Discussion Guide: Climate Resilience Considerations for WRIA 14

April 2020

Purpose of Discussion

At the October committee meeting, the committee agreed that it did want to address climate resilience in its plan, but needed more discussion to determine how to do that. The purpose of this discussion is to determine which options the committee would like to pursue.

What is Required?

Chapter 90.94.030 RCW does not require Ecology or WRE Committees to consider climate change in the planning process. Likewise, the Final Guidance on Net Ecological Benefit Determination (GUIDE-2094) released by Ecology to inform the planning process on how plans will be evaluated, does not address or require climate change.

October Discussion

The following summarizes the discussion at the October committee meeting (drawn from the meeting summary)

- Potential areas to address climate change in the plan are in the consumptive us calculation (evapotranspiration likely to change with higher temperatures), and resiliency of projects.
- Consider projects with higher resiliency and effective risk management.
- WDFW commented that they have done an analysis for sizing factors of culverts with climate change considerations in mind.
- Consider conditional addition of metering to address changes in water use due to climate change – some Committee members expressed concerns with this approach.
- Suggestion that consumptive use calculations should not be changed to factor in climate considerations on the front end due to data uncertainties.
- Consider weighting projects in regards to climate considerations – Angela commented that this is a component of the draft project screening criteria.
- The Committee will need to consider how to use climate project data.
- Angela will incorporate more climate discussions in future meetings.

Options for Committee Consideration

There are many options or considerations for climate change inclusions. The ideas described below are a starting point for committee discussion.

- Projects and Actions
    - Each project included in the plan could address climate considerations, such as:
        - Water timing, and how it may shift due to climate change (e.g. flashier systems, more water in the winter, change from snow-dominant to rain-dominant or mixed system).
        - Include criteria that evaluates whether projects are resilient to changing systems (wetter winters, drier summers, flashier systems).
        - Consider restrictions on summer watering when flows are lowest.

        - Identify or prioritize projects that take advantage of changing future conditions (e.g. storage of water during the wetter winters) and that focus on the timing of water availability.
        - Other ideas?
- Safety Factor
    - The overall plan could provide a safety factor on the amount of offset to ensure we overshoot consumptive use estimates.
    - See information provided by Paul Pickett in Attachment A (below)

Questions for committee discussion

- What specific components of the plan do you feel would best address climate resilience? (See the list above for possible considerations for the committee).
- Are there members of the committee who have the required expertise and resources to address these considerations? If not, do you have suggestions on how to address this?

Attachment A
WRA 14 - Analysis of water use under climate change
February 12, 2020
Paul Pickett

Assumption: increased evapotranspiration (ET) is equivalent to increased water use. If yard and landscaping vegetation has higher ET, homeowners will increase water use at a similar rate.

Approach: Regression of average daily ET to average daily temperature, relative humidity, wind speed, and precipitation. Method suggested by Guillaume Mauger UW Climate Impacts group. Direct calculation is possible but is complex and data-intensive.

Data sources

- AgWeatherNet (WSU) Poulsbo.S station http://weather.wsu.edu/index.php?page=station_details&UNIT_ID=355001
- AgWeatherNet (WSU) Tumwater station http://weather.wsu.edu/?p=90150&UNIT_ID=330153
- NWS Sanderson Field, Shelton station (KSHN) https://www.wunderground.com/weather/KSHN

Data selected

- 2018 chosen for analysis – a summer with moderate summer conditions. Multiple years possible but labor-intensive. Single year seemed reasonable for screening-level analysis. April through October – growing season.
- Average of ET from AgWeatherNet Poulsbo and Tumwater stations
- Temperature, percent humidity, wind speed, and precipitation from Shelton NWS station

Initial regression screening

- Relationship to temperature and humidity strong, wind and precipitation weak. (See attached graph.)
- Regressions tested for 4, 3, and 2 parameters. Regressions to temperature and humidity were very similar in strength to regressions including wind or precipitation.

Regression Results: multiple regression of ET to temperature and relative humidity

Regression Statistics	
Multiple R	0.836
R Square	0.699
Adjusted R Square	0.696
Standard Error	0.029
Observations	214
Coefficients	
Intercept	0.06117
Tair	0.00361
AvgRH%	-0.00217

Method to project future climate conditions: assume primary driver is temperature change. Northwest Climate Toolbox provides forecasts of future climate, including daily average temperatures. Relative humidity forecasts are not available, and so are assumed to not change significantly.
https://climatetoolbox.org/tool/Future-Boxplots

