Session A8- Flood frequency estimates for New England fish passage projects: Considering climate change in project design

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Flood Frequency Estimates for New England Fish Passage Projects:
Considering Climate Change in Project Design

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• Brief overview of flood frequency estimates and applications in fish passage design
• Review statistical assumptions
• Present relevant New England hydroclimate trends and implications for flood frequency analyses
• Recommendations to avoid underestimating flood magnitudes

• Please take a fact sheet (FS-2011-01)!
Flood Frequency Estimates (FFE)

• What are they?
  — Estimates of the magnitude and frequency of comparatively rare, or infrequent, stream discharges
  — Computed and expressed as probabilities
    e.g., “1% chance annual exceedance probability event”
    e.g., “100-year event”

• How are they computed?
  — Statistical analyses of stream gauge records (annual flood series)
  — Alternatively, rainfall-runoff models
FFE for Fish Passage Design

• Size infrastructure
  — spillways, including passage facilities
  — rock ramps (capacity, materials sizing)

• Estimate floodplain impacts
  — changes in flood heights/velocities (e.g., dam removal)
  — sediment transport

• Size channels
  — channel dimensions closely related to size of frequent floods (i.e., 1-5 year recurrence interval)
FFE Assumptions

- Sufficiently long gauge record
- Past is a reasonable guide to the future
- Past is homogeneous
  - Land cover/land use not changing
  - Water inputs (i.e., climate) not changing
Annual Flood Trends

- Long-record, HCDN gauges
- 25 of 28 show ↑
- Results confluent with precip trend research (e.g., Douglas and Fairbank, 2011; Madsen and Figdor, 2007; Karl and Knight, 1998)

after Collins, 2009
Average Standardized Departures for 23 New England Flood Series
Step Change Implications for FFE

• Remember, FFE assume homogeneous flood records!
• If climatically distinct time periods can be identified, federal interagency guidelines ("Bulletin 17B"; IACWD, 1981) recommend analyzing them separately
Recommendations for New England FFE Estimates

• At a minimum, update your flood records to include the most recent available data
• For sites with substantial pre-1970 data, compute and compare pre-1970, post-1970, and full record estimates
• If no recent flood data are available, consider other techniques that incorporate recent data and compare results
Questions?

PLEASE TAKE A FACT SHEET!