

Weather Data for ET Calculations – Northern Water

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June Caves



Northern Water

East Slope of
Rocky Mountains
in northeastern
Colorado

1.6 million acres
(652,000 ha) in
eight counties

Contracting entity for repayment of
irrigation component of Colorado –
Big Thompson (C-BT) Project

Colorado – Big Thompson Project

\$160 million
construction cost

12
reservoirs/lakes

3 pumping plants

7 hydro-electric
power plants

99 miles (160 km)
of canals

693,000
irrigated acres
(280,000 ha)

220,000 ac-ft
($270 \text{ m}^3 \times 10^6$)
average annual
deliveries

\$370
million/year
agricultural
production

721,000
population

Weather Station Network

Provides weather & crop water use information throughout service area

21 automated stations – 19 on eastern plains, 2 on west slope at high elev

Solar powered

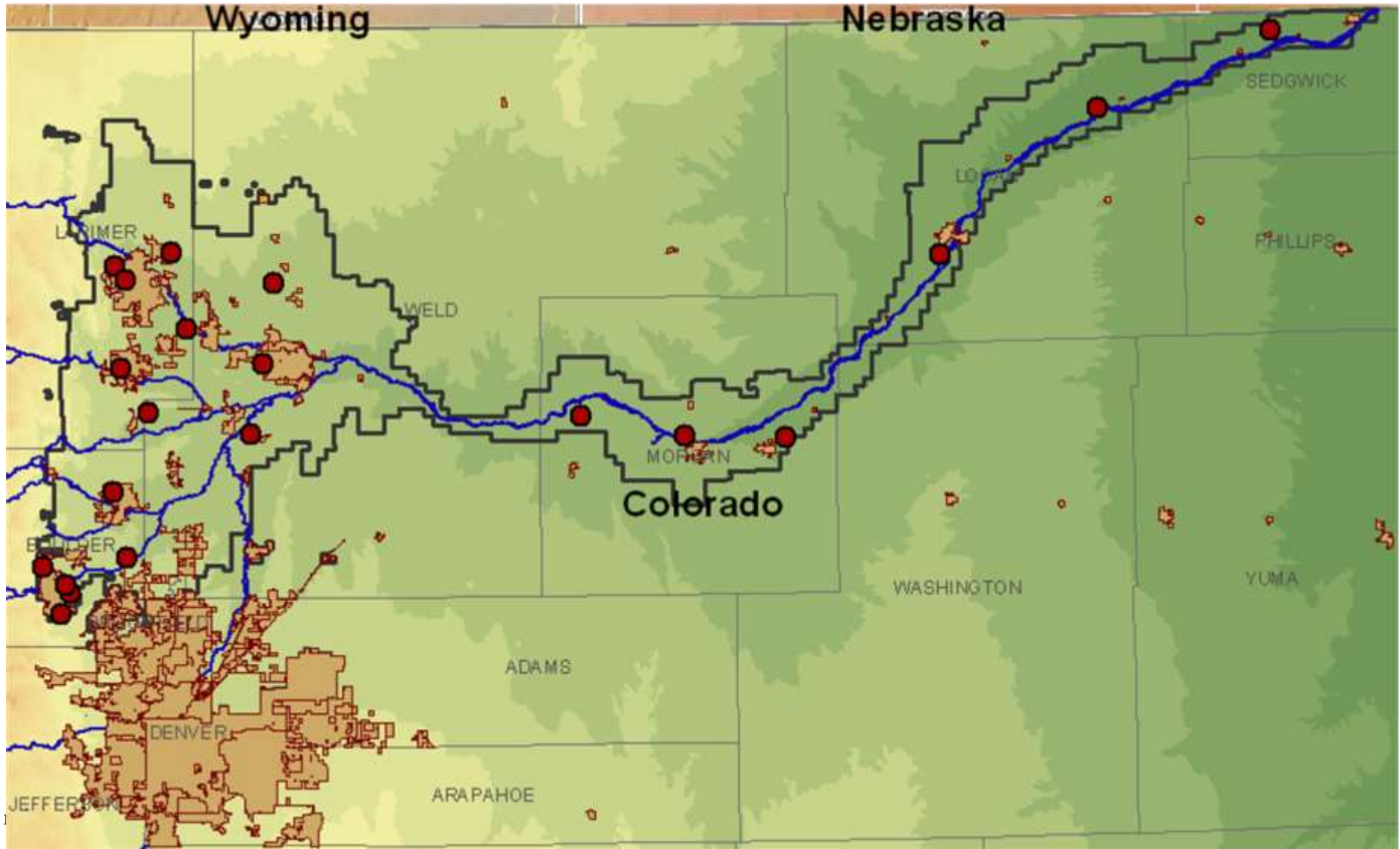
CDMA modems: data downloaded every 15-minutes

