I. GCASE: Methodology
Climate change impact assessment on water resources

Eylon Shamir (presenter)

Eshamir@hrcwater.org

Hydrologic Research Center, San Diego www.hrcwater.org

coauthors:

Sharon B. Megdal and, Susanna Eden Water Resources Research , University of Arizona (UA)

Karletta Chief, Soil Water & Environ. Sciences, UA

&

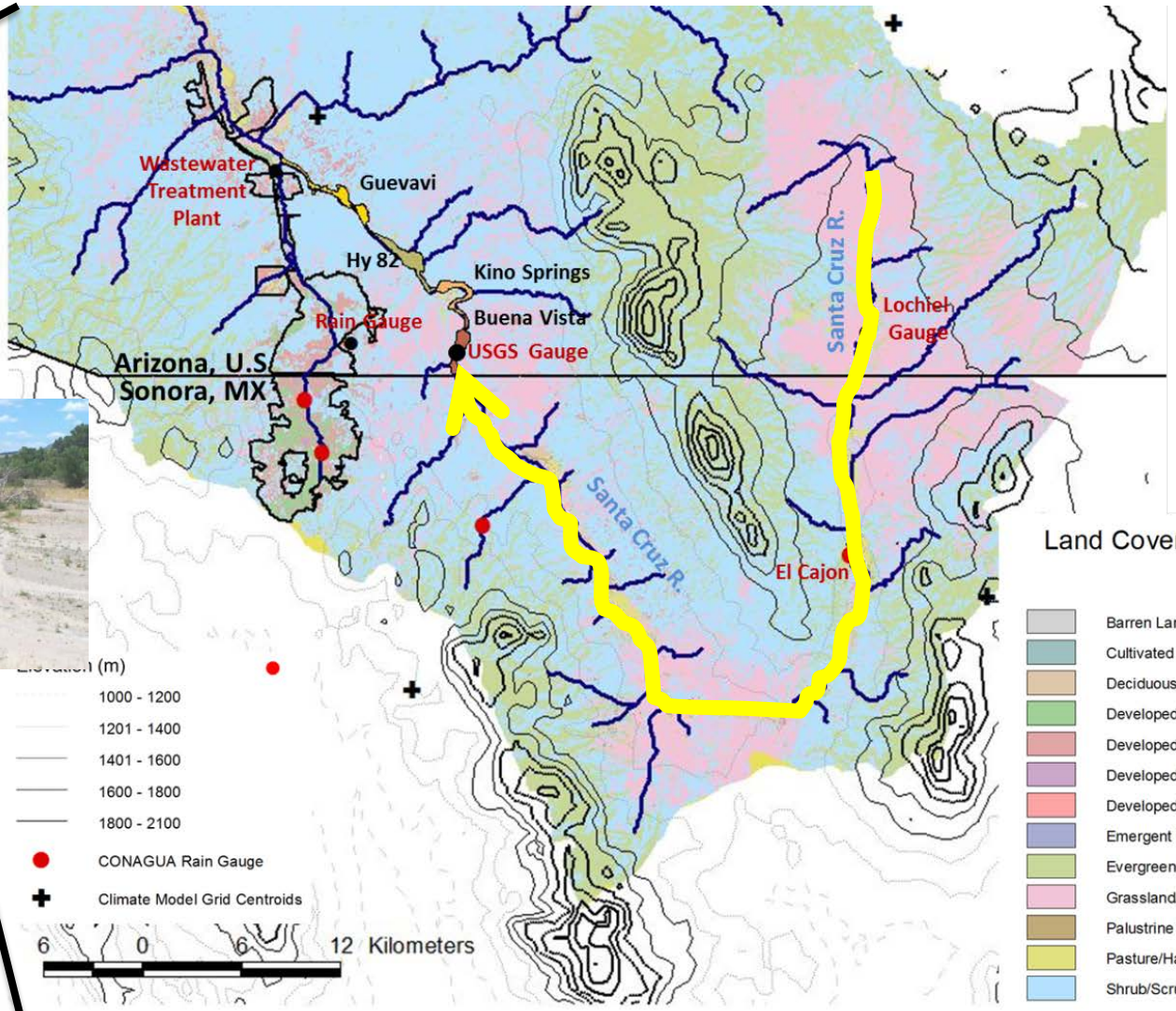
Cristopher Castro, Atmospheric Sciences, UA

Funded by,
NOAA Climate and Societal Interactions
Sectoral Applications Research Program (SARP)

