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Final report for project: Continuation of Weather Stations for North Park lysimeters to determine high altitude, hay meadow crop coefficients

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This project supported the maintenance of three CoAgMET weather stations in the North Platte basin. These stations have been in place since 2009 in Cowdrey, Hebron, and Larand. In 2016, two Lysimeters were installed adjacent to the Cowdrey CoAgMET station to better quantify consumptive use in the North Platte Basin. Due to unforeseen issues with the lysimeters prevented quality data to be collected for the first two years of the project. This project supported three additional years of maintenance and data collection at these CoAgMET stations, in order to improve consumptive use and crop coefficient calculations from the lysimeters. These weather stations are instrumented to measure temperature, solar radiation, wind speed, and surface humidity, allowing for fully-physical computations of American Society of Civil Engineers (ASCE) Potential Evapotranspiration (PET).

Figure 1: Photos of the three North Park CoAgMET stations. Left: Cowdrey; Center: Hebron; Right: Larand.

This project supported routine maintenance of these three stations, along with the processing, quality control, and dissemination of the data through the web, CoAgMET API, and other avenues. The funding primarily supported CoAgMET/CCC staff salary, along with some travel, materials, and supplies. The data collected during the project were also provided to Colorado River Engineering, which maintains the lysimeters.

The proposed plan was to perform routine annual maintenance on these three stations toward this project's goals. Early in the project period, the COVID-19 pandemic arose, which restricted travel for some time. As a result, visits to these stations (and all CoAgMET stations) for maintenance were delayed. However, regular quality control of the data was performed, and with one exception in 2022, all three stations collected high-quality data as expected.

For about two weeks in late May and early June 2022, the Cowdrey station had a data outage. Then-CoAgMET manager Zach Schwalbe visited this station in early June 2022, got the station back up and running, and performed routine maintenance of the station during this visit. In January 2023, Zach Schwalbe left the position of CoAgMET manager to pursue a new career opportunity.

In April 2023, full maintenance was performed on all three North Park stations by CoAgMET station technician Alistair Vierod. This includes the replacement of anemometer bearings to keep the sensor spinning with as little friction as possible; replacement of the temperature and relative humidity sensor with a factory-calibrated sensor; and replacement of the bearings for the wind vane for accurate wind direction measurement. This leaves all of the stations in excellent shape to continue collecting high-quality data well beyond the end of this project. Reference evapotranspiration estimates for the project period are included below in Figs. 2-4. All CoAgMET data are publicly available via the website at https://coagmet.colostate.edu/.

Wendy Ryan of Colorado River Engineering confirmed that the data collected by the CoAgMET stations met her needs for the calculation of crop coefficients from lysimeter data.