Station sites 'carefully' selected – in alfalfa fields or large turf areas

Air temperature, relative humidity, rain/precipitation, wind speed/direction, solar radiation & soil temperature

Every sensor serviced & calibrated at least annually

Weather Station Network



ET Reference

ASCE Standardized Penman-Monteith equation

Hourly calculations: ETrs for alfalfa & ETos for turf grass

Daily, weekly, monthly, quarterly, and yearly data aggregations available via web.

ETrs is factored using coefficients based on crop growth stages for all major crops grown in the area

How to Access Weather Data

**REST web
services**

**Data alerts
via text or
e-mail**

**Older daily
data sets
not yet
available
online.**

www.northernwater.org

Weather & ET Info

Weather & Evapotranspiration Data

- Favorites
- Select Weather Stations / list or map
- Select Weather Categories
- Adjust Time Interval / Standard Daily Report
- View Results
 - Tabular Results
 - Graph Results
 - Export to Excel

Background Information

More Ways to Get Data

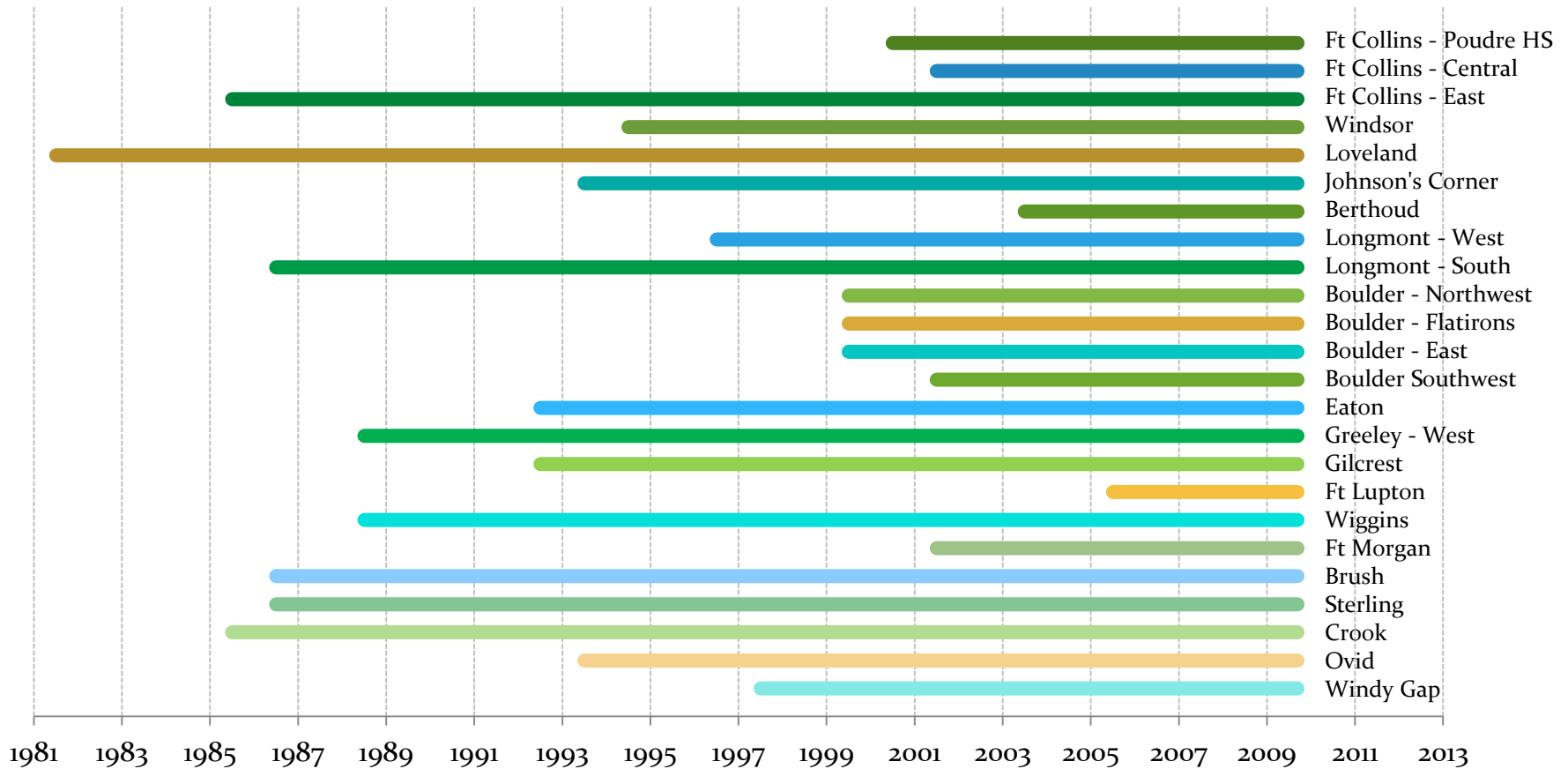
□ coagmet.colostate.edu

CoAgMet

□ erams.com

eRAMS - CSU

Period of Record



Sensor Calibration

every sensor - every year

Air
Temperature

Relative
Humidity

Rain – tipping
bucket gauge

Precipitation
– weighing
bucket gauge

Wind Speed

Wind
Direction

Solar
Radiation

Soil
Temperature



Solar Radiation

Li-Cor pyranometer LI-200



Berthoud

Northern Water Headquarters



Eaton



Greeley – West

Greeley Parks & Recreation



Gilcrest



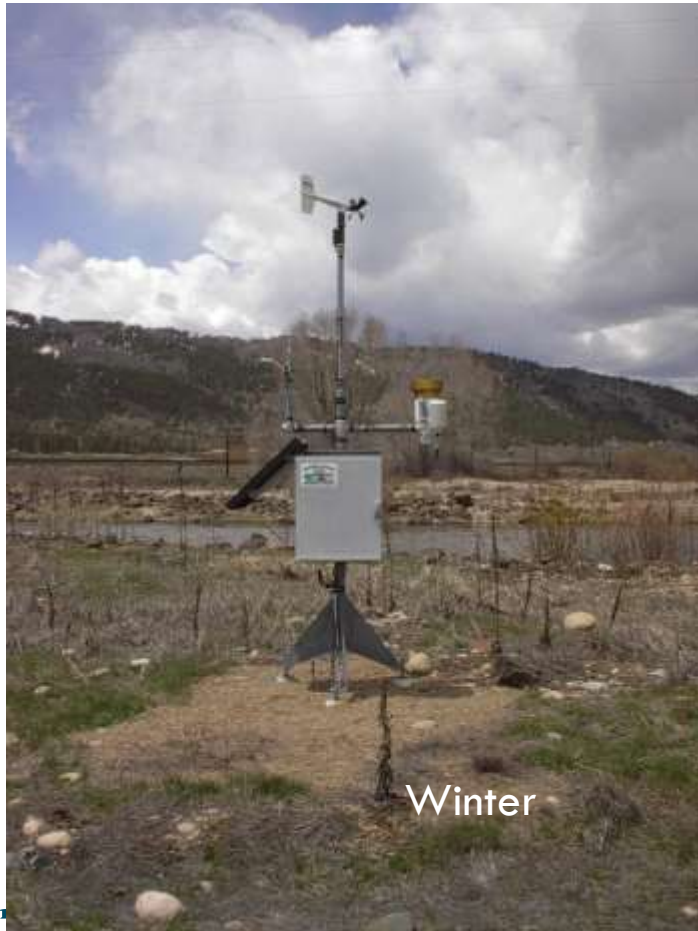
Fort Lupton

Coyote Creek Golf Course

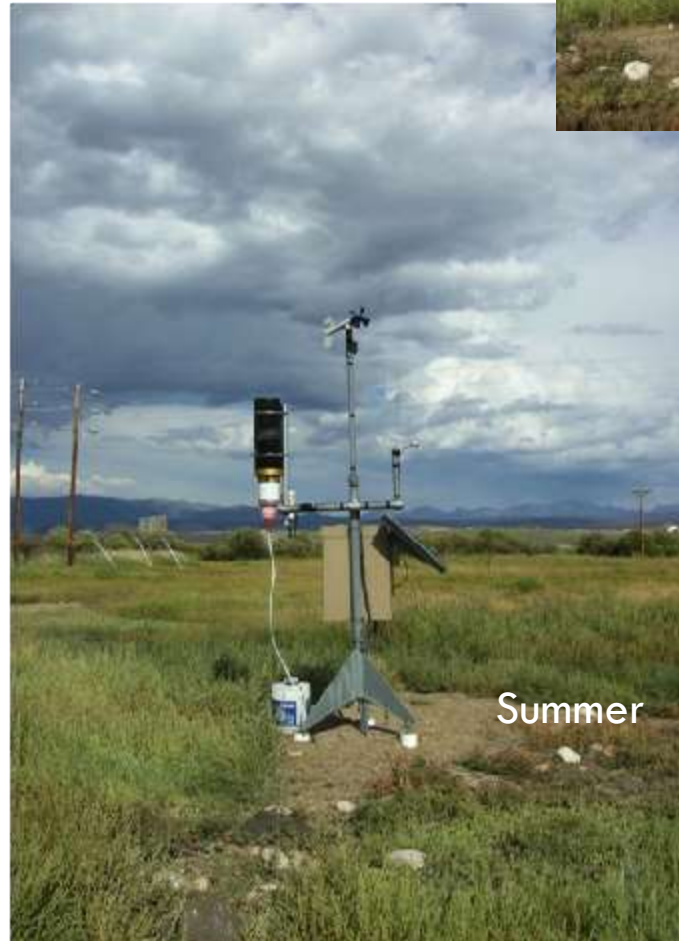


Windy Gap

7,851 ft above MSL



Winter



Summer

Common Questions

- ❑ Tipping bucket rain and weighing bucket precipitation are not the same.
- ❑ Wind data has been standardized at 3-meter height for all stations.
- ❑ Wind at 2-meter height is also provided.
- ❑ k_p is not evaporation – pan evaporation is not water surface evaporation.
- ❑ The station locations provided publically are not exact.

Proposed Improvements

- ❑ Improved REST web services – easier access to retrieve desired data.
- ❑ Addition of weighing bucket precipitation gauges at remaining stations having only tipping bucket rain.
- ❑ Discretize WB precipitation data – remove sensor “bounce” to eliminate slight negative readings.
- ❑ Make “current” weather readily available.
- ❑ Make older daily data sets available online.
- ❑ Catch-up QA/QC review of past data sets.



Questions?

Conservation Gardens at Northern Water





