

DRAFT MEMORANDUM

FROM: Jennifer Sukow, IDWR
TO: ESHMC
DATE: September 19, 2011
RE: Group B Spring Target for cell 1041013 (Three Springs, Weatherby Springs, Hoagland Tunnel, and Spring Creek Spring)

During the September 13, 2011 ESHMC meeting, the committee decided that model cell 1041013 should be changed from a Group C to Group B spring target for calibration of ESPAM2.0. This memorandum describes data available for the four springs in this cell during the model calibration period (1980-2008), and provides a transient data series for use as a calibration target.

Three Springs, Weatherby Springs, and Hoagland Tunnel Complex

Based on data reviewed, spring flow from Three Springs, Weatherby Springs, and Hoagland Tunnel is diverted by the Jones Hatchery and irrigators. Diversions are measured by the water users and reported to Water District 36A. Diversion records include sites 360410067 (Jones Hatchery), 360410066 (Pipe from Three/Weatherby), 360410069 (Hoagland Tunnel Ditch), 100058 (Weatherby Springs Pipeline), 360410005 (Bar S), and 101173 (Jones Pumps). Sites 36041066 and 360410069 are diverted upstream of 360410067. Some water reported in 360410066 is used in the Jones Hatchery, but this flow was not included in the records for site 360410067 until sometime in 2006. Sites 360410005 and 101173 are diverted from the hatchery tailwater and are included in site 360410067 before 2006. Prior to 2006, total spring discharge for these springs can be estimated by the following equation. If there is any undiverted spring discharge, it will not be included in this estimate.

Three Springs Complex discharge (<2006) = 360410067 (Jones Hatchery) + 360410066 (Pipe from Three/Weatherby) + 360410069 (Hoagland Tunnel Ditch)

Sometime in 2006, the Jones Hatchery installed a new weir to measure the portion of the hatchery outflow that discharges directly to Billingsley Creek. Following installation of the new weir, record 360410067 (Jones Hatchery) no longer includes the water rediverted by 360410005 (Bar S) and 101173 (Jones Pumps), but does include hatchery inflow from 360410066. Beginning sometime in 2006, total spring discharge for these three springs can be estimated by the following equation. If there is any undiverted spring discharge, it will not be included in this estimate.

Three Springs Complex discharge (2007-12/2009) = 360410067 (Jones Hatchery) + 360410005 (Bar S) + 101173 (Jones pumps) + 360410066 (Pipe from Three/Weatherby) – Hatchery inflow from 360410066 + 360410069 (Hoagland Tunnel Ditch)

The diversion works at this spring complex were modified sometime in 2010. Calculation of total spring discharge from diversion records may require use of a different equation beginning in 2010.

A few miscellaneous measurements were made by IDWR staff during the model calibration period. On August 26, 1993, IDWR staff measured 34.79 cfs at the Jones hatchery raceways, 8.95 cfs at the pipe from Three/Weatherby Springs, and 6.05 cfs at the Hoagland Tunnel Ditch. During this site visit, the pipe from Three/Weatherby Springs provided 3.12 cfs to the hatchery. The memo¹ indicates that there was an additional 3 to 3.5 cfs from a lower spring that the Jones was able to pump to the hatchery, but it was not being diverted at this time. The memo indicates that total spring flow was 46.67 cfs (34.79 + 8.95 – 3.12 + 6.05) plus the unmeasured 3 to 3.5 cfs from the lower spring. Total spring flow on this date was approximately 50 cfs.

On July 13, 2004, IDWR staff measured 27.21 cfs at the Jones hatchery raceways, 6.86 cfs at the pipe from Three/Weatherby Springs, and 5.09 cfs at the Hoagland Tunnel Ditch. During this site visit, the pipe from Three/Weatherby Springs provided 1.66 cfs to the hatchery. Estimated spring flow based on these measurements was 37.5 cfs (27.21 + 6.86 + 5.09 -1.66). For comparison, records submitted by the water users report diversions of 23.1 cfs at site 360410067, and 6.9 cfs at the pipe from Three/Weatherby Springs on July 13, 2004. Records of the Hoagland Tunnel Ditch diversion are not available for this date. Note that the record for site 360410067 does not include the 1.66 cfs delivered to Jones Hatchery through the Three/Weatherby pipe.

