Feb 1

**Meeting**

Phone call with Alden from Upstream – he works on remote sensing of ET and PUB. Recommended the following to me: University of Idaho’s METRIC; USDA’s ALEXI and DisALEXI; SEBAL. I said I would email him with info on PUB and 30m resolution or better ET information.

Feb 7

**Meeting**

For power law recession fitting:

* Nonlinear fitting for power law works better. Try it
* Identify the last meaningful storm at end of wet season. The little spikes in dry season shouldn’t make a huge difference in the quality of fitting.
* Experiment with knobs and get a sense of goodness of fit.
* Might need to ignore the “chunks” of constant Q which are probably sensor error.
* Take a closer look at separating shallow aquifer recession from deep GW recession.
* Try fitting individual dry seasons instead of all dry seasons at the same time.
* Don’t fit recessions to storms that happen in the middle of the dry season.
* Need a new way to define where the wet season ends (step fit individual years? step fit for all years, and throw out dry season window as part of decision tree approach.
* Ask Marc how he got a and b.
* Use a representative subset containing well behaved and badly behaved gauges to test the recession.

For NSE of data vs numeric vs analytic:

* turn the PDF into CDF or FDC to avoid effects on the tail end

Schaefli:

* think about what z\* physically means.
* Do a PUB thing – take z\* from neighboring gauges (requires that there be a cluster of gauges in the same group). In R, look up mixed effects models

Seasonality stuff: look at PUB book and Xue’s seasonality index

Future: think about skills to get out of PhD

Feb 13

**Desk**

Testing Marc Seasonally Dry v2.R: add in comparison of CDFs in addition to PDFs. Had to change the FCN\_findDrySeasonCDF\_Marc\_numeric, analytic so that it takes qds as the first argument in order to use sapply

PLOT\_NSE\_Testing\_Marc *Seasonally*\_Dry.R: began to move plotting into a separate file. Also did PLOT\_DISTRIBUTION…R

Attempted, in addition to CDF, to create FDC. FDC’s x axis is 1-CDF and its y axis is flow rate. Used approx() to interpolate among flow rates to get the same exceedance prob on x axis across all distributions we need to compare. Found that FDC and CDF all come with their own challenges in terms of finding NSE. Analytic CDF seems to be the best way to compare, but still need to figure out why number of breaks in histogram matters so much for analytic pdf performance.

Feb 14

**Meeting**

Quals committee: Mark (data science), Roger, Tina/Evan/Ashok, Iryna Dronova, Paolo D’odorico. First figure out what I’m doing then ask them/schedule it.

Can turn Marc’s power law recession into linear recession, and then re-derive.

For CDF: bin according to number of points in each bin. Leave out atom of probability at zero (figure out prob at zero, and fix it), then for everything else, find the pdf, and then the CDF. (stick with the CDF).

Feb 15

**Desk**

New function FCN\_findQuantileCDFs which calculates data CDF in a way that has the same number of counts in each bin and, from that info, the analytic Marc CDF.

Start testing different ways to estimate power law recession; file is Power Law Validation v2.R

Feb 16

**Desk**

Set up Power Law Validation v2.R and a function to calculate RMSE of the recession fitting, FCN\_findRecessionFittingError.R

Begin alternative power recession fitting method from Marc’s paper. This is developed and tested in power law recession Marc’s Way.R. used optim function. need to determine qo by finding the last Q peak in previous wet season. Explore this in find last wet season peak.R

Feb 19

**Desk**

Altered find last wet season peak.R to use max Q instead of mean Q as the threshold dQ/dt setter. Also added finding dry season peaks if wet season has no acceptable peaks. Also added in the possibility to using baseflow to find qo

Feb 20

**Desk**

Worked on find last wet season peak.R, add in ability to find local max of baseflow after finding the rough location of qo by using dQ\_total/dt. Put this code into FCN\_findWetSeasonPeak.R

Use FCN\_findWetSeasonPeak function in power law recession Marc’s Way.R, which finds a and b parameters from qo. NOTE that it also adjusts the start of the dry season to peakPosition\_adj, which corresponds to the day that qo happens.

In power law recession Marc’s Way.R,

Feb 21

**Desk**

Look at how a, b estimates with power law recession Marc’s Way.R changes across years for a certain gauge.

**Meeting**

* This week, contact Avery about the agri project and ask about PhD directions. Potential thing: is climate vs. soil/ET better control on indicators? (like, look at Baldocchi’s ET datasets). Google Earth Engine will be important.
* For NSE calcs between data CDF and analytic CDF: take out the first (smallest flow) bin to compare to the dataset that doesn’t have zero flows – to make comparison fair
* For a, b recession stuff:
  + either do individual year step fitting, or instead of starting with individual year step fit, try looking forward and backward x number of days. For example, +50 days into dry season.
  + We need to make sure that flows in dry season do not start increasing.
  + Before simulated annealing, try doing a log fit to get a good guess of a and b. we expect b to be a relatively consistent value, though a will vary by wetness and initial conditions.
  + Read Dave’s a, b careful paper for more information.
  + Since we are calculating qo and Td to fit the FDC and not individual years of flow, it’s ok if the peak of qo doesn’t match with step fit prediction of where dry season starts.

Feb 26

**Meeting with Avery Cohn**

The project has two parts: influence of climate indeces on agricultural productivity, and how fluctuating productivity might affect business applications (shipping, adjusting irrigation practice, etc)

Connect climate and crop response.

Variables with effect on crop response: crop yield as function of heat data/temperature, covariance of climate on crop productivity

Not many places in the area have irrigation because it’s expensive (only about 5% of crop area is irrigated)

However, there are small-scale impoundments of streams – understand the effects. Woods Hole dataset.

Collaborate with Dave on workflows, datasets, statistical models. Learn Python, Google Earth Engine

Send Avery a timeline of development of project ideas, working backward from rough draft of papers

Administrative stuff – talking to Nature Conservancy; ask A+R extension specialists for meeting on how to communicate with NGOs

Think about how to go from summer project to tie into PhD – this will also be prospectus for qual