**Groundwater-River Water Exchange Alters Semi-arid Ecosystem Dynamics**

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**Objective**
- Determine how carbon uptake and surface energy fluxes are influenced by rainfall and lateral-groundwater river water exchange in two semi-arid ecosystems

**New Science**
- Lateral groundwater-river water exchange can account for a large portion of the annual water balance in riparian ecosystems, and allow the ecosystems to maintain high productivity during the dry season when rainfall is nearly absent.
- The response of ecosystem respiration to available soil moisture is a critical driver of net annual carbon uptake; increases in gross primary productivity in response to increased water availability can be offset by enhanced ecosystem respiration.

**Significance**
- Demonstrated that groundwater-river water exchange could dramatically alter ecosystem carbon uptake and evapotranspiration;
- Illustrated that in order to predict the response of terrestrial ecosystems to future Earth system changes, we must consider the role of lateral water flow in the groundwater-river continuum, in addition to those of precipitation and other meteorological variables.