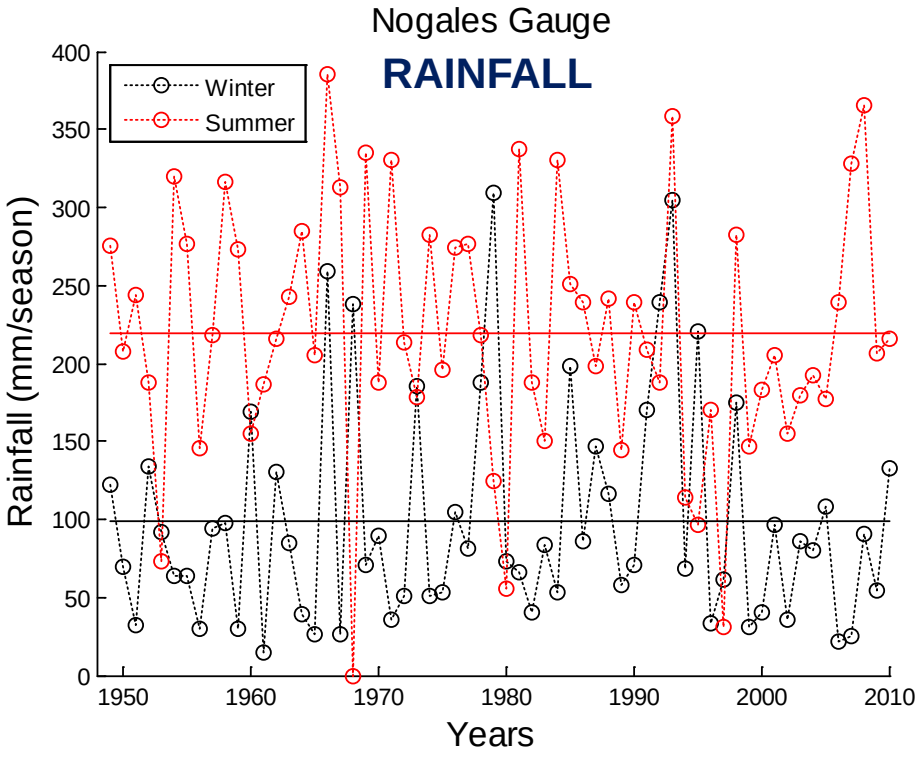
Project Goals and Approach

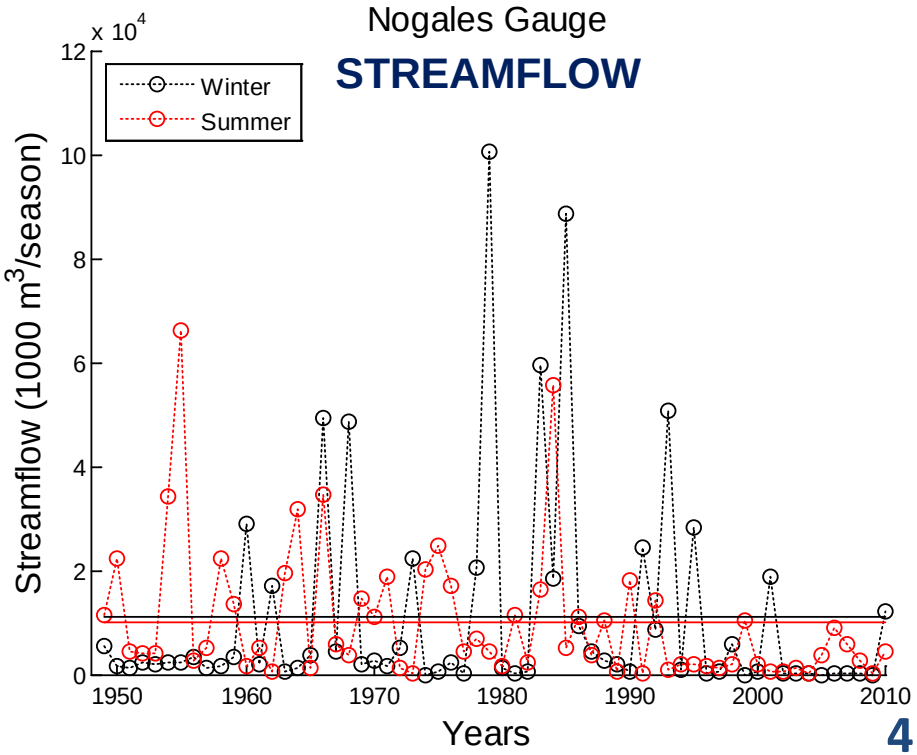
1. Develop water resources decision support modeling framework that addresses future climate uncertainties
   - -Climate scenarios and surface water flows
   - -Linkages to groundwater recharge
   - -Linkages to water management decisions
2. Increase stakeholders' capacity to adapt water planning and management to future climate uncertainties
3. Establish transferability of the modeling approach and stakeholder engagement

