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**From:** Stephen Maurano - NOAA Federal <stephen.maurano@noaa.gov>  
**Sent:** Thursday, May 9, 2019 1:17 PM  
**To:** Brittany Cunningham - NOAA Affiliate  
**Cc:** Cathy Marcinkevage - NOAA Federal; Brian Ellrott  
**Subject:** Re: ROCON American River Effects

Hi Brittany,

Since I just prepped figures, ideally Cathy or Brian could confirm the origin of the data -- but I know they're busy so here's what I can glean: the Excel file has Mark Raymond Westbrook (USBR?) as author and from his notes I tried to summarize his [explanation](#) plus the actions I completed. The excel file is also on [CVO data](#) if you'd like to examine or edit anything (especially the titles, labels, other annotation).

Water temperature data were downloaded on April 5, 2019 from the California Data Exchange Center (<http://cdec.water.ca.gov/>) for Watt Bridge (AWB) station from 1999-2018 and converted to daily means. A series of quality control filters were then applied. A histogram of 32-119°F in 0.1°F bins was used to examine and remove discontinuities and outliers and it was determined that values outside 43.7-76.4°F weren't realistic. These outliers, along with any values that jumped 10°F, were removed. Missing data was then interpolated by averaging values before and after so long as the gap was less than ten hours (40 increments of 15 minutes). Based on the assumption that climate change could account for a 1-3°F increase in water temperatures within the time frame of the proposed action, two time series to simulate climate change were created by adding 1°F and 3°F respectively to the historic daily average temperature. The differences were then calculated between these three series (historic, +1°F and +3°F) and temperature metrics to support over-summer rearing of juvenile steelhead in the lower American River (65°F & 68°F). The percent of days that met these temperature metrics ( $\geq 0.1^\circ\text{F}$  exceedance) in the key July through September time period were summarized by year.

On Thu, May 9, 2019 at 11:42 AM Brittany Cunningham - NOAA Affiliate <[brittany.cunningham@noaa.gov](mailto:brittany.cunningham@noaa.gov)> wrote:

Hi Stephen,

I'm incorporating your figures into the American Division Section and am wondering what model results or data-set I put in the figure caption citation for them.

Thank you,  
Brittany

On Wed, May 8, 2019 at 10:53 AM Brittany Cunningham - NOAA Affiliate <[brittany.cunningham@noaa.gov](mailto:brittany.cunningham@noaa.gov)> wrote:

Thank you for this Stephen!

On Tue, May 7, 2019 at 4:26 PM Stephen Maurano - NOAA Federal <[stephen.maurano@noaa.gov](mailto:stephen.maurano@noaa.gov)> wrote:  
Hi Brittany,

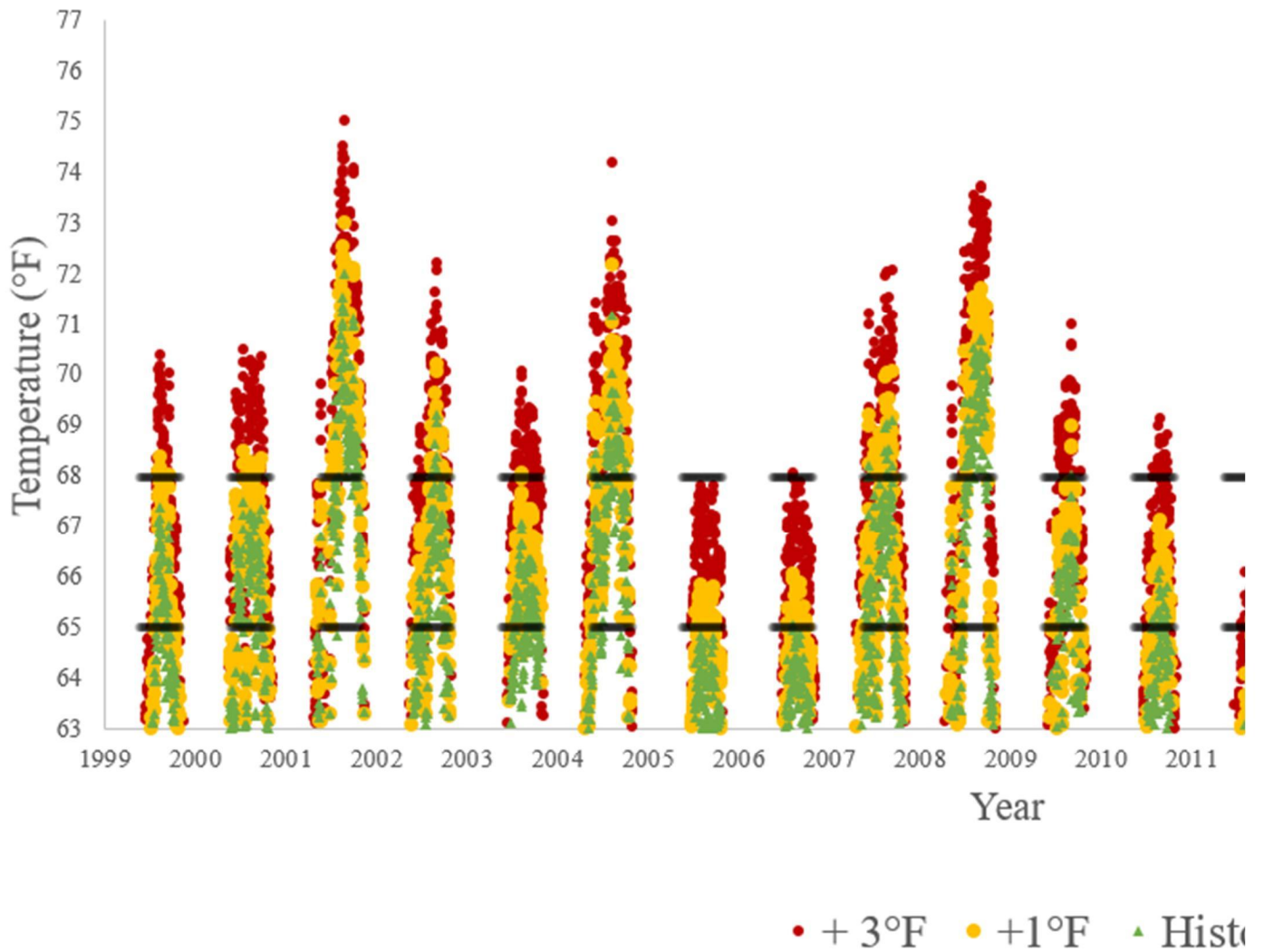
I hope these are still useful, I was a meeting Monday so I didn't make additional progress. Per Brian's directions from Friday afternoon, these tables/figures:

- Consider historic temperatures ( +0°F) , plus two climate change scenarios (+1°F and +3°F) and compare against two temperature metrics (65°F and 68°F). Note that two of those scenarios are functionally the same since 65+3=68°F.
- Count exceedances with duration of 1 day and magnitude of  $\geq 0.1^\circ\text{F}$ .
- Limit the analysis to July - Sept (rather than May 15 - Oct 31) (except the very first figure below, which just plots all the data to show trends)

Just let me know if you'd like anything changed, Thanks!

# Lower American River Temperature Suitability Decreases With Anticipated Climate Change

Comparing Historic Daily Average Temperatures (Green) with +1°F (Yellow) +3°F (Red) overlaid with 65°F / 68°F temperature thresholds from May 15 - Oct 31 for Juvenile Steelhead Over-Summer Survival



# % Days with Lower American River Temperature Amenable to Steelhead Rearing

(65°F or 68°F) in Key July through September Period Under Historic (+0°F) or Climate Change (+1°F / 3°F) Scenarios

Year	68°F Metric			65°F Metric		
	+0°F	+1°F	+3°F	+0°F	+1°F	+3°F
1999	100%	97%	59%	59%	32%	9%
2000	100%	91%	32%	32%	21%	2%
2001	38%	20%	8%	8%	7%	5%
2002	93%	71%	32%	32%	17%	7%
2003	100%	100%	43%	43%	14%	0%
2004	50%	30%	5%	5%	1%	1%
2005	100%	100%	100%	100%	74%	0%
2006	100%	100%	100%	100%	67%	9%
2007	92%	65%	22%	22%	13%	0%
2008	18%	5%	0%	0%	0%	0%
2009	100%	97%	39%	39%	30%	13%
2010	100%	100%	85%	85%	55%	13%
2011	100%	100%	100%	100%	99%	61%
2012	100%	100%	71%	71%	36%	9%
2013	77%	49%	16%	16%	13%	0%
2014	33%	5%	0%	0%	0%	0%
2015	2%	0%	0%	0%	0%	0%
2016	88%	62%	15%	15%	12%	7%
2017	100%	100%	100%	100%	59%	5%
2018	100%	99%	32%	32%	7%	0%
<b>Average</b>	80%	70%	43%	43%	28%	7%

On Sat, May 4, 2019 at 6:09 AM Brian Ellrott - NOAA Federal <[brian.ellrott@noaa.gov](mailto:brian.ellrott@noaa.gov)> wrote:  
Thanks Brittany for working on the American effects section. Please coordinate with Stephen on updating the water temperature analysis. He's putting together a couple of tables for over summer rearing that we'll want to incorporate, and likely will be able to help with other temp data updates.

Stephen, for the tables, instead of looking at the entire May through October compliance period, please modify the analysis so the table just focus on July through September. I think that will be a better indicator of potential effects to steelhead, and I'm more interested in showing potential effects than compliance. Feel free to call me if you want to talk that over.

Thanks,  
Brian

On Fri, May 3, 2019 at 8:59 PM Garwin Yip - NOAA Federal <[garwin.yip@noaa.gov](mailto:garwin.yip@noaa.gov)> wrote:  
It's been too long since I reviewed. I'd have to take a look. If we have the data we should be able to make our own.

Sent from my iPhone

On May 3, 2019, at 8:43 PM, Brittany Cunningham - NOAA Affiliate <[brittany.cunningham@noaa.gov](mailto:brittany.cunningham@noaa.gov)> wrote:

I'm still working on addressing comments the American River effects section. The biggest gap in it and the majority of comments left to address have to do with the figures needing to be updated. Did we ever get or make updated figures for the American Effects Section?

Brittany

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