On June 22, 2005², IDWR staff measured 28.05 cfs at the Jones hatchery raceways, 6.46 cfs at the pipe from Three/Weatherby Springs, 4.4 cfs at the Hoagland Tunnel Ditch, and 0.5 cfs of undiverted flow. During this site visit, the pipe from Three/Weatherby Springs provided 0.7 cfs to the hatchery. A site diagram was provided in this memorandum. Estimated spring flow based on these measurements was 38.71 cfs (28.05 + 6.46 + 4.4 – 0.7 + 0.5). For comparison, records submitted by the water users report diversions of 23.5 cfs at site 360410067, 8.0 cfs at the pipe from Three/Weatherby Springs, and 4.4 cfs at the Hoagland Tunnel Ditch on June 22, 2005. Note that the record for site 360410067 does not include the 0.7 cfs delivered to Jones Hatchery through the Three/Weatherby pipe.

On July 10, 2009, IDWR staff measured 19.8 cfs at the Jones hatchery discharge to Billingsley Creek, 7.81 cfs at the Jones irrigation pumps, 5.15 cfs at the Hoagland Tunnel Ditch, and 5.99 cfs in the Three Springs/Weatherby pipeline. The Three Springs/Weatherby pipeline was measured with a polysonic meter at a point below the split to the hatchery. IDWR staff did not

¹ Luke, 1993, Memorandum to Norm Young, dated August 27, 1993, Re: Visit & Measurements at Jones Fish Hatchery. http://www.idwr.idaho.gov/apps/ExtSearch/DocImages/4q8z01_.PDF

² Patton and Yenter, 2005, Memorandum to Karl Dreher, dated June 28, 2005, Re: Jones Hatchery – Conjunctive Administration Call Field Investigation Report.

measure the Bar S diversion during this site visit. The water user reported 5.71 cfs at the Bar S on this date. Estimated spring flow based on these measurements was 44.46 cfs. For comparison, water users report 19.8 cfs at site 360410067 and 7 cfs at the Three/Weatherby pipe. Note that the record for site 360410067 includes water delivered to Jones Hatchery through the Three/Weatherby pipe, but does not include water rediverted by the Bar S and Jones irrigation pumps.

Available diversion records between 1980 and 2008 are summarized in Table 1.

Site	Dates	Frequency
360410067 (Jones Hatchery)	8/26/1993; 7/13/2004; 6/22/2005; 7/10/2009 3/1/1995 – 12/31/2009	Miscellaneous Daily or weekly
360410066 (Pipe from Three/Weatherby)	8/26/1993; 7/13/2004; 6/22/2005; 7/10/2009 5/30/1996 – 12/31/2009	Miscellaneous Daily or weekly
Hatchery inflow from 360410066	8/26/1993; 7/13/2004; 6/22/2005	Miscellaneous
360410069 (Hoagland Tunnel Ditch)	8/26/1993; 7/13/2004; 6/22/2005; 7/10/2009 5/16/2005 – 12/31/2008	Miscellaneous Daily or weekly
Undiverted spring discharge	8/26/1993; 6/22/2005	Miscellaneous
360410005 (Bar S)	3/1/1995 – 12/31/2009	Daily or weekly
101173 (Jones Irrigation Pumps)	1995 – 2008	Annual volume

Table 1. Available diversion records for Three Springs, Weatherby Springs, and Hoagland Tunnel

Estimated spring discharge can be calculated for the time period between June 1996 and December 2009 using available data and the following assumptions (Figure 1). The change in measurement method and locations in 2006 may contribute to the calculated increase in spring discharge between May and July 2006.

- The change in measurement device and location for record 360410067 is assumed to occur in June 2006.
- Prior to June 2006, spring flow = 360410067 (Jones Hatchery) + 360410066 (Pipe from Three/Weatherby) + 360410069 (Hoagland Tunnel Ditch).
- After June 2006, spring flow = 360410067 (Jones Hatchery) + 360410005 (Bar S) + 101173 (Jones pumps) + 360410066 (Pipe from Three/Weatherby) – Hatchery inflow from 360410066 + 360410069 (Hoagland Tunnel Ditch).
- Records available from IDWR databases are assumed to be a reasonably accurate representation of diversions.
- Hatchery inflow from 360410066 is not included in records for 360410067 prior to 6/2006
- After 6/2006 hatchery inflow from 360410066 is assumed to be 1.83 cfs (based on the average of three miscellaneous measurements) from April through October, and is assumed to be equal to the entire diversion from November through March.
- Hatchery inflow pumped from the lower spring is included in records for 360410067.
- Hoagland Tunnel Ditch diversions between June 1996 and April 2005 are assumed, based on the average monthly diversion reported between May 2005 and December 2008.
- Undiverted spring discharge is neglected.
- Prior to June 2006, records 360410005 and 101173 are rediversions of water reported in record 360410067.
- Beginning in June 2006, record 360410067 is assumed to be the hatchery discharge to Billingsley Creek. Records 360410005 and 101173 are assumed not to be included in the flow reported in record 360410067.
- Jones Irrigation Pump diversion is assumed to be a constant rate from April through October, based on the reported annual volume divided by 214 days.