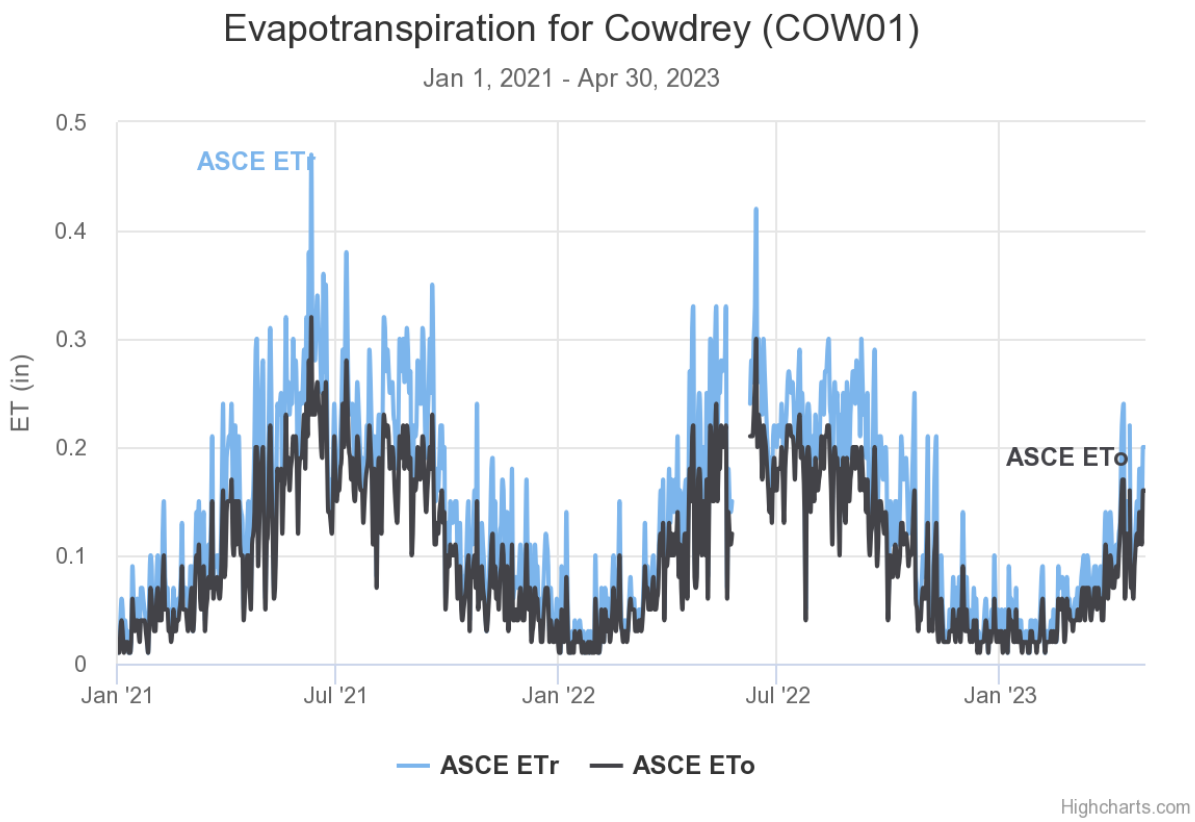

Figure 2: Time series of reference evapotranspiration using the American Society of Civil Engineers equation for tall crop (ETr, blue) and short crop (ETo, black) for the Cowdrey CoAgMET station from 1 January 2021-30 April 2023.

