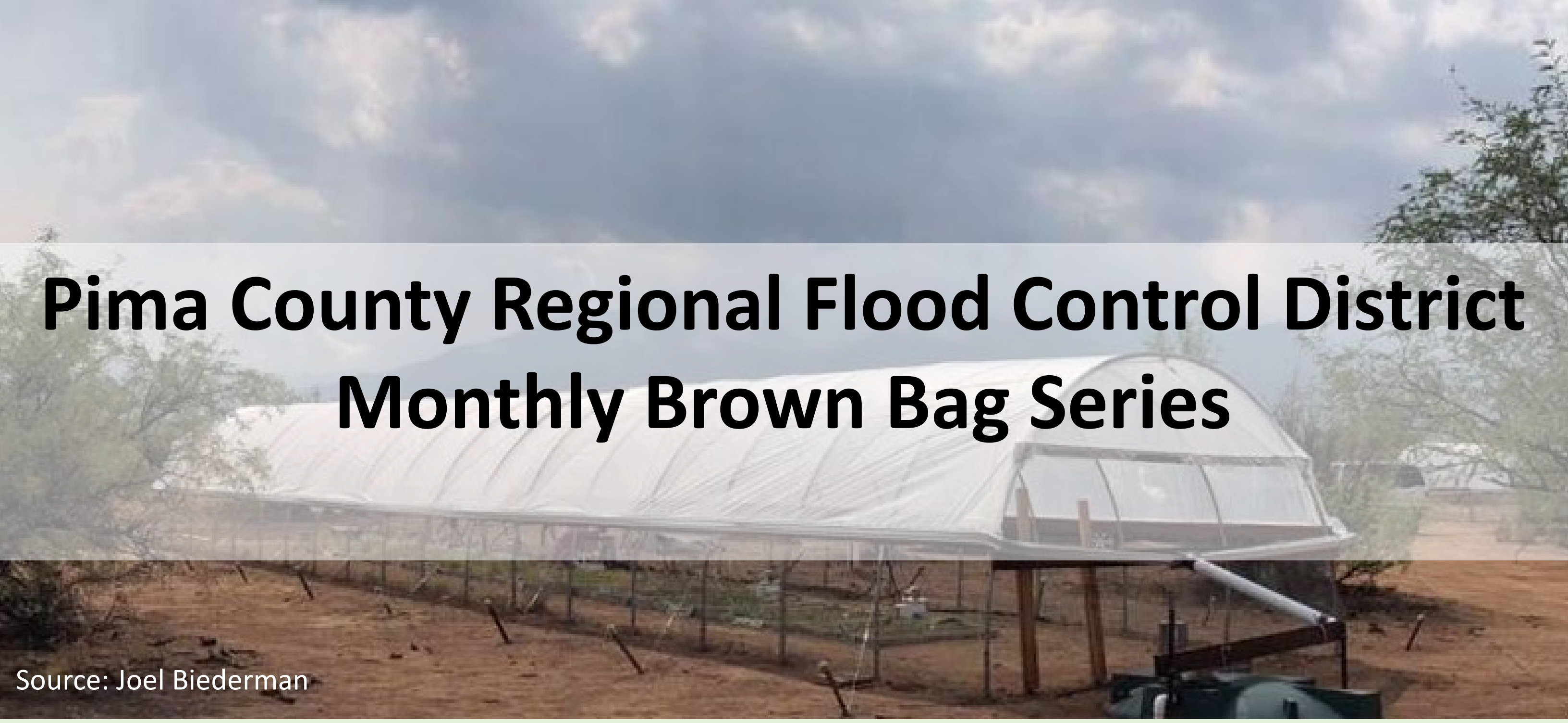

Pima County Regional Flood Control District Monthly Brown Bag Series

Source: Joel Biederman

Linking above- and below-ground responses to temporal repackaging of precipitation in a semiarid grassland agroecosystem

Joel Biederman
Research Hydrologist
USDA – Agricultural Research Service

A key characteristic of climate change is temporal repackaging of precipitation: larger rainfall events are separated by increasingly extreme-duration drought. Relatively little is known about the coupled responses of plants, soil hydrology, and cycling of carbon and nutrients. Here we present first results from a field experiment in a semiarid grassland of Arizona, US in which a constant growing season precipitation amount was repackaged into four treatments with dry intervals ranging from 3.5 – 21 days. Aboveground measurements include whole-ecosystem ET and CO2 exchanges, soil CO2 efflux, plant community composition and ANPP. Multi-angle photography (~40 images/plot) provides a weekly time series of structure and biomass production. Belowground, minirhizotron tubes in each plot (N=60) monitor root growth and quantify BNPP with local allometry. Soil C and N species are extracted monthly. Plot-level remote sensing includes visible-light greenness and hyperspectral reflectance.

Water is the critical variable linking above- and below-ground ecosystem responses to drought. Soil hydrology is monitored with an intensive, deep network of soil water content and soil water potential sensors and linked to the aboveground leaf water potential. A soil water model is applied to understand how rainfall signals translate into root zone water availability.   Key results presented will include 1) edaphic, hydrologic an biogeochemical controls on plant community composition and structure; 2) translation of rainfall drought into hydraulic stress in the soil and leaf; 3) assessment root/shoot allocation and root depth profiles in response to frequent-shallow versus rare-deep soil wetting; 4) quantification of CO2 exchanges, ET and water use efficiency; and 5) evaluation of visible and hyperspectral remote sensing tools as indicators of plant response to extreme-duration drought.

PIMA COUNTY
FLOOD CONTROL

Wednesday, December 9th, 2020: 12:00 - 1:00 PM
Online via Teams