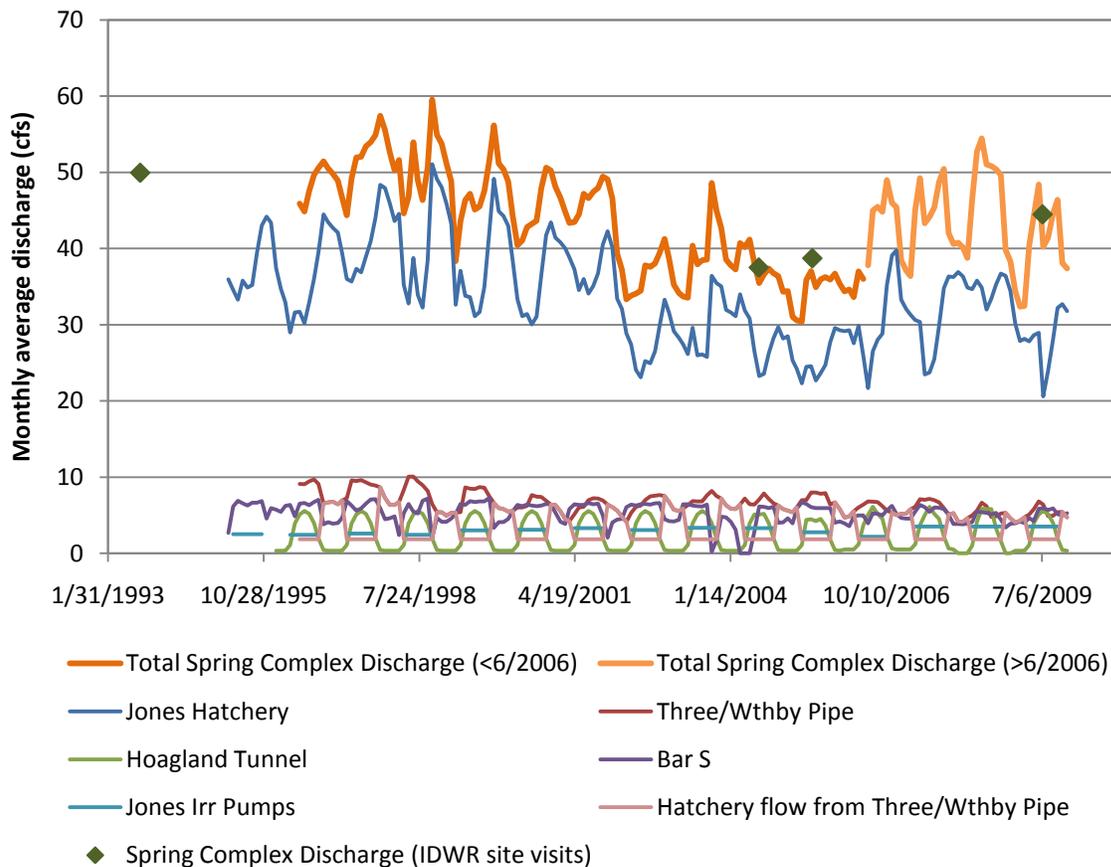


Figure 1. Estimated spring discharge at Three Springs, Weatherby Springs, and Hoagland Tunnel. (“Jones Hatchery” is data from record 360410067 and does not represent all water diverted to the hatchery).

Spring Creek Spring

Based on data review, flow from Spring Creek Spring is diverted by the Lee Hatchery, residential users, and an irrigator. Diversions are measured by the water users and reported to Water District 36A. Diversions include sites 36010072 (Lee Hatchery), 410074 (Spring Creek Spring Pipeline), and 410037 (Musser Pump). Sites 410074 and 410037 are diverted upstream of the hatchery. Total spring discharge for these three springs can be estimated by the following equation. If there is any undiverted spring discharge, it will not be included in this estimate.