Santa Cruz River - Alluvial Aquifer

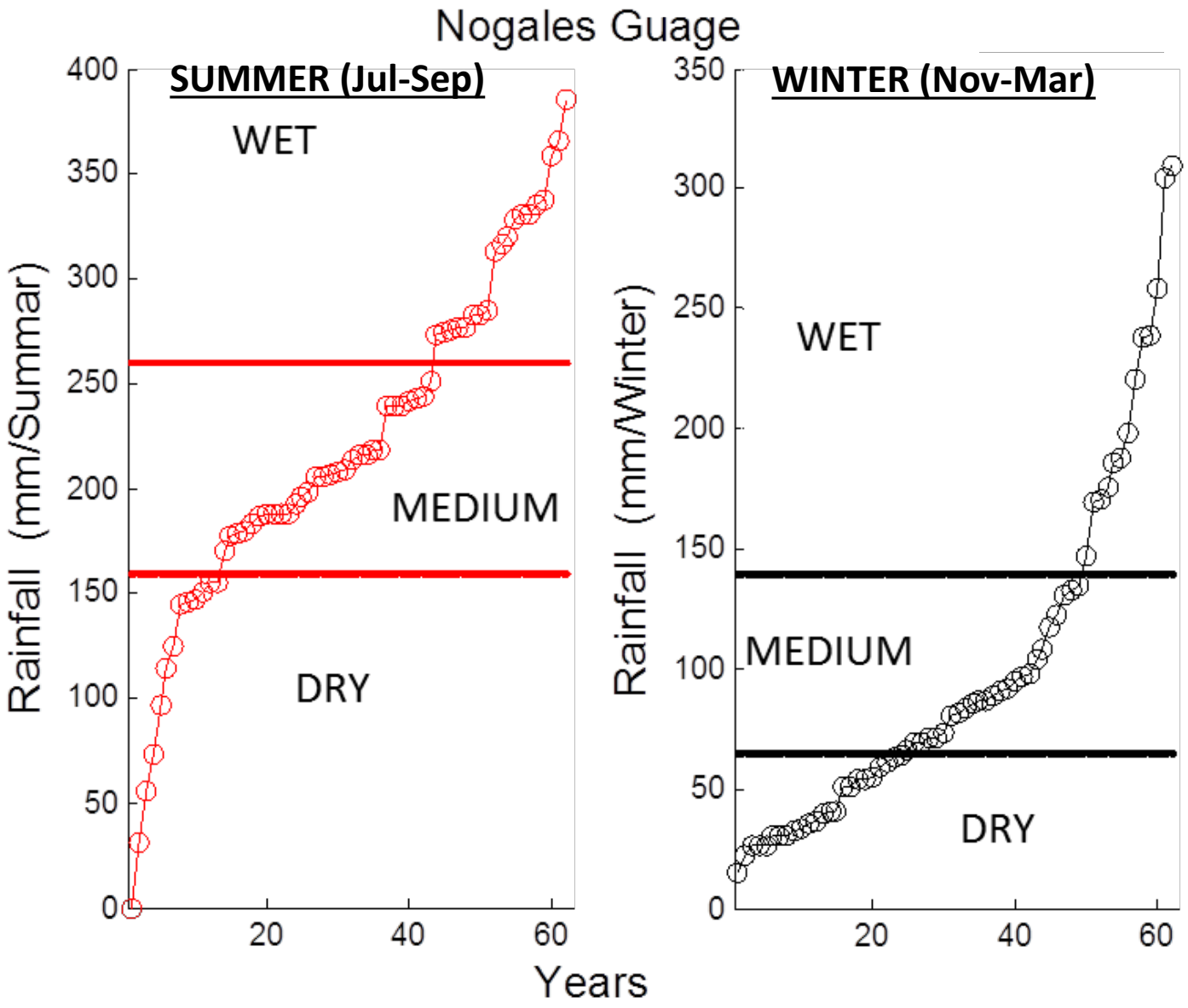


Seasonal Precipitation & Streamflow

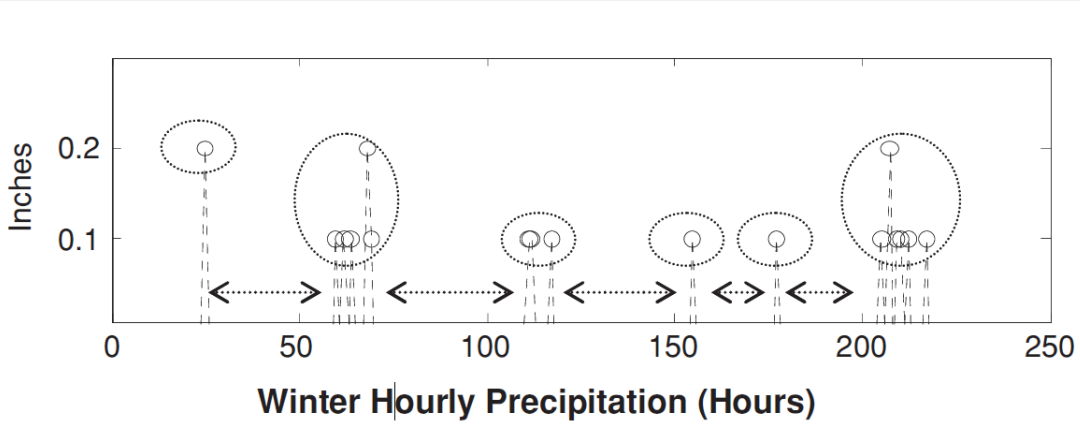


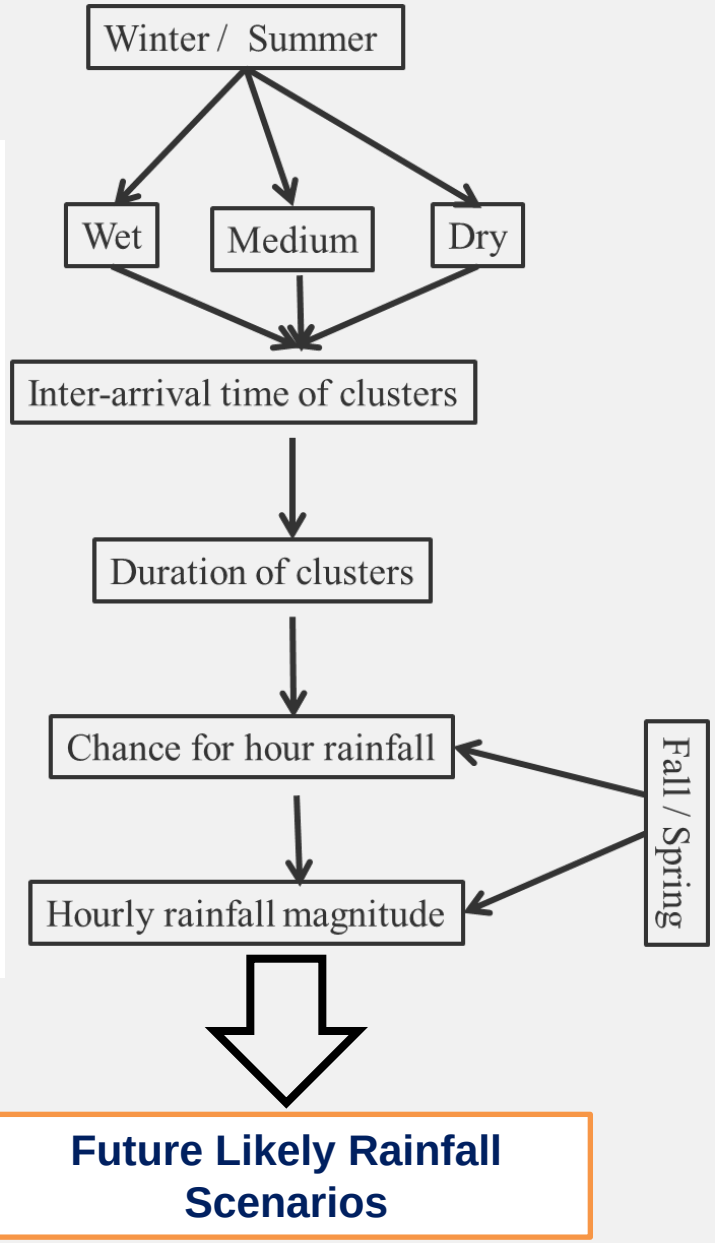


Precipitation Categorization

