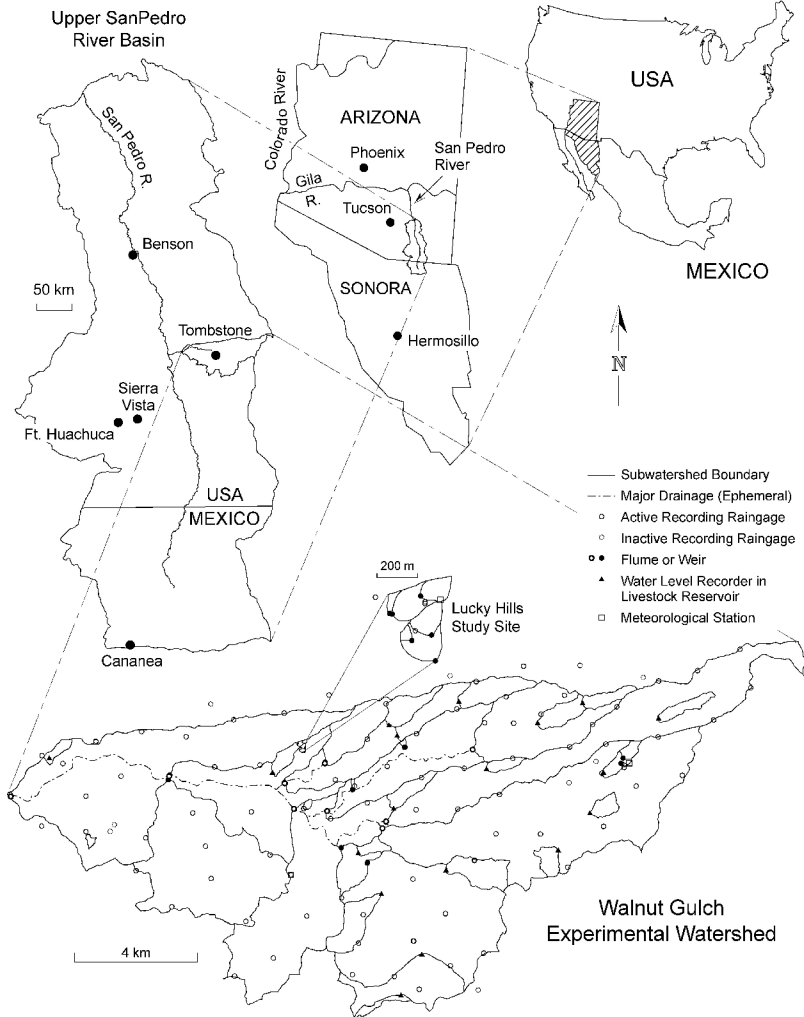


**CEOP HYDROLOGY REFERENCE SITES: Walnut Gulch, Arizona (drainage area ~150 km<sup>2</sup>)**

**Site summary:** Walnut Gulch Experimental Watershed is operated by the United States Department of Agriculture, Agricultural Research Service, Southwest Watershed



Research Center located in Tucson, Arizona. The Walnut Gulch Experimental Watershed encompasses the 150 square kilometers in southeastern Arizona, USA draining to the outlet gage at (31° 43' N, 110° 41' W) that surrounds the historical western town of Tombstone. The watershed is contained within the 7600 km<sup>2</sup> upper San Pedro River Basin flows north from Sonora, Mexico into Arizona. The watershed is representative of approximately 60 million hectares of brush and grass covered rangeland found throughout the semi-arid southwest and is a transition zone between the Chihuahuan and Sonoran Deserts.

Figure 1: Walnut Gulch Experimental Watershed site location

Elevation of the watershed ranges from 1250 m to 1585 m MSL. Cattle grazing is the primary land use. Annual precipitation is 350 mm; mean annual temperature is 17.7C; potential ET is 2600mm. Walnut Gulch is an ephemeral tributary of the San Pedro River and is dry about 99% of the time. Hydrometeorological and soil erosion/sedimentation data are collected from 125 instrumented installations on WGEW. Precipitation is measured with a network of 88 weighing-type recording rain gauges arranged in a grid throughout the watershed. Various runoff measuring structures are used to monitor runoff from eight small subcatchments (< 40 ha). These structures include broad-crested V-notch weirs, H-flumes, and Santa Rita supercritical flow flumes. Runoff from watersheds greater than 40 ha is measured using either livestock watering ponds or large supercritical flow flumes.

The largest flume, at the outlet of the Walnut Gulch Experimental Watershed has a flow capacity of 650 cubic meters per second. There are 10 stock pond watersheds and 11 large flume watersheds currently being monitored. Sediment from the small watersheds monitored with V-notch weirs or H-flumes is sampled with automatic pump samplers. Sediment from watersheds equipped with the Santa Rita supercritical flow flumes is sampled with a total-load automatic traversing slot sampler. Meteorological, soil moisture, soil temperature and energy flux measurements are made at two vegetation/soil complexes – shrub dominated Lucky Hills and grass dominated Kendall.

### **Data Summary:**

Drainage area to outlet: ~150 km<sup>2</sup>

Basin outlet latitude-longitude: 31° 43' 45.3" N, 110° 9' 12.1" W

Stream gauge/water level recorder period of record: approximately 1960-2004 (available in digital form): one V-notch weir, two H-flumes, five small (2.8 cms) supercritical flow flumes, 11 large (up to 650 cms) supercritical flow flumes, 10 stage recorders at stock ponds. Data precision is 3.0 mm (0.01 feet), 1 minute.

Precipitation gauges: 88 recording rain gauges, period of record approximately 1960 – 2004 (available in digital form). Data precision is 0.25 mm (0.01 inch), one-minute.

Micrometeorological data: Daily min, max, and average air temperature 1960-2004 at one station (NWS-Cooperative Observer). Relative Humidity, 2-m air temperature, wind speed/direction, incoming total solar, and surface pressure at three sites approximately 1990-2004 (sites are co-located with NWS-Cooperative Observer at Lucky Hills and Kendall)

Turbulent flux measurements: Bowen Ratio measurements of latent, sensible heat and CO<sub>2</sub> flux, 1996-2004 as part of USDA-ARS Agriflux Network at two sites (Lucky Hills and Kendall). Flux data are available at discretion of lead scientist.

Other measurements: PAR, soil moisture, soil temperature, soil heat flux, 20 minute or hourly at two sites (Lucky Hills and Kendall) approximately 1990-2004. Soils have been characterized for much of the watershed by USDA-NRCS. Vegetation at selected sites has been characterized. The WGEW Image and Ground Data Archive (WIGDA) is a computer database containing over 100 sharable spectral images from satellite and airborne sensors, and hundreds of associated ground data files. The database contains metadata regarding the images and ground data and allows the user to locate data according to user-specified criteria and to determine easily which images are related to which ground data files, and vice-versa.

**References:**

Renard, K.G., L.J. Lane, J.R. Simanton, W.E. Emmerich, J.J. Stone, M.A. Weltz, D.C. Goodrich, and D.S. Yakowitz, 1993, **Agricultural Impacts in an Arid Environment: Walnut Gulch Studies**, Hydrological Science and Technology, Vol. 9, No. 1-4, American Institute of Hydrology, pp 145-190.

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See also: <http://www.tucson.ars.ag.gov/>

Contact:       Tim Keefer ([tkeefer@tucson.ars.ag.gov](mailto:tkeefer@tucson.ars.ag.gov))  
                  Susan Moran ([smoran@tucson.ars.ag.gov](mailto:smoran@tucson.ars.ag.gov))