Spring Creek Spring discharge = 360410072 (Lee Hatchery) + 410074 (Spring Creek Spring Pipe) + 410037 (Musser Pump at Spring Creek)

The week of July 12, 2004, IDWR staff measured 2.11 cfs at the Lee Hatchery raceway, 0.25 cfs at the Spring Creek Spring Pipeline, and 0.64 cfs at the Musser Pump. Estimated spring flow based on these measurements was 3.00 cfs. For comparison, records submitted by the water users report diversions of 2 cfs at the Lee Hatchery. Water users do not submit daily diversion records for the pipeline or the irrigation pump.

Available diversion records between 1980 and 2008 are summarized in Table 2.

Site	Dates	Frequency
360410072 (Lee Hatchery)	7/2004 (IDWR) 3/1/1995 – 12/31/2009 (water users)	Miscellaneous Daily or weekly
410074 (Spring Creek Spring Pipeline)	7/2004 (IDWR)	Miscellaneous
410037 (Musser Pump)	7/2004 (IDWR) 1995 – 2010 (power consumption)	Miscellaneous Annual volume

Table 2. Available diversion records for Spring Creek Spring

Estimated spring discharge can be calculated for the time period between March 1995 and December 2009 using available data and the following assumptions (Figure 2).

- Spring Creek Spring discharge = 360410072 (Lee Hatchery) + 410074 (Spring Creek Spring Pipe) + 410037 (Musser Pump at Spring Creek)
- Records available from the database are an accurate representation of diversions.
- Spring Creek Spring Pipeline diversion is assumed to be 0.25 cfs from May through October and 0.1 cfs from November through April.
- Musser Pump diversion is assumed to be a constant rate from April through October, based on the reported annual volume divided by 214 days.
- Undiverted spring discharge is neglected.

