**WERA 102 - September 19-21, 2018 - Davis, California**

**Wednesday, September 19, 2018:**

Introduction of attendees by Mike Anderson

Mike Anderson discussed committee objectives and goals for the 5 year plan

**Steve Ostoja** (USDA – ARS) - USDA Climate Hubs (10 nationwide) sponsored by ARS receives funding via ARS, Forest Service and variety of IAG’s, all hubs are tied to land grant universities. Originally seven climate hubs, increased to 10 to accommodate very different California climate from the rest of the southwest. Each hub operates differently based on needs of constituents derived from steering committees (state, local, federal). Focuses on forest management, climate and specialty crops to include ecology, fire, restoration. Providing tools to promote better decisions for users, including fact sheets, workshops. Sustainable Groundwater Management Act (SGMA) will attempt to manage groundwater in California.

**Danny Marks** (USDA – ARS) – Partnership with NASA-JPL and USDA – ARS, Airborne Snow Observatory (ASO), integration of modeling and airborne lidar. Spatial snow measurements from satellite imagery for remote sensing. ARS role was originally to provide density field, then transitioned into providing modeling system to customers. iSnobal is a raster-based, two layer, energy balanced snow hydrology model for water supply, not snow pack physics. Model is completely decoupled, everything is done inside the model, generates the forcing data itself. Precipitation distribution is the limiting factor. Many different meteorological forcing variables and snow variable outputs. Issues arise with heterogeneity of snow cover with drifting and wind scoured areas. Finding met stations are too low as snowpack elevation increases. Lidar data makes model data more accurate. Goal is to couple snowpack and streamflow modeling for a complete water balance. Streamflow model is PRMS-like, raster-based, decoupled and has isolated calibration procedures. Integrating sensors, modeling and measurements will allow for better forecast if higher accuracy inputs are achieved.

**Discussion** – Group discussion on direction of meeting and plans for the next couple days.

**Thursday, September 20, 2018**

**Dave Dubois** (NM State) – Dave discussed current NM Climate Center Staff. Center activities include climate and drought monitoring, contribution to activities, outreach and research. Maintains seven different monitoring networks including ag based stations. ZiaMet network, currently 10 stations, soon to be one new station in Aztec (cooperative with USBR), and 4 more will come back online. Research includes air quality, dust, transportation (trucking companies) and range management/erosion. Future plans include improving network data quality, visibility/branding, funding and collaboration; as well as increasing expanse of CoCoRahs.

**Amanda Sheffield** (NOAA/UC) – NIDIS drought early warning systems prepares for drought, is not an actual alert system. Comprised of 5 locations throughout the US, not a national system yet. Work with National Soil Moisture Network, National Drought Mitigation Center, National Water Center and Drought Amelioration with NIDIS. Drought information is used to provide information on impacts of drought associated with wildfire (ie Red Flag Warning) and public health (ie valley fever, mental health). US Drought Portal provides tool for drought monitoring and statistics (drought.gov). Coordinators provide communication to constituents in a variety of ways included printed publications, webinars, website information, etc. California-Nevada Drought Early Warning System provides workshops, conference calls, strengthening of the input process, and activities. California Drought 2011-2017 story map shows a visual representation of drought. CNAP snowpack and reservoir storage maps/visualizations show the actual water supply as well as groundwater pumping/land subsidence. Nevada Drought Forum supports drought monitoring. Climate Engine provides drought monitoring, agricultural and ecosystem and wildfire data.

**Dan McEvoy** (DRI) – Replace Kelly Redmond as the Regional Climatologist along with Nina for the Western Regional Climate Center, 6 Regional Climate Centers throughout the US. California Climate tracker, a new tool developed a couple years ago that displays current climate trends using PRISM data. Archive maps and climate data/statistics available for any year back to 1895. Snow drought shows the whole story, not just SWE values, looks at precip, temps and the impacts of variables. Snow drought study in the Northern Sierra looking at data from a variety of data sources. Warm snow droughts are where precip was normal/above normal, but temperatures were higher, reducing snow pack. Lower elevations showed lower SWE where higher elevations showed higher SWE values on April 1. NIDIS now has a snow drought page with information, maps, data, etc. Climate Engine developed by DRI and University of Idaho to allow non-programmers to view data sets without programming. DRI put on day long trainings for Climate Engine at all BLM offices in Nevada for users and specific aspects based on needs. NiceNet ag met stations installed in 2010, calculated ET across Nevada. Three new stations planned, year to year funding, state forgot to put funding in the budget, working out the kinks. Looking at hemp water usage.

**Kathie Dello** (OSU) – Kathie gave an overview of Oregon Climate Center and staff. Much of Oregon is under extreme drought and record breaking dry period. Looking at re-evaluating drought determination procedures as drought monitor doesn’t accurately reflect conditions. On the ground impacts from local farmers/ranchers/people aren’t being applied to the drought monitor, just based on precipitation. Oregon is questioning the process of the drought monitor and trying to improve the process. US Water Watcher looks at different drought, precip, etc maps and compares to the drought monitor (<https://climatetoolbox.org/tool/US-Water-Watcher>) along with other tools for climate, crops, etc.

**Jama Hamel** (USBR) – Jama reported on the AgriMet program, budget issues and uses.

**Lorrie Flint** (USGS) – Hydrologic modelling on Lake Mendicino, extreme drought followed by atmospheric rivers. 39% of precipitation not accounted for in measured/estimated values. Measured water content in the soil and compared to streamflow when soil saturated. Used wilting point associated with soil moisture to adjust model. Determined requirements for measuring a range of conditions across the watershed and installed precip, soil moisture and streamflow gauges along with existing stations. Basin characterization model used to match streamflow based on soil moisture, SWE and ET stations. Models are used for resource management to interpolate processes across the landscape to predict conditions. Model determines number of months of average conditions to return to average annual water supply and compared deficit to 2017 wildfires to determine risk. Looked at historic vs future runoff and recharge, determined with an increase of atmospheric rivers, events will become flashier. Used 10m model to determine vegetative diversity. Streamflow model also predicts sedimentation events based on 3 day flow events and percentage of increase.

**Discussion** – Collaborating with members to fulfill objectives of committee should be a priority and looking at resources available. Need to bring attention to the value of the output of the group’s work.

**Friday, September 21, 2018**

**Mike Anderson** (CA DWR) – Discussed atmospheric river and the Oroville spillway failure. San Joaquin watershed is higher elevation. Variability in precip across the US deviates little east of the Mississippi and greatly in the west, especially California. In the west cannot plan according to the mean. Decadal precip variability driven by atmospheric rivers. Monthly average runoff is increasing in the winter months and April/May/June is decreasing in the last half of the century. 5 year water data shows more extremes and variability in the 21st Century. The size, number and strength of AR’s result from the alignment of key physical processes operating on different space and time scales, water supply depends on how many AR’s hit and their intensity. Advanced observing system for atmospheric rivers with a variety of sensors and instruments helps observe AR’s. Atmospheric rivers result in warmer precip events, higher freezing elevations and rain on snow events. AR driven pulses are the future for California. Goal is to develop an integrated observing system for integrated water management. Hourly data is important. Freezing levels associated with precip is important. Need new advanced observing/weather stations, to understand influence of climate change at the hourly scale to improve observation and key elements.

**Discussion** – Next steps to fulfill requirements of this year’s meeting, will get all reports to Mike and he will submit to Ed. Discussed next year’s meeting plans, meeting will be held in Reno or Corvallis, Mike will reach out to Dan and Kathie to determine who will host next year and who will be the following year. Ed suggested plans to host a conference in 2021 to allow climate related researchers to present work and collaborate.