



Klamath Natural Flow Study

Evapotranspiration Modeling

Evapotranspiration Analysis Purpose

Evapotranspiration (ET) is an important component of the Klamath Basin water budget and thus is a key input to the groundwater and RiverWare mass balance models. The purpose of the ET modeling efforts is to:

- Develop a dataset of irrigation demands to produce calculated net ET (ET less effective precipitation) and estimates of deep percolation recharge by agricultural field
- Develop ET estimates for groundwater dependent vegetation (i.e., vegetation that uses groundwater as a source for ET) based on current conditions and undeveloped conditions and extents

Model Selection and Input Data

The ET-Demands model (Reclamation 2015) uses climate data, crop type, and distribution data as well as soils data to estimate crop potential ET and effective precipitation assuming well-watered, stress-free conditions. The OpenET eeMETRIC model (Allen et al. 2005, Allen et al. 2007, Allen et al. 2011) uses optical and thermal data from the Landsat series of satellites combined with local weather stations to measure actual ET which is often less than potential ET. Groundwater ET was calculated based on a regression approach using both meteorological data and vegetation indices. The conceptual diagram (backside) shows the inter-relationship of the ET modeling with the other study components.

Natural Flow Representation

To simulate undeveloped conditions, the following features are modified:

- Use undeveloped wetlands and phreatophyte extent and estimates of undeveloped wetland ET and phreatophyte ET in place of current conditions extents and ET
- Remove ET and deep percolation recharge in irrigated areas (this will be accounted for in the groundwater model)

Model Products

- Monthly net ET and deep percolation recharge by field provided as text files
- Current and pre-development conditions wetland extent and ET estimates provided as geotiff raster images

Uncertainty Analysis

The following approaches were used to account for uncertainty in estimates of ET:

- Rates of ET for groundwater dependent vegetation were developed along with an uncertainty range calculated using a 90% confidence interval
- eeMETRIC results were compared to ET estimates calculated by an eddy covariance station within the region to produce an estimate of accuracy. This estimate of accuracy was added/subtracted from model estimates to create a range of likely ET values

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Key References

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