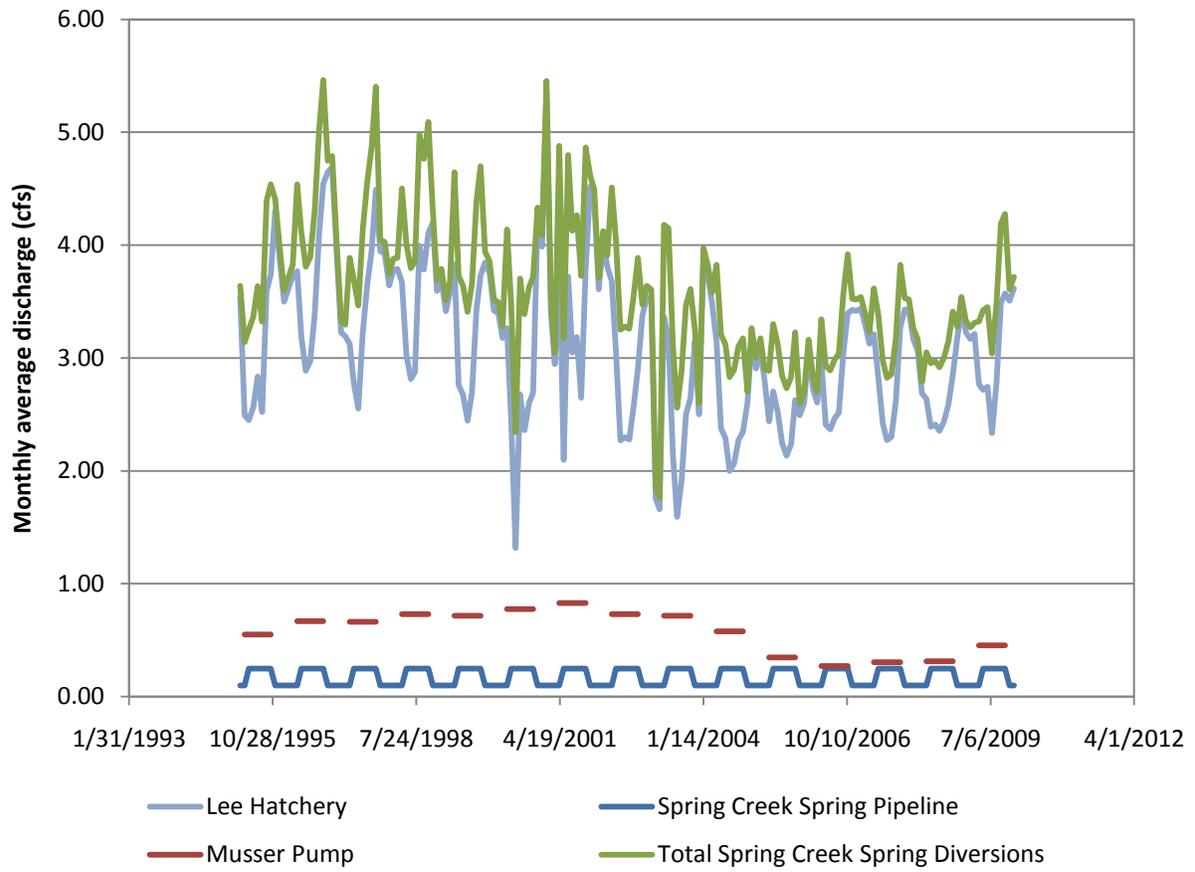


Figure 2. Estimated spring discharge at Spring Creek Spring.

ESPAM2.0 Calibration Target for Cell 1041013

The calibration target for cell 1041013 is the sum of estimated spring discharges at the Three Springs, Weatherby Springs, Hoagland Tunnel complex and at Spring Creek Spring. The calibration target is shown in Figure 3. Changes in measurement methods and locations within the Three Springs, Weatherby Springs, Hoagland Tunnel complex occurred sometime in 2006 and may contribute to the increase in calculated spring discharge between May and July 2006.

