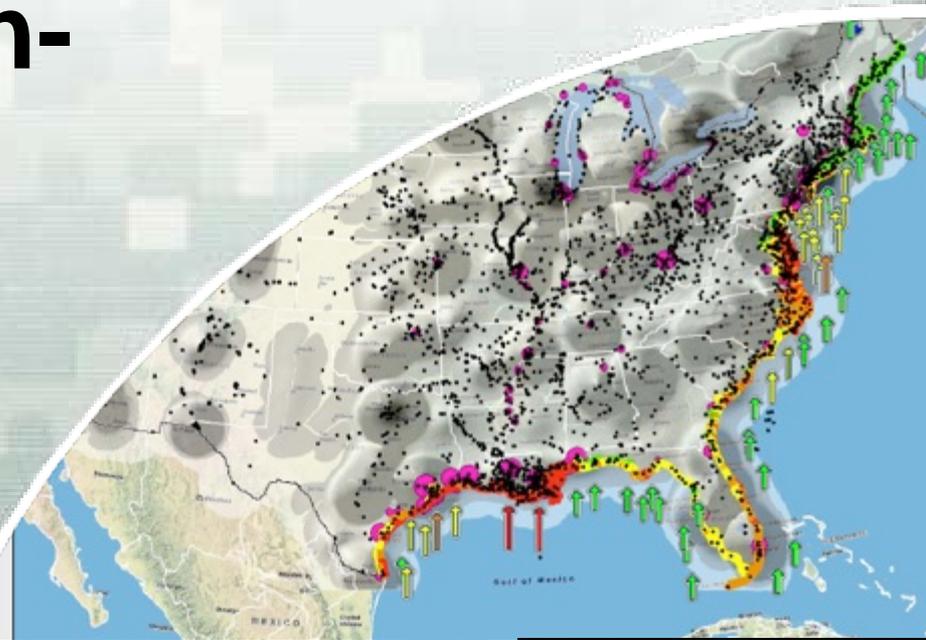


Interagency Workgroup on Hydrologic Non- Stationarity

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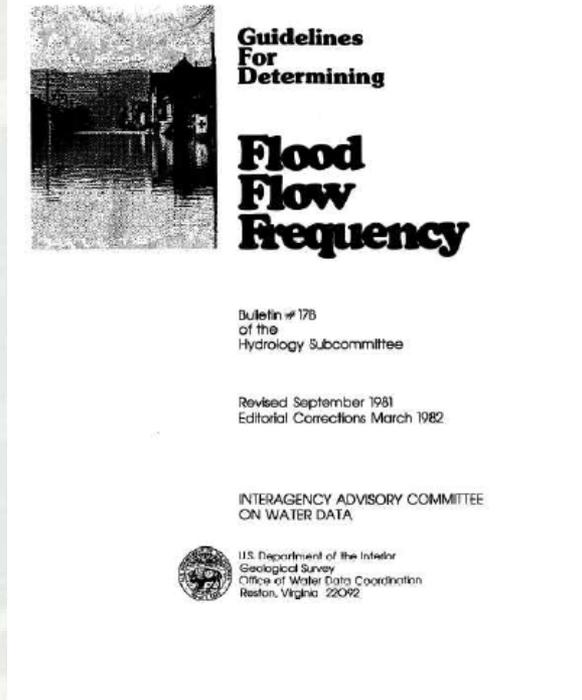
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Bulletin 17B Revision

- Previous Wording for “Climatic Trends:”

“There is much speculation about climatic changes. Available evidence indicates that **major changes occur in time scales involving thousands of years**. In hydrologic analysis it is conventional to assume flood flows are not affected by climatic trends or cycles. Climatic time invariance was assumed when developing this guide.”



Bulletin 17B Revision

- Revised Wording for Climate Paragraph:

“There is much speculation about changes in flood risk over time. Available evidence indicates that ***major changes may be occurring over decades or centuries.*** While time invariance was assumed when developing this guide, where ***changes in climate and flood risk over time can be accurately quantified, the impacts of such changes should be incorporated in frequency analysis by employing time-varying LP3 parameters or using other appropriate and statistically justified techniques.*** All such methods need to be thoroughly documented and justified.”



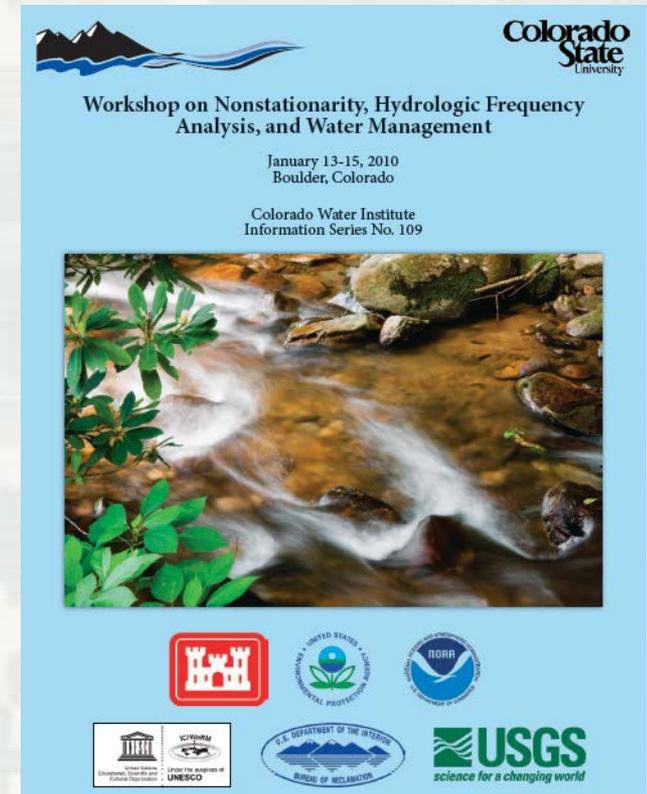
Bulletin 17B Revision

- Some concern has been expressed by that this change is not sufficient.
- Topic is on agenda for next meetings of both CEQ's Water Resources and Climate Change Adaptation Workgroup and the Subcommittee on Water Availability and Quality (SWAQ).



Nonstationarity Workshop

- One objective of the January 2010 “Workshop on Nonstationarity, Hydrologic Frequency Analysis, and Water Management” was to facilitate Federal interagency efforts to account for nonstationarity in hydrologic frequency analysis.



Workgroup on Interagency Hydrologic Nonstationarity

- USACE, USGS, FEMA, Reclamation, and the Federal Highways Administration (FHWA) are working together to evaluate approaches to and issues regarding nonstationarity, climate change, and flood risk.
- First product will be an annotated bibliography of statistical methods to describe nonstationarity.



What is stationarity?

- Stationarity: distribution of any set of n consecutive variables is the same, regardless of where in the series it is chosen. Realizations from stationary processes can, therefore, exhibit excursions that persist for long periods.
- “Functional” non-stationarity: a data set (not a population) that does not meet the assumption of independent and identically distributed variables (IID) needed for a traditional frequency analysis.



Statistics and Nonstationarity

- Statistical significance of trends may be ambiguous.
- Natural climate variability and long term persistence can cause episodic patterns in long-term hydroclimatic records.
- It is difficult to assess whether an observed trend is truly a long term monotonic trend or part of an episodic pattern, of which we see only the upward or downward arm.
- Will the trend persist into the future?



Climate Variability and Flood Frequency Estimation

- Workgroup likely has consensus on using conditional probabilities based on climate indices, such as El Nino/Southern Oscillation and Pacific Decadal Oscillation.
- Not clear how useful this approach is for practical flood risk management.



Workgroup on Interagency Hydrologic Nonstationarity

- Future work
 - ▶ Comparison of statistical methods used to quantify changes in flood risk.
 - ▶ Evaluation of the choice of probability distribution on flood frequency estimation (example – use of fat-tail distributions).
 - ▶ Evaluation of the potential to use climate projections for estimating future flood likelihoods.

