EPA BASINS 4 Climate Assessment Tool (CAT)

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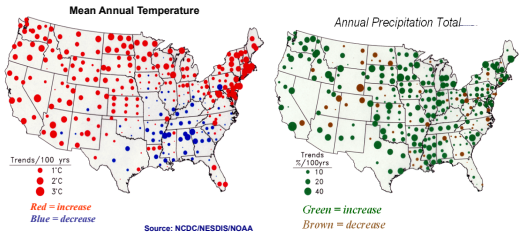
What is Climate Change?

The 2007 Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) states that "warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level". The global average temperature has increased 1.4ºF in the last century. At the same time many regions have experienced changes in precipitation amount and an increase in the frequency of heavy precipitation events (i.e., the proportion of annual precipitation occurring as heavy precipitation events; IPCC, 2007). Projecting forward, continued warming temperatures and changes in the amount, form, and intensity of precipitation are expected, albeit with large and poorly understood regional variations.

Water and watershed systems are highly sensitive to climate. To reduce the likelihood of future impacts, water managers must be able to assess climate related risk, and where appropriate, implement practices and strategies to adapt to future climatic conditions. Meeting this challenge will require tools and information allowing water managers to incorporate consideration of climate change into their decision making process.

Observed Trends (1901-1998):



BASINS Climate Assessment Tool

The BASINS Climate Assessment Tool (CAT) was released with EPA's BASINS version 4, and extends the existing capabilities of BASINS to facilitate watershed based assessments of the potential implications of climate change on watershed systems using the Hydrologic Simulation Program FORTRAN (HSPF) model. Specifically, BASINS CAT provides flexible capabilities for creating climate change scenarios allowing users to quickly assess a wide range of "what if" questions about how weather and climate could affect their systems. Combined with the existing capabilities of HSPF for assessing the effects of land use change and management practices, BASINS CAT can be used to assess the coupled effects of climate and land use change, and to guide the development of effective management responses.

BASINS CAT Scenarios

Climate change scenarios are created with BASINS CAT by selecting and modifying an arbitrary base period of historical temperature and precipitation data to reflect any desired future change or changes. After selecting a period of historical data to be modified (e.g., from an NCDC weather station used as meteorological input to a watershed model), BASINS CAT facilitates the application of one or more operations or "adjustments" to that baseline time series. Climate change information from a variety of sources can be used to create scenarios. For example, scenarios can be developed to reflect re-occurrence of an extreme historical condition or event, to reflect specific attributes of a projection based on a climate modeling experiment, or be specifically designed to address a hypothesis about the sensitivity of a hydrologic or water quality endpoint to a particular type of climate change.

Case Study: Monocacy Watershed

Drainage area: 750 sq. mi.
Land use: 60% agric, 7% urban, 33% forest

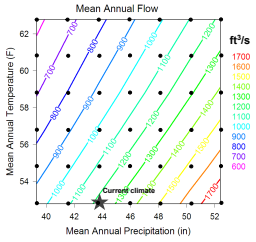
Approach:

Climate change scenarios created using BASINS CAT by adjusting historical temperature and precipitation data for the period 1984-2000

HSPF watershed model was used to assess hydrologic and water quality sensitivity to range of potential climate change

Questions addressed:
- What is the general watershed sensitivity to temperature and precipitation change?
- What is the watershed sensitivity to changes projected from climate modeling experiments?

General Sensitivity to Changes in Temperature and Precipitation



General Sensitivity:
- Δ flow = 5% per ºF
- Δ flow = 2% per % P

Sensitivity to Model Based Scenarios (2085 future climate based on 7 GCM models and IPCC A2 and B2 emissions storylines)