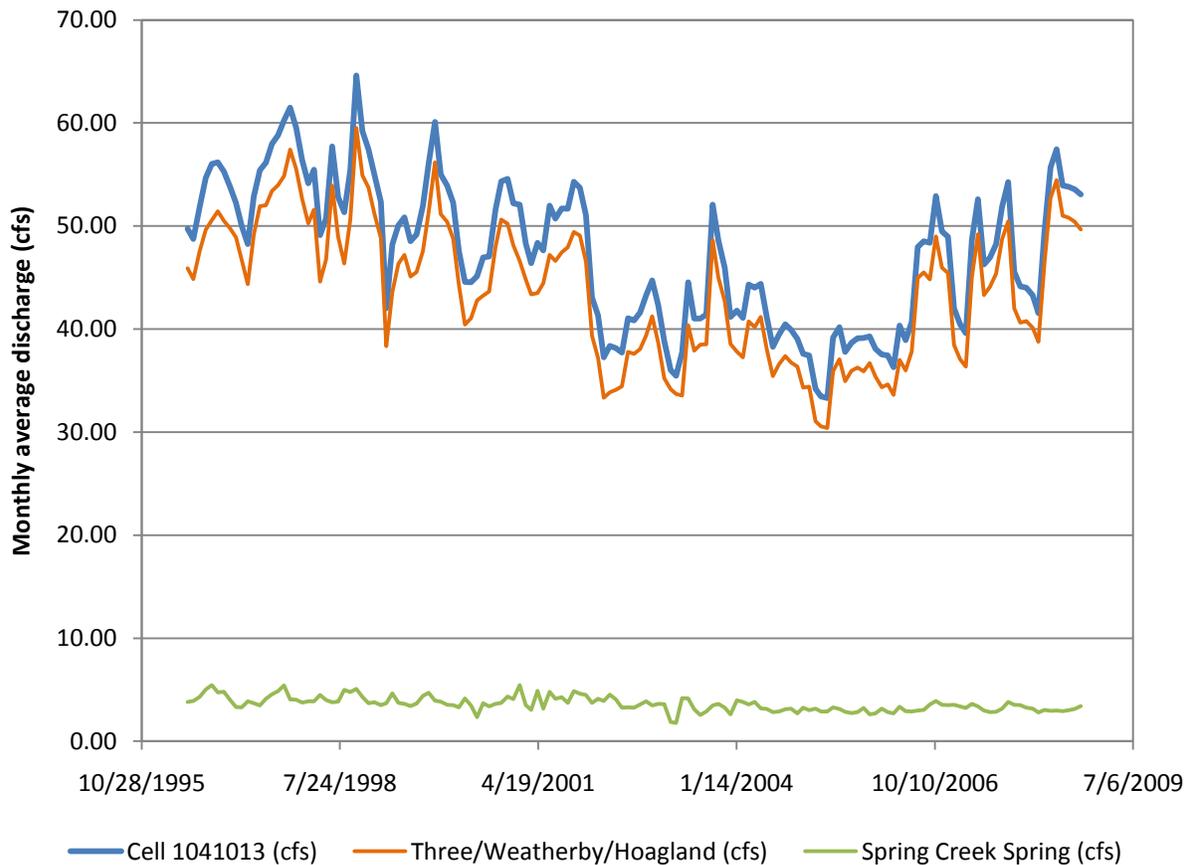


Figure 3. Group B calibration target for spring discharge in cell 1041013.

Seasonal fluctuations in the calibration target for cell 1041013 are not consistent throughout the time series as illustrated in Figure 4, which compares the ESPAM2.0 calibration targets for cell 1041013 and nearby Curren Spring. This may be indicative of the quality of the measurement records that comprise the cell 1041013 target.

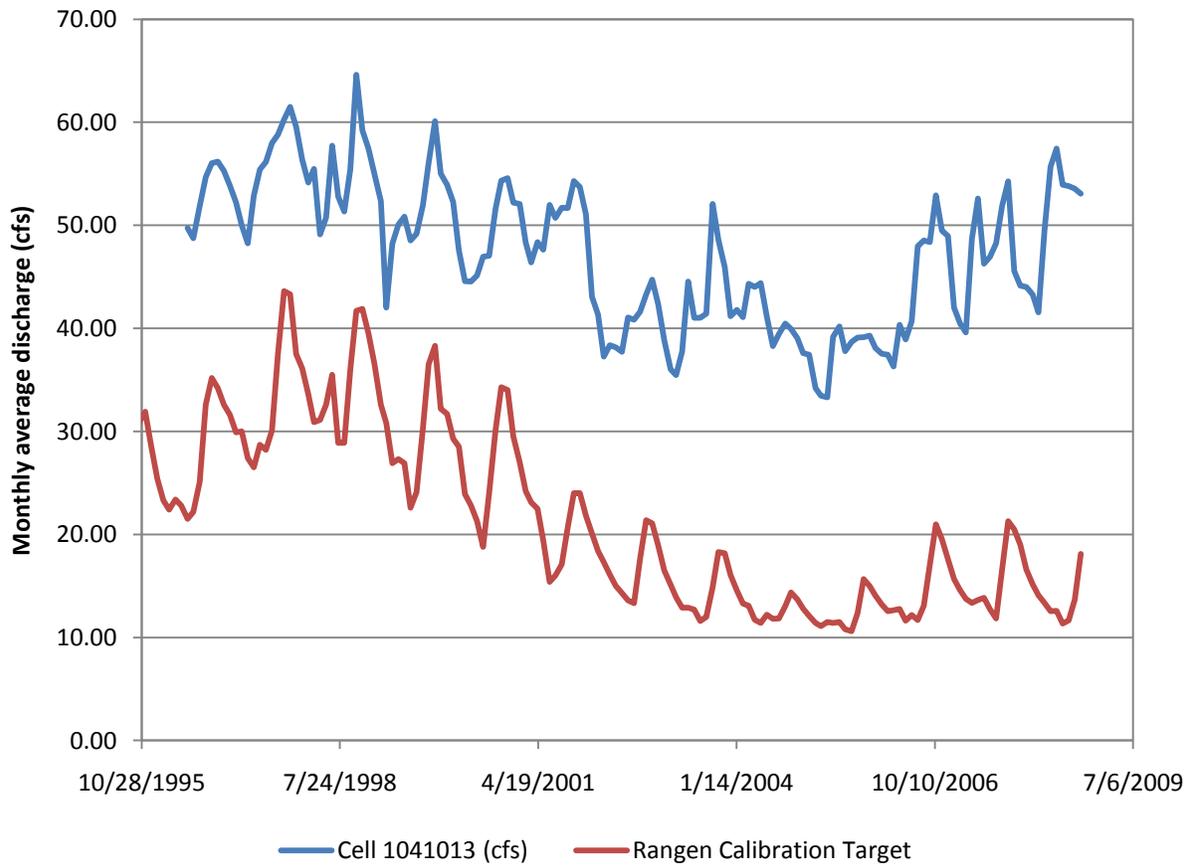


Figure 4. Comparison with Curren Spring calibration target.