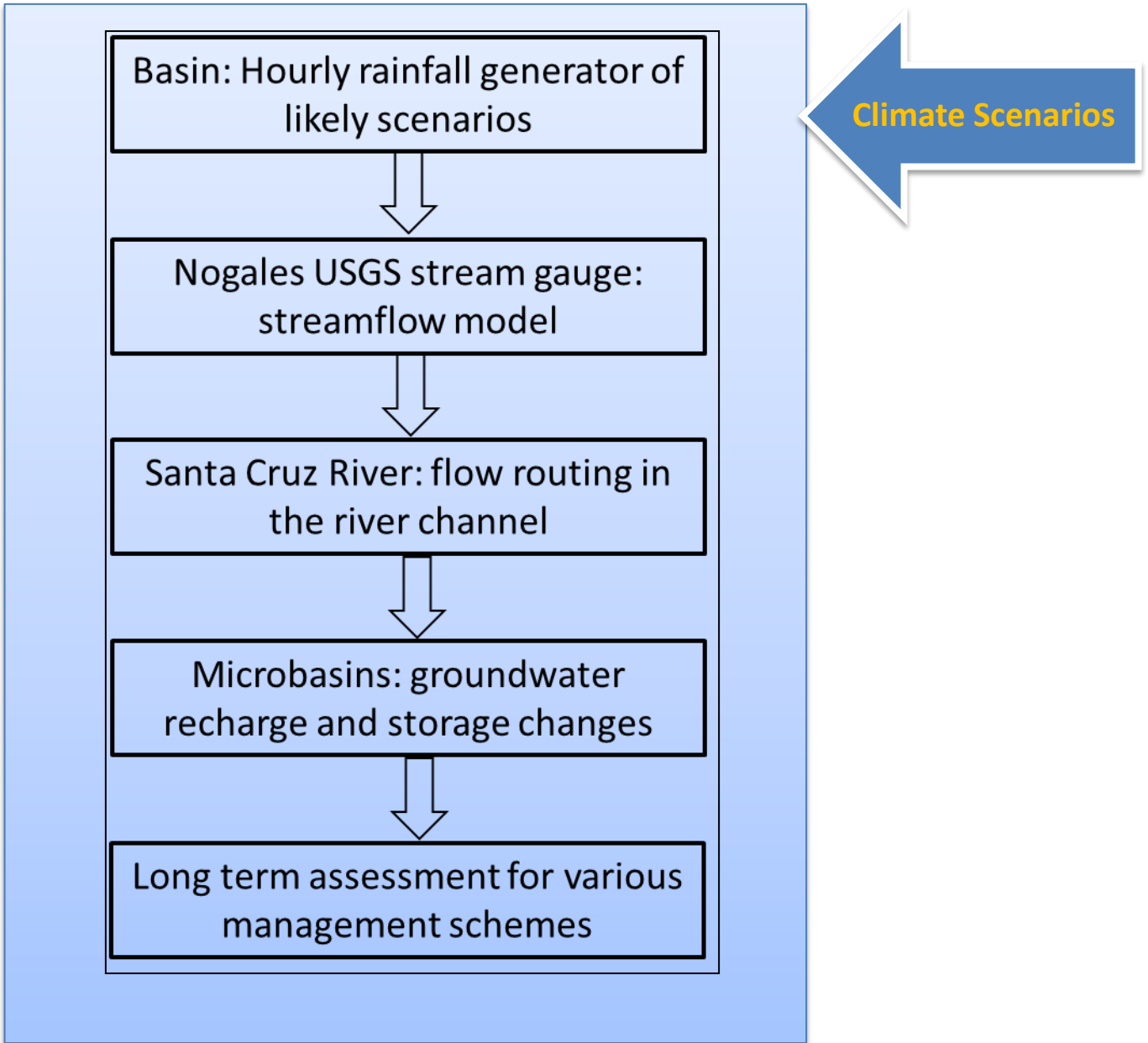


Rainfall Generator

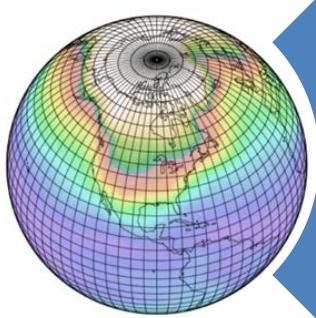




Hydrologic Modeling Framework



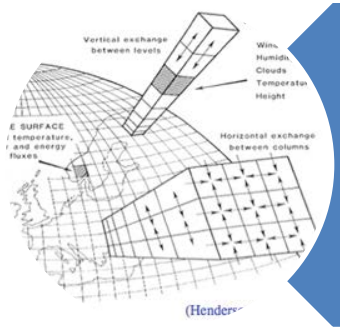
Climate and Hydrologic Models



Global Circulation Models

- General climatology patterns ocean-land
- Pacific sea surface temperature and relations to SW climatology
- Trade wind, atmospheric rivers etc.
- General climatology of temperature and precip.