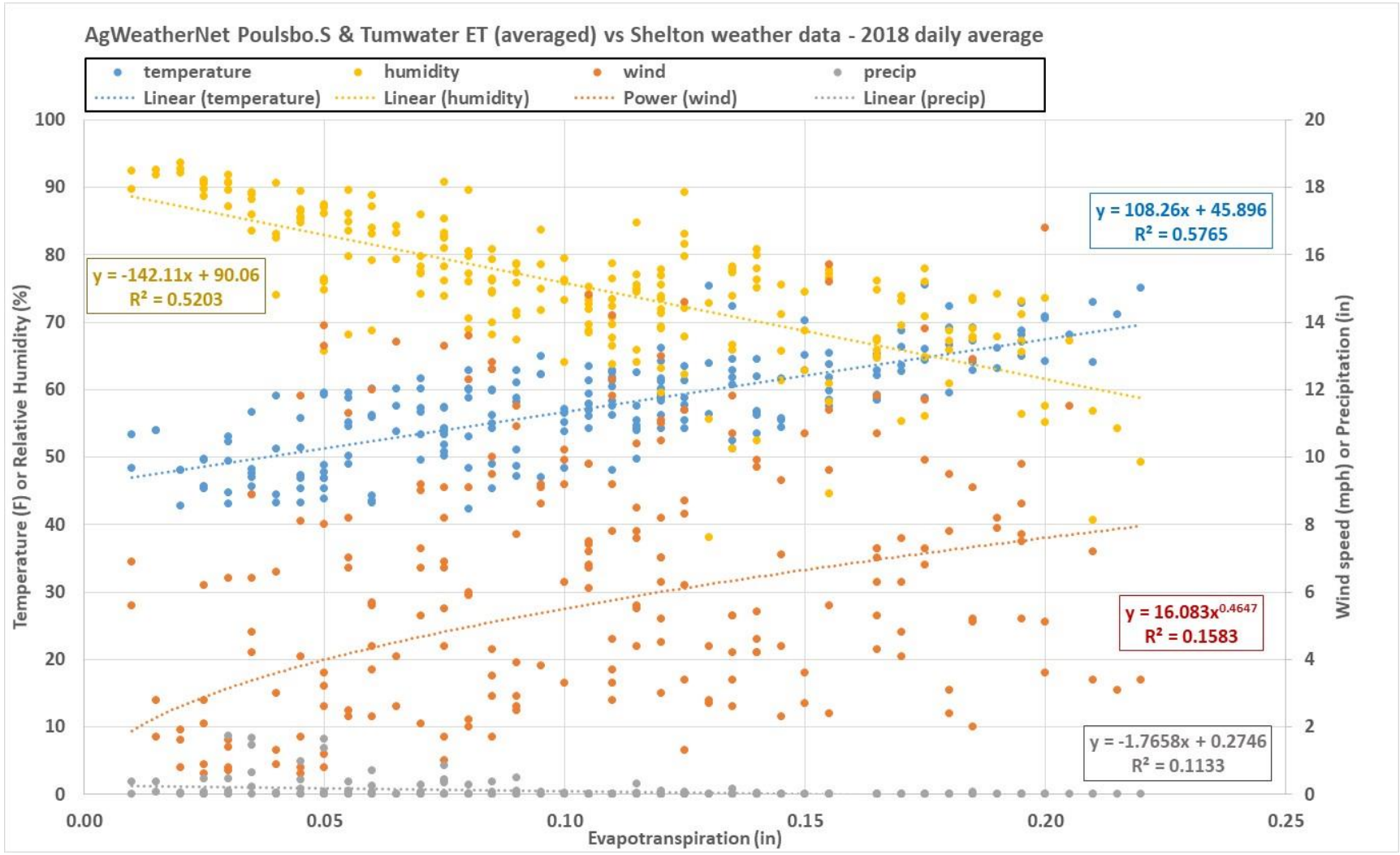
- Select location (same lat/long as Shelton NWS station)
- Select season: spring (March-May), summer (June-August), fall (September-November)
- Select mean temperature
- Select high emissions scenario (current track)
- Box plots show mean of climate model results for seasonal mean temperatures

Climate Toolbox	**Mar-May**	**Jun-Aug**	**Sep-Nov**
1971-2000	49.7	63.2	51.4
2010-2039	51.8	65.5	53.4
Diff	2.1	2.3	2.0

Future ET results: Seasonal difference in temperatures applied to 2018 record. ET calculated with regression. Daily ET summed for a total difference by month and over the growing season.

Month:	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sept**	**Oct**	**Apr-Oct**
2018	2.2	3.3	3.6	4.7	4.3	3.0	1.6	22.7
2040	2.4	3.6	3.9	5.0	4.5	3.0	1.6	24.0
Difference	0.2	0.2	0.3	0.3	0.3	0.0	0.0	**1.2**
percent	10.4%	7.1%	7.0%	5.5%	6.1%	0.0%	0.0%	5.5%

The analysis shows an increase in total growing season evapotranspiration of 1.2 inches by 2040.


AgWeatherNet Poulsbo.S & Tumwater ET (averaged) vs Shelton weather data - 2018 daily average
temperature
humidity
wind
precip
Linear (temperature)
Linear (humidity)
Power (wind)
Linear (precip)
y = 108.26x + 45.896
R² = 0.5765
y = -142.11x + 90.06
R² = 0.5203
y = 16.083x^0.4647
R² = 0.1583
y = -1.7658x + 0.2746
R² = 0.1133
Temperature (F) or Relative Humidity (%)
Wind speed (mph) or Precipitation (in)
Evapotranspiration (in)
0.00
0.05
0.10
0.15
0.20
0.25
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
14
16
18
20