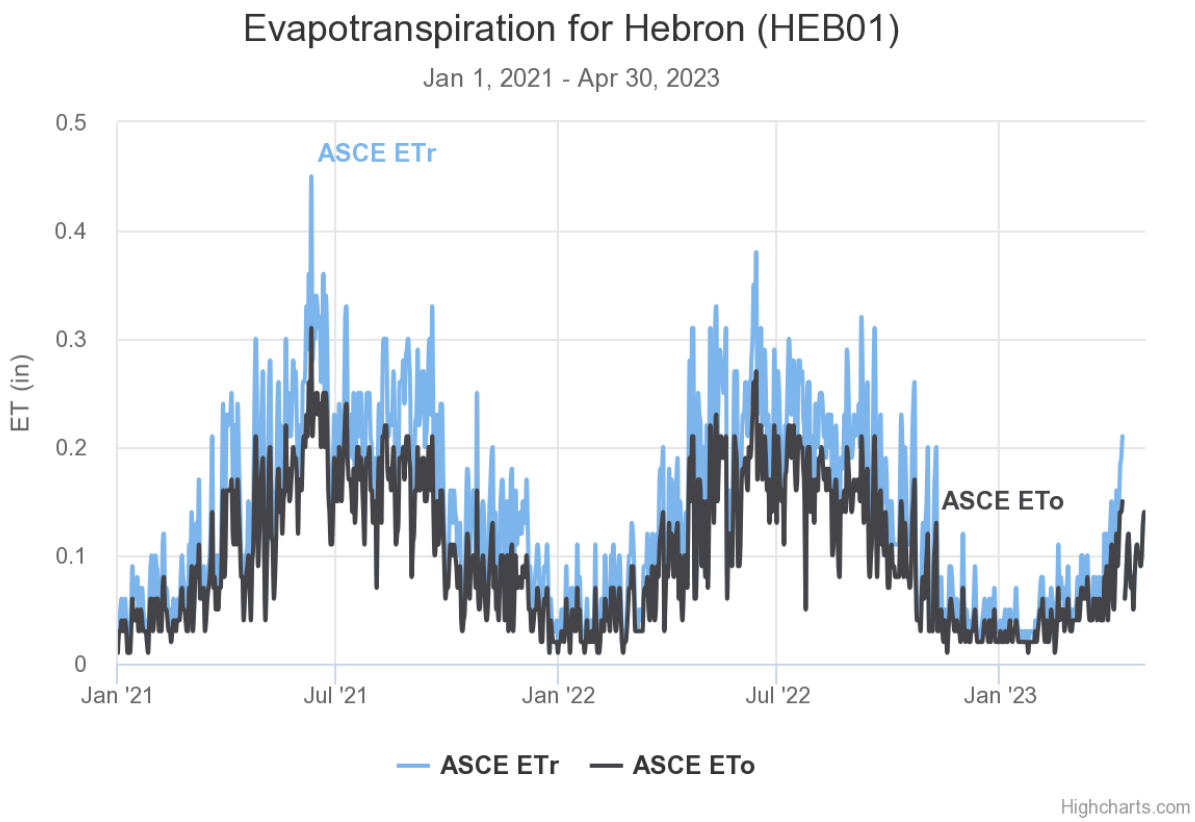

Figure 3: Same as Figure 2, but for the Hebron station.

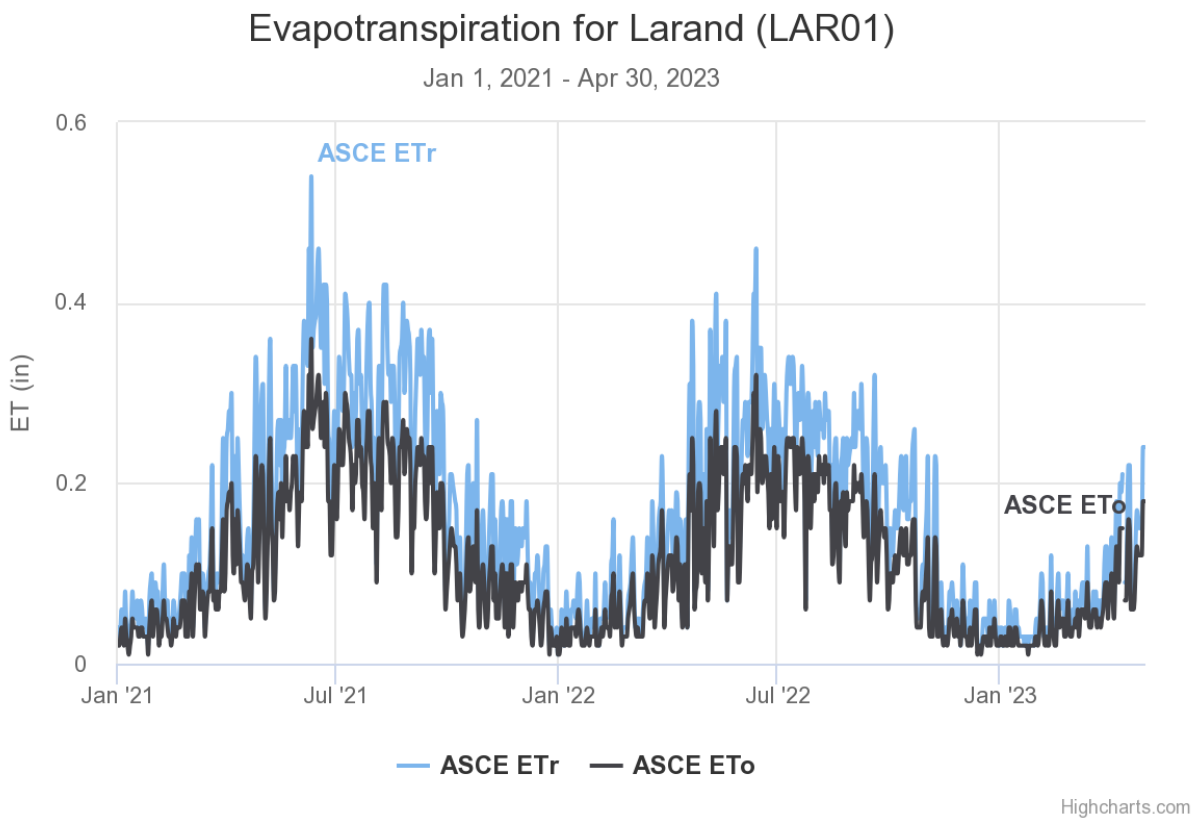

Figure 4: Same as Figure 3, but for the Hebron station.