Downscale



Regional Mesoscale Models

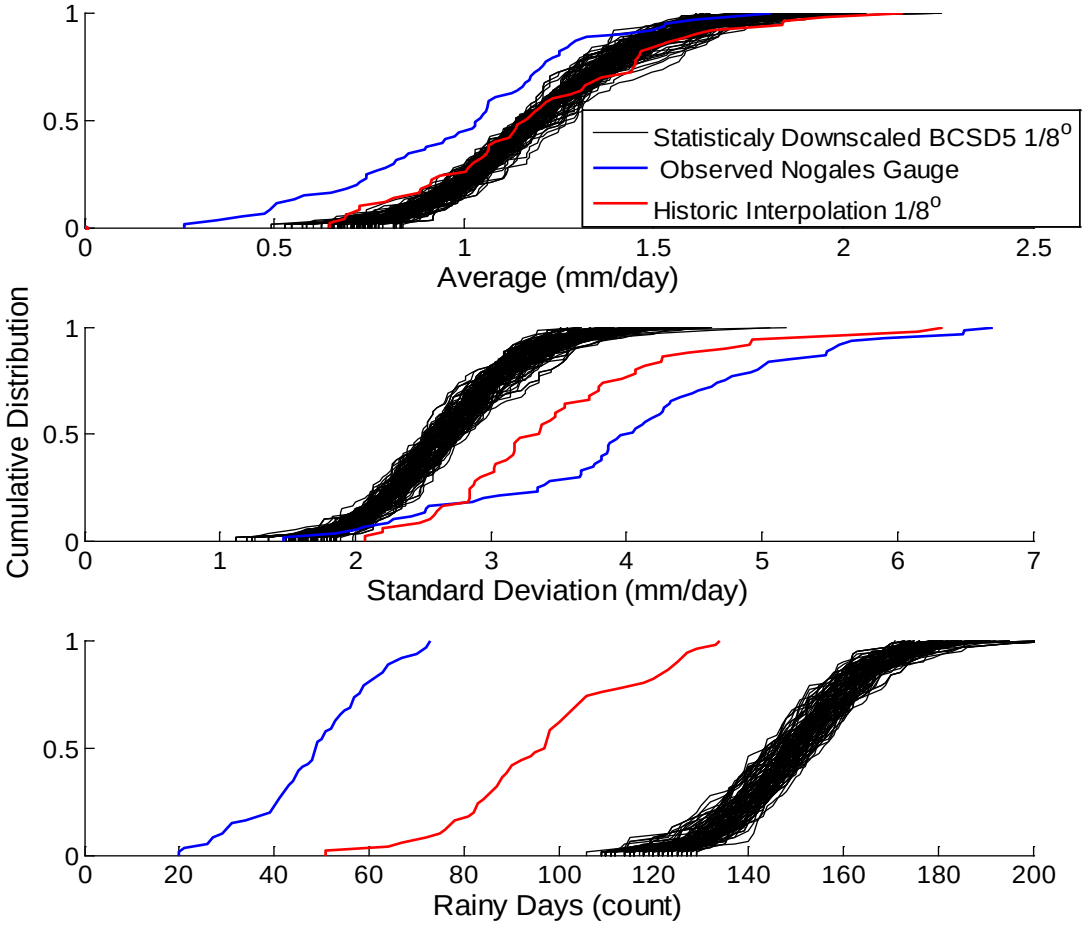
- Spatial distribution of climatological variables due to terrain and microclimate
- Special regional features
- Summer rainfall, snow
- Regional prevalent synoptic conditions

Input

Watershed Hydrologic Models

- Developed using local high resolution data
- Further refinement of microclimate features
- Interaction – surface –Groundwater
- Feedback with management decision

Issues with widely used climate impact assessment procedures



Statistical Downscaled CMIP 3 &5 Climate and Hydrology Projections

http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/

RECLAMATION USGS Santa Clara University CLIMATE CENTRAL SCRIPPS INSTITUTION OF OCEANOGRAPHY

Precipitation from 8 IPCC-AR3, A2 emission scenario, dynamically downscaled regional climate models

No.	Regional Model	Resolution
1	Max Planck Institute (MPI)	35 km^2, 6 h, 1950-2100
2	Hadley center (HADCAM3)	
3-8	North American Regional Climate Change Assessment Program [NARCCAP]	50km^2, 3 h, 1970-2000 2040-2070

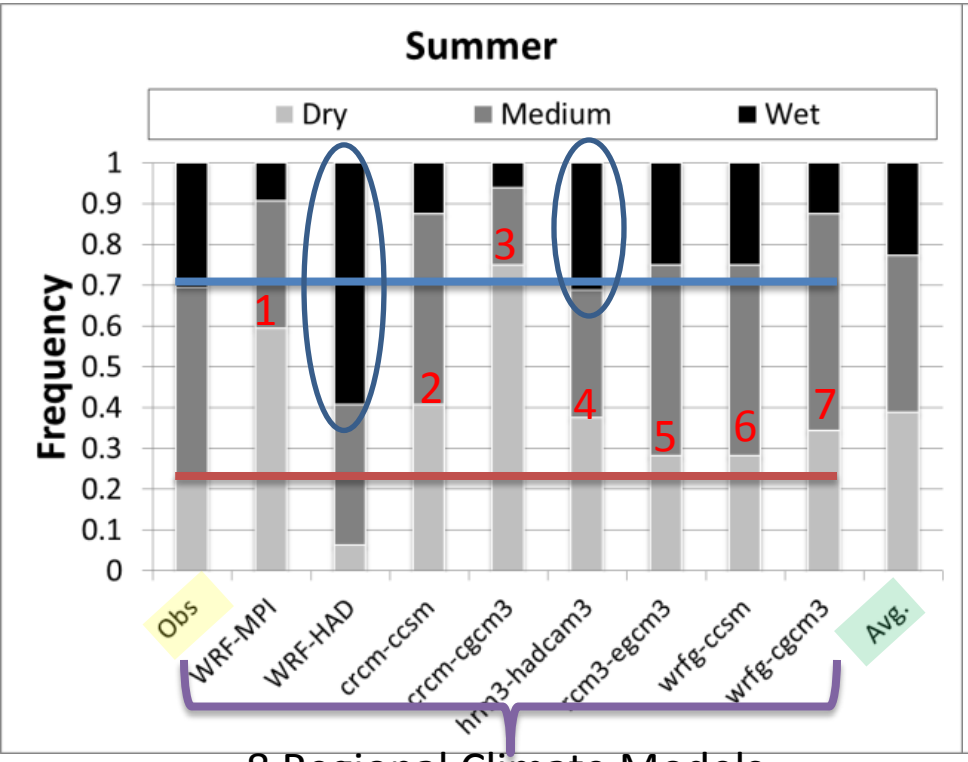
Projected Wetness by 8 models

SUMMER

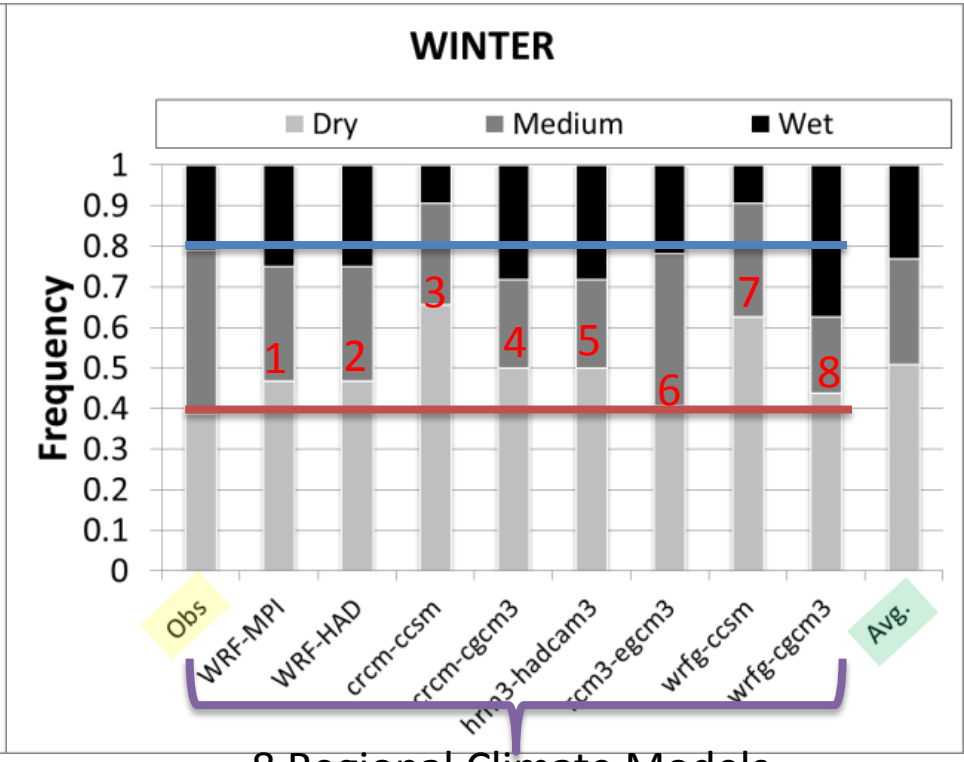
- 7 models projected MORE DRY summers
- Only 2 models projected MORE WET summers

WINTER

- 8 models projected MORE DRY winters
- 6 models projected MORE WET winters



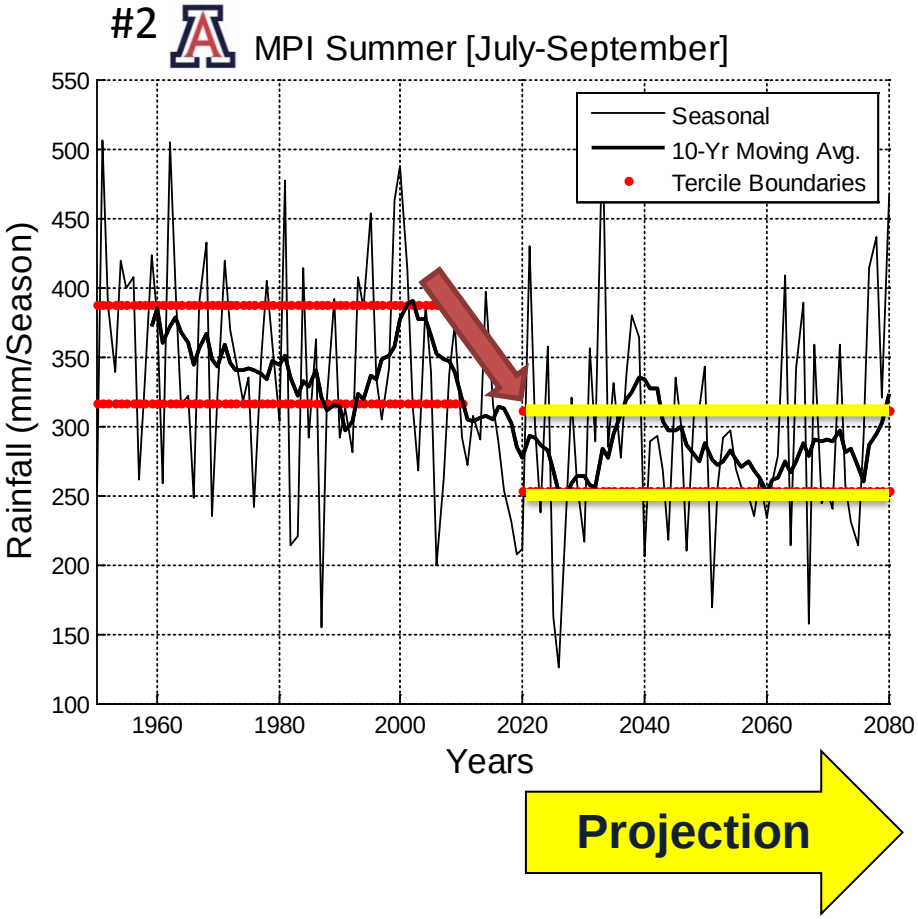
8 Regional Climate Models



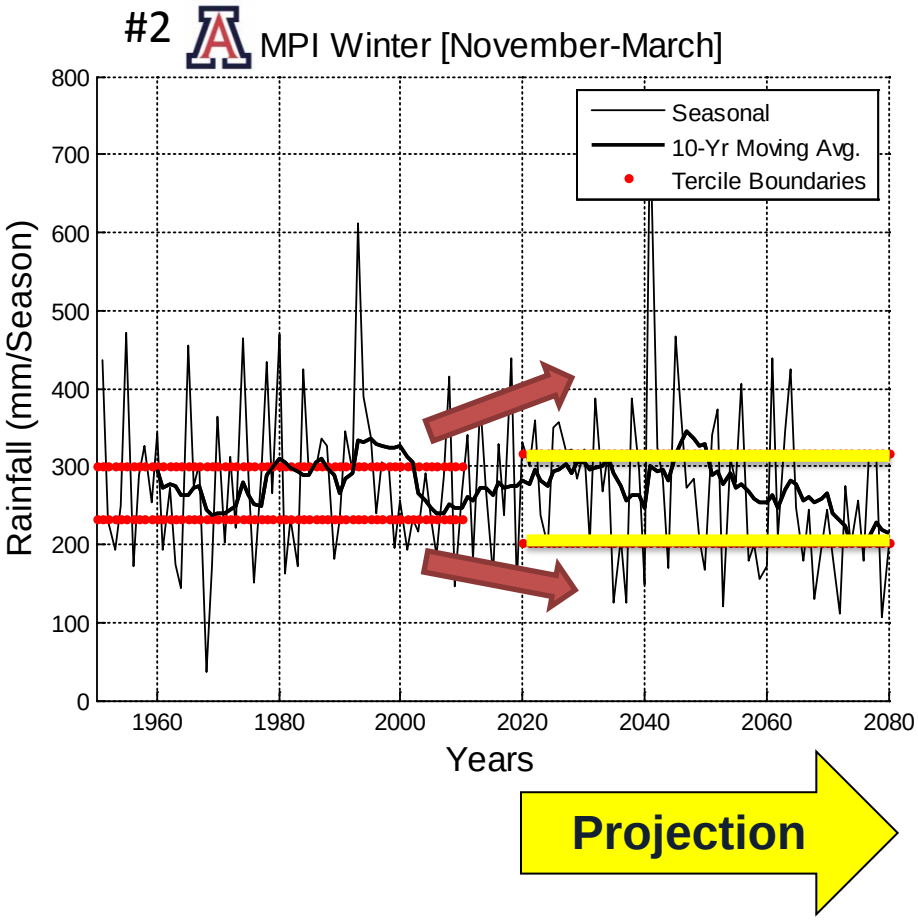
8 Regional Climate Models

Regional Climate Model

Clear reduction in Summer



Higher variability in Winter



Summary

- We developed a modeling framework that is capable to generate ensembles of likely realizations that represent the climate variability of rainfall, streamflow and ground water recharge
- Climate projections indicate:
  - higher frequency of dry summers
  - lower frequency of wet summers
  - higher frequency of dry and wet winters