3rd Colorado ET Workshop

Goal: Accurate, efficient, and standardized methods to estimate historic (25 – 50 yr), recent (previous year), and current (previous month) CU estimates for the purpose of documenting historic CU, savings for water transfers, and augmentation requirements.

Colorado ET Workshop

Primary Organizers

- Colorado Division of Water Resources
- Colorado Water Conservation Board
- Colorado State University
- Northern Water
- USDA-Agricultural Research Service

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Organizing Committee

Kelly Thompson, CDWR

Steve Miller, Michelle Garrison, Craig Godbout, CWCB

Jon Altenhofen, Northern Water

Mark Crookston, Northern Water

Jose Chavez, CSU

Tom Trout, Kendall DeJonge, USDA-ARS

Matt Lindburg, Meg Frantz, Brown and Caldwell

Bruce Kroeker, TZA

Steve Smith, Buena Vista Farm

Ivan Walter, Ivan's Engr.

Larry Stephens, USCID

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4 Sessions

- **30 minute coffee breaks – morning and afternoon**
- **Lunch with speaker**

Session 1:

- **Comments by CDWR and CWCB**
- **B-C methods – Dean Santistevan, CDWR**
- **Allan Andales – Rocky Ford lysimeter, and WISE**

Session 2: Weather Data

Session 3: Deficit Irrigation and Crop Coefficients

Session 4: Remote Sensing and Big Data

A Few Definitions

- **Evapotranspiration (ET):** movement (flux) of water from a surface to the atmosphere; includes evaporation, **E**, from the surface and transpiration, **T**, through plant stomates**.**
- **Actual ET (ET_a):** ET from a land surface (also **Consumptive Use, CU**)
- **Crop ET (ET_c):** modeled (predicted) ET from a cropped land surface
- **Potential ET (ET_p):** ET of a crop with non-limiting water (well-watered)
- **Reference ET (ET_{ref}):** **ET_p** from a well-watered reference surface (usually a 0.12 m grass surface (**ET_o**) or a 0.5 m alfalfa crop (**ET_r**))

ET Estimation Methods

- **SCS Blaney-Criddle method (TR-21):** **ET_p** estimation method based on air temperature, day length, and crop and climatic coefficients.
- **Penman-Monteith "Combination" equation:** **ET** estimation method based on temperature, relative humidity, solar radiation, and wind speed.
- **ASCE Standardized P-M equation**: Standardized method to calculate **ET_{ref}** for a short (grass) and tall (alfalfa) reference surfaces (ASCE 2005).
- **FAO-56 Method:** **ET_c** estimation method based on P-M **ET_{ref}** and crop coefficients, Kc (Allen et al. 1998)
- **Surface Energy Balance:** **ET_a** estimation method based on energy fluxes at the surface (net radiation, latent heat (ET), sensible heat, soil heat).
- **Water Balance:** **ET_a** measurement method based on water fluxes into and out of a control volume.

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