

# Utilizing Remote Sensing to Estimate Consumptive Use of Water

## NORTH PLATTE DECREE COMMITTEE

### PROJECT SUMMARY

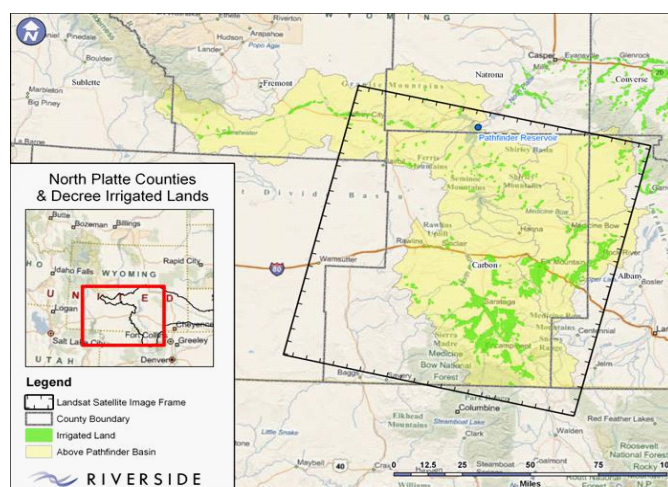
The Nebraska Community Foundation, acting on behalf of the North Platte Decree Committee, required an evapotranspiration expert knowledgeable in using satellite imagery to estimate consumptive use of water on irrigated cropland for the North Platte River Basin in Wyoming above Guernsey Reservoir. Riverside Technology, inc. recommended using Mapping Evapotranspiration at high resolution with Internalized Calibration (METRIC) as the project's image-processing model for calculating evapotranspiration as a residual of the surface energy balance.

LOCATION  
Wyoming, U.S.A.

PERIOD  
2008 – 2010

### PROJECT DETAILS

As a result of the 2001 Final Settlement Stipulation (FSS), in the case of Nebraska vs. Wyoming, No. 108, as accepted by the U.S. Supreme Court on November 13, 2001, the North Platte Decree Committee (NPDC) was formed to oversee the implementation of the settlement. This included conducting research related to the estimation of the consumptive use of irrigation water in Wyoming's North Platte River Basin above Guernsey Reservoir. To monitor compliance with the FSS cap on irrigation consumptive use, Wyoming currently develops annual estimates based on routine reference evapotranspiration (ET), crop efficient, and effective precipitation procedures.



North Platte Decree Committee Study Area

Quantifying the consumption of water over large areas and within irrigation projects is essential for water demand forecasting, water rights management, water resources planning, and water regulation. Because it is difficult to capture this information, it is often misunderstood. Limitations in obtaining accurate estimates of crop ET have led the North Platte Decree Committee (NPDC) to investigate alternative methods.

Recent developments in satellite remote sensing ET modeling have enabled an accurate estimate of ET and crop coefficients ( $K_c$ ) for large populations of irrigated parcels. Two approaches, the Surface Energy Balance (SEBAL) and the Mapping Evapotranspiration at high Resolution with Internalized Calibration (METRIC), are commonly used for this type of work. METRIC is the most suitable approach for this project because it provides better integration with ground-based ET, enhancing its repeatability and accuracy.

Riverside Technology, inc. (Riverside) recommended using Mapping Evapotranspiration at high resolution with Internalized Calibration (METRIC) as the project's image-processing model for calculating ET as a residual of the surface energy balance. To select and analyze remote sensing-based ET data, Riverside proposed its ArcGIS ET-Server technology.

The spatially distributed ET produced by METRIC was summarized geographically using Wyoming's GIS data which included irrigated parcels, watershed boundaries, and administration boundaries. The objective of this study was to use satellite imagery to estimate the consumptive use of water on irrigated lands in Wyoming's Platte River basin. Riverside met this objective by using the METRIC approach, concluding that it was the best approach to develop an estimate of the water used within each zone.

### RELATED PROJECTS

South Platte Decision Support System, Spatial Information Systems

Enhancing Water Management Decision Support Systems for Colorado and Washington

Cooperative Development of an Irrigated Lands and Crop Characterization Monitoring System

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