Meeting Minutes of the
Extreme Storm Events Work Group (ESEWG) of the
Federal Subcommittee on Hydrology (SOH)

On Tuesday, May 7, 2019, @ 2:00 p.m. EDST, the National Weather Service (NWS) hosted a meeting of the Extreme Storm Events Work Group (ESEWG) in their offices, Silver Spring, Maryland. The host was Dr. Sanja Perica, Chief, Hydrometeorological Design Studies Center (HDSC), Office of Water Prediction (OWP), NWS, National Oceanic and Atmospheric Administration (NOAA). The meeting coordinator was Michael St. Laurent, University Corporation for Atmospheric Research (UCAR), Cooperative Programs for the Advancement of Earth System Science (CPAESS), HDSC. The meeting followed the attached meeting agenda sent out a month prior to the meeting. The meeting was organized and chaired by Thomas Nicholson, USNRC and ESEWG Chair.

Of special note, attending the meeting in person and participating were:

- Mark Glaudemans, Director, Geo-Intelligence Division, OWP, NWS, NOAA
- Michael St. Laurent, UCAR, HDSC, NWS, NOAA
- Carl Trypaluk, HDSC, NWS, NOAA
- Dale Unruh, HDSC, NWS, NOAA
- Victor Hom, NWS, NOAA
- Jason Giovannettone, Dewberry

Of special note, attending via Webinar and participating were:

