From: Cathy Marcinkevage - NOAA Federal <cathy.marcinkevage@noaa.gov>
Sent: Monday, May 13, 2019 11:21 AM
To: Garwin Yip; Howard Brown; Barbara Byrne; Maria Rea; Evan Sawyer - NOAA Affiliate
Subject: Fwd: Summary of Tier 2 temp-mortality
Attachments: Teir_2_Temp_Mortality_Output.png; CDF_CCR.png

All –

The attached figures and email came from SWFSC a bit ago but I was too swamped last week to digest it. But, digest we shall, because it is meaty.

The figure tilted "Tier_2_Temp_Mortality_Output.png" is what I'm referring to.

This is in response to them 1) visualizing the operational Tier figure with proper scaling, 2) developing a time series of the "worst-case Tier 2" temperature conditions, and 3) applying that time series of temperature to the egg mortality models.

Basically, assume it's a Tier 2 year. Given Rec's figure of the Tiers, temperatures at CCR can be this time series:

- Pre-May 15 through 37 days after first redd: 56F
- 37 days after first redd to 67 days after last redd: 53.5F
- 67 days after last redd through Oct 31: 56F

This is shown in the left most figure, "Simulate Water Temperature, Tier 2".

The second and third plots show TDM for the emergence and hatch models. Note the histogram of redd presence at the top of each.

What I see from this:

- Both models 'protect' the "peak" of redd presence, and TDM is <20% for both models in the mid-June-mid-July period.
- There is NOTABLE discrepancy in TDM for periods outside of this "peak" redd presence time. Emergence model shows much greater TDM in the upper reaches before mid-June and after mid-July.
- Hatch model looks to estimate lower TDM in upper reaches than emergence model, but greater TDM in lower reaches, where there aren't as many redds, but they are still there, according to the "redd spacing distribution" bars on the right of each plot.
- If nothing else, this shows the wide discrepancy for the different methods that could be used to assess effect of the operational range within a Tier that would not require discussions with NMFS. TDM jumps to nearly 60% in early August for the emergence model.

I had not incorporated this into Shasta, but will this week.

Happy to hear your thoughts, too.

Online for 45 more minutes,

Cathy

---------- Forwarded message ---------
From: **Eric Danner - NOAA Federal** <eric.danner@noaa.gov>

Date: Tue, Apr 30, 2019 at 2:32 PM
Subject: Fwd: Summary of Tier 2 temp-mortality
To: Cathy Marcinkevage - NOAA Federal <Cathy.Marcinkevage@noaa.gov>
Cc: Evan Sawyer - NOAA Affiliate <evan.sawyer@noaa.gov>, Miles Daniels - NOAA Affiliate <miles.daniels@noaa.gov>

Hi Cathy,

Please see the following analyses from Miles Daniels.

Eric

---------- Forwarded message ---------
From: **Miles Daniels - NOAA Affiliate** <miles.daniels@noaa.gov>
Date: Tue, Apr 30, 2019 at 1:56 PM
Subject: Summary of Tier 2 temp-mortality
To: Eric Danner - NOAA Federal <eric.danner@noaa.gov>

Hi Eric,

Attached is the summary plot simulating how a stringent adherence to Tier 2 temperature targets on the Sacramento River could affect temperature-dependent winter-run egg mortality. The plot shows the simulated river temperature generated for the Tier 2 simulation (more text below describing methods) and corresponding egg mortality for the emergence (Martin) model and hatch (Anderson) model. Each sub-plot also has marginal histograms showing the distribution of when redds are assumed to be constructed in time and space on the river.

To generate a river temperature landscape from the Tier 2 figure USBR provided, which only specifies temperature targets at the Clear Creek gauge (CCR), historical observations from 1990-2017 were used. Specifically, historical observations were used to estimate the rate of river temperature change above and below CCR. Put another way, if we assume CCR temperature to be 53.5F, what is the river temperature below and above CCR. To generate these temperatures we selected dates when CCR was at 53.5 or 56F (the two temperature targets) and made cumulative distribution functions (CDFs) of how much the river temperature changes from gauges up or downstream from CCR and chose the 75th percentile estimate of the CDF.

The attached plot title "CDF_CCR", shows an example of this approach for the change in river temperature from Keswick (KWK) to CCR for the month of July. The plot shows that for the 75th percentile, when CCR temperature is 56F (i.e. 13.3C), Keswick temperature is 0.94C cooler. This approach was done for months from May-October using gauge data from KWK, BSF, JLF, BND, and RDB.

Please let me know if you want any further clarification on any of this,
Miles

--
Miles Daniels, Ph.D.
Assistant Project Scientist
University of California, Santa Cruz
Phone: 831-420-3946

--

Eric Danner, Ph.D.
Supervisory Research Ecologist
Fisheries Ecology Division, Southwest Fisheries Science Center
110 McAllister Way
Santa Cruz, CA 95060
831-420-3917
http://swfsc.noaa.gov/