyporheic flows, will maintain some form of ‘thermal refugia’ at the temperature of the aquifer. Given estimated residence times of less than a day and the residual thermal mass of Landa Lake strongly suggest acceptable thermal regimes in riffle beetle areas.
  - Qual2E is not a ground water model nor is it a fully 3-dimensional hydrodynamic model of the lake that is coupled to temperature dynamics. Regardless, these ‘advanced’ class of models are not going to change the simple underlying physics of residual spring flows that are at aquifer temperatures.
Temperature Simulations: San Marcos: What Matters

Four Defined Headwaters:
Spring Lake Headwater (Reach 1),
- Individual spring flows within Spring Lake were treated as a single incremental inflow within Reach 1. This approach within Qual2e assumes that the total discharge is distributed along the entire reach length which closely approximates the spatial distribution of springs (see next slide)
Spring Lake Slough Headwater (Reach 2),
Glover’s Ditch Headwater (Reach 10),
Mill Race Diversion Headwater (Reach 14),

4 Point Loads
Sessoms Creek Point load,
Mill Race Discharge Point load,
State Fish Hatchery Point load,
San Marcos Wastewater Treatment Plant Point load
<table>
<thead>
<tr>
<th>Source</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
<th>80</th>
<th>85</th>
<th>90</th>
<th>100</th>
<th>110</th>
<th>120</th>
<th>130</th>
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</thead>
<tbody>
<tr>
<td>San Marcos Discharge (cfs)</td>
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<tr>
<td>Spring Lake Headwater</td>
<td>3.1</td>
<td>3.4</td>
<td>3.8</td>
<td>4.1</td>
<td>4.4</td>
<td>4.8</td>
<td>5.1</td>
<td>5.5</td>
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<td>6.1</td>
<td>6.8</td>
<td>7.5</td>
<td>8.2</td>
<td>8.9</td>
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<tr>
<td>Incremental Inflow Reach 1</td>
<td>41.9</td>
<td>46.6</td>
<td>51.3</td>
<td>55.9</td>
<td>60.6</td>
<td>65.2</td>
<td>69.9</td>
<td>74.5</td>
<td>79.2</td>
<td>83.9</td>
<td>93.2</td>
<td>102.5</td>
<td>111.8</td>
<td>121.1</td>
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<tr>
<td>Spring Lake Slough</td>
<td>0.1</td>
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<td>Sessoms Creek</td>
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<td>State Fish Hatchery</td>
<td>23.0</td>
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<td>Wastewater Plant</td>
<td>6.6</td>
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</tbody>
</table>
San Marcos Temperatures: IMHO

- At drought of record flows (i.e. 45 cfs)
  - Small headwater springs are likely to cease flowing
  - Major springs (Balcones Escarpment) are not expected to cease flowing based on historical records during the drought of record (45 cfs)
- Major springs will continue to provide aquifer water temperatures (22-24 C depending on specific spring – Nowlin and Schwartz SMOS).
- Residence time is much less than a day and the thermal mass of Spring Lake buffers responses to meteorological conditions.
Sam Marcos
Temperatures: IMHO

• Fountain darters
  • Spring Lake and the San Marcos River downstream to ‘above’ Rio Vista will maintain water temperatures within target ranges
  • Downstream of Rio Vista the Qual2e model has a wider range of uncertainty in predicted water temperatures but empirical data on water temperatures show it will infringe on acceptable thermal regimes
  • Additional water quality calibration/simulations will not substantially refine the residual longitudinal thermal zone acceptable to fountain darters

• The ‘real issue’ is the likely loss of aquatic vegetation below Spring Lake
  • Vegetation monitoring since 2009 I have conducted clearly shows seasonal loss of vegetation from recreation in all river reaches below Spring Lake Dam
  • An assessment of the State Scientific Area flow regime triggers suggests extensive vulnerability of TWR (all aquatic vegetation in reality) to disturbance at flows as high as 120 cfs that reflects the empirical observations
  • The effectiveness of restricted river access is unknown if ‘closures’ are warranted

• Temperature is not the limiting factor for fountain darters (or other aquatic organisms such as salamanders). It is protection of aquatic vegetation downstream of Spring Lake.

<table>
<thead>
<tr>
<th>Discharge (cfs)</th>
<th>Clear Springs</th>
<th>Saltgrass to Sewell Park</th>
<th>Sewell Park to Bicentennial Park</th>
<th>Bicentennial Park to Rio Vista Park</th>
<th>Cheatham to IH35</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWR % in reach with depth ≥ 1 m</td>
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<tr>
<td>60</td>
<td>0</td>
<td>11</td>
<td>27</td>
<td>20</td>
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<td>80</td>
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<td>160</td>
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<td>220</td>
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<td>240</td>
<td>43</td>
<td>58</td>
<td>67</td>
<td>64</td>
<td>62</td>
</tr>
<tr>
<td>260</td>
<td>49</td>
<td>66</td>
<td>69</td>
<td>77</td>
<td>66</td>
</tr>
<tr>
<td>TWR total Area*</td>
<td>188</td>
<td>1652</td>
<td>2982</td>
<td>601</td>
<td>338</td>
</tr>
</tbody>
</table>
2019 VISPO AMP low-flow scenarios
• The VISPO AMP Scientific Evaluation Report contains the predicted Phase II flow regime through a repeat of the DOR (EAHCP 2019).

• Changes to springflow protection measures described in the EAHCP are an addition of 1,795 ac-ft yr\(^{-1}\) to the VISPO program.
## Springflow Habitat Protection WG

### Table 3. Long-term average and minimum total San Marcos discharge management objectives (Table 4-13 of EAHCP)

<table>
<thead>
<tr>
<th>Description</th>
<th>Total Comal Discharge (cfs)</th>
<th>Time-step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term average</td>
<td>225</td>
<td>Daily average</td>
</tr>
<tr>
<td>Minimum</td>
<td><strong>30</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Daily average</td>
</tr>
</tbody>
</table>

<sup>a</sup>Assumes a minimum of a 50-year modeling period that includes the drought of record
<sup>b</sup>Not to exceed six months in duration followed by 80 cfs (daily average) flows for 3 months

<table>
<thead>
<tr>
<th>Description</th>
<th>Total San Marcos Discharge (cfs)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Time-step</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term average</td>
<td>140</td>
<td>Daily average</td>
</tr>
<tr>
<td>Minimum</td>
<td><strong>45</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Daily average</td>
</tr>
</tbody>
</table>

<sup>a</sup>Assumes a minimum of a 50-year modeling period that includes the drought of record
<sup>b</sup>Not to exceed six months in duration followed by 80 cfs (daily average) flows for 3 months
Figure 3. Comal Springs Drought of Record MODFLOW simulation shown in Figure 2 with periods of less than 80 cfs shown with bars. Other selected thresholds and statistics are shown.
Figure 4. San Marcos Springs Drought of Record MODFLOW simulation shown in Figure 2 with periods of less than 80 cfs shown with bars. Other selected thresholds and statistics are shown.
Figure 5. Frequency distributions displaying consecutive months less than flow thresholds. The vertical line is placed at 6 consecutive months.
Public comment
Future meetings

• Meeting 3 - Salamanders
  • Thursday, May 28
  • 9AM-11AM

• Meeting 4 – CS Riffle Beetles
  • Wednesday, June 3
  • 2PM-4PM

• Meeting 5 – TBD
  • TBD
Thank you!
eahcp@edwardsaquifer.org