



USGS Water Census Guidelines and Specifications for ET Remote Sensing

U.S. Department of the Interior
U.S. Geological Survey

Remote Sensing Workshop
September 28, 2012 – San Diego

Guidelines and specifications

- **Many prior and ongoing crop ET remote sensing activities Universities, state agencies, and consultants**
- **Idaho, Colorado, Wyoming, Nevada, New Mexico, California, more**
- **Bureau of Reclamation**
- **Upper Colorado River Basin Commission**



Guidelines and specifications

- Potential duplication of effort**
- But good reason for “own numbers”**
- Solution: guidelines and specs**
 - Use model you like**
 - Numbers accepted by the community**
 - Realize economies, while meeting accuracy standards**

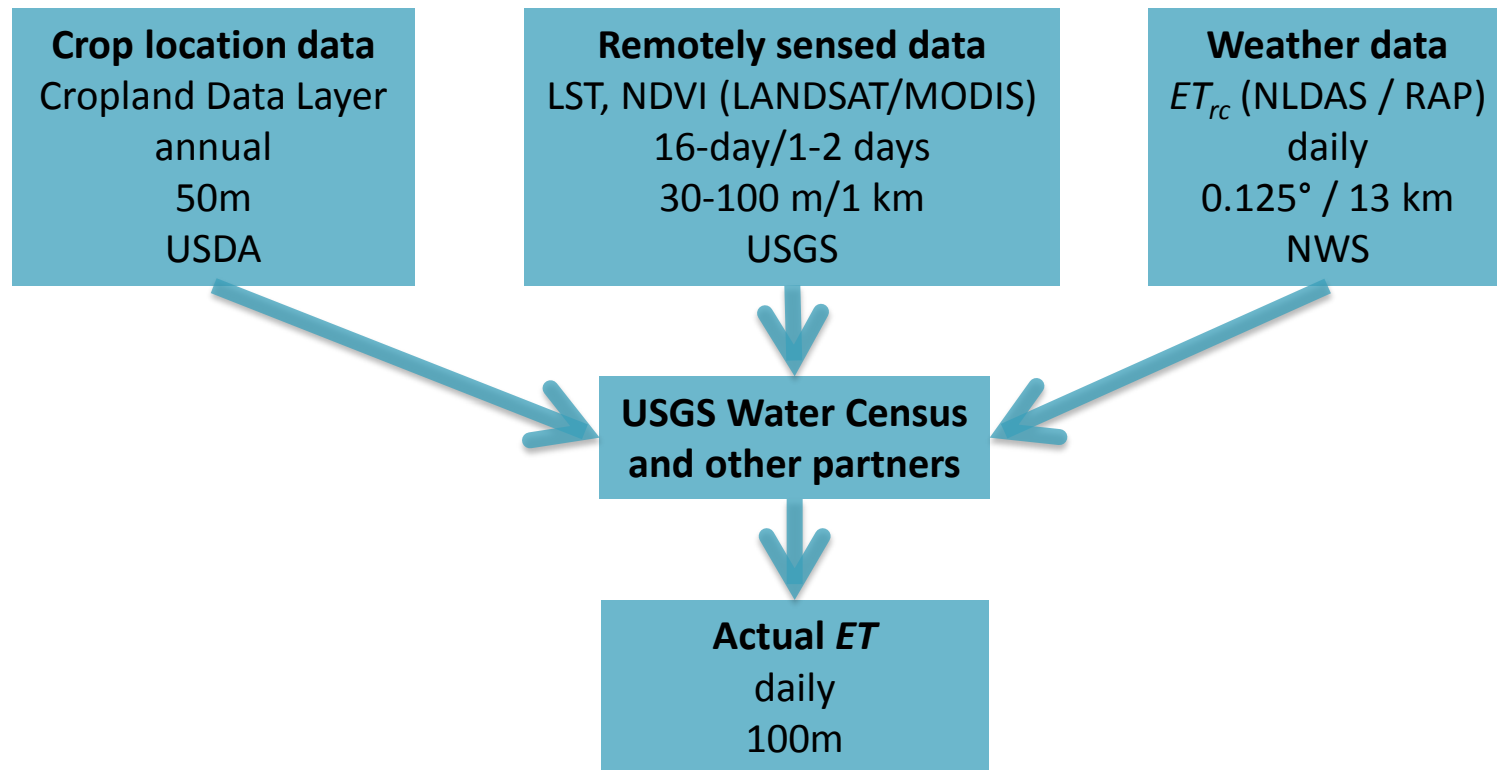
Guidelines and specifications

- **Common framework of practice**
- **Consistent inputs to reduce uncertainty**
 - **Where are the crops?**
 - **USDA CDL, State GIS**
 - **Gridded reference ET from NOAA**
 - **Colorado Basin River Forecast Center**
 - **Consistently pre-processed Landsat image data from USGS**
 - **Consistent with requirements for Essential Climate Variables**



Guidelines and specifications

- **Common framework of practice**



Agreement with Utah State

- **Identification of currently available ET models**
- **Review and testing of candidate models, visit with modelers for feedback**
- **Assessment of USDA and State cropland databases**
- **Assessment of standardized input imagery**
- **Assessment of gridded ET_0 needs**



USU Progress

- **Candidate models identified:**
 - **Thermal infrared**
 - Two Source Energy Balance (USDA ARS- Kustas, Norman)
 - ALEXI-DisALEXI (USDA-ARS Anderson, Norman)
 - SEBAL (Bastiaanssen), METRIC (Allen)
 - SEBI-SEBS, S-SEBI, SEBS (Su, Roerink, Menenti)
 - SSEB (Senay)
 - **Reflectance/crop coefficient**
 - USBR Lower Colorado River Accounting System
 - NASA Ames (Melton)
 - **USU Hybrid thermal/reflectance approach (Geli & Neale)**
 - **Satellite P-M: U Montana MODIS (Mu); de Bruin**
 - **Satellite Priestley-Taylor: JPL (Fisher)**

USU Progress

- **Validation sites identified:**
 - California, Arizona, Wyoming, Utah
- **Cropland data:**
 - USDA CDL; State of Colorado
- **Imagery:**
 - Landsat, MODIS, GOES
- **Weather data for ET_0 :**
 - Station networks in different western states
 - Gridded sources for solar radiation, vapor pressure, wind speed, air temperature, etc.



Remote Sensing Workshop

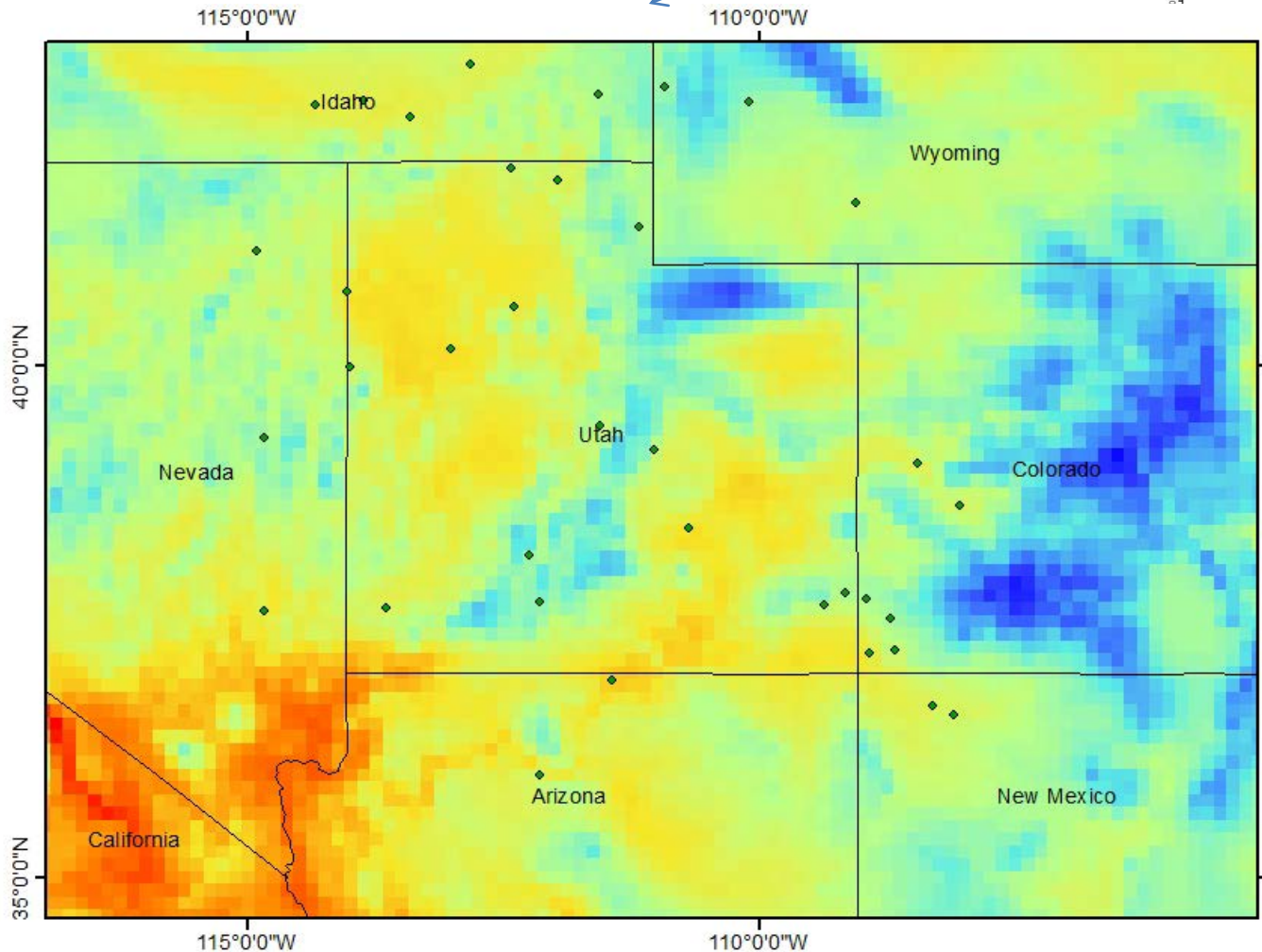
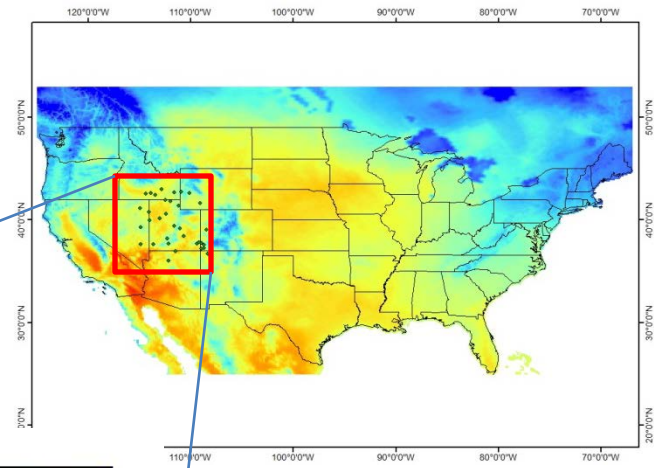
September 28, 2012 – San Diego

Update on USU activities

Ongoing efforts include:

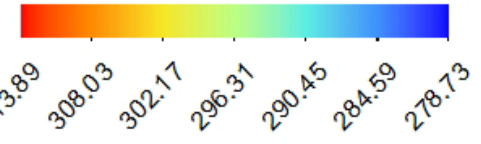
1. Comparison of gridded NLDAS weather forcing data with ground based stations in Utah and adjacent states and its effects on remote sensing of ET. Preliminary results will be presented at the AGU Fall Meeting 2012 under the following presentation titles:
 - a. Using NLDAS weather forcing data on remote sensing of evapotranspiration using a two source energy balance model (Geli et al. 2012).
 - b. Comparison of NLDAS Weather Forcing Data with Ground-based measurements in Utah (Neale et al. 2012)
2. Testing of standardized calibrated land surface temperature and at-surface reflectance TM product that will be provided by the USGS.
3. Review of remote sensing based model of ET
4. A draft report summarizing the concepts of the suggested remote sensing of ET framework and standardization methodology should be available early year 2013.

Comparison of NLDAS forcing with ground-based weather station over Utah and adjacent states



◆ Ground-based weather stations located over agricultural areas

Air Temperature (K) at 2 m for 2007/04/30 at 00 hr



Guidelines and specifications

- Agreement reached between NWS and NIDIS to fund

“Developing and Implementing a National Reference Evapotranspiration Service”,

a two year effort by Mike Hobbins to identify an operational process for IWRSS that meets the needs of the Water Census and partners for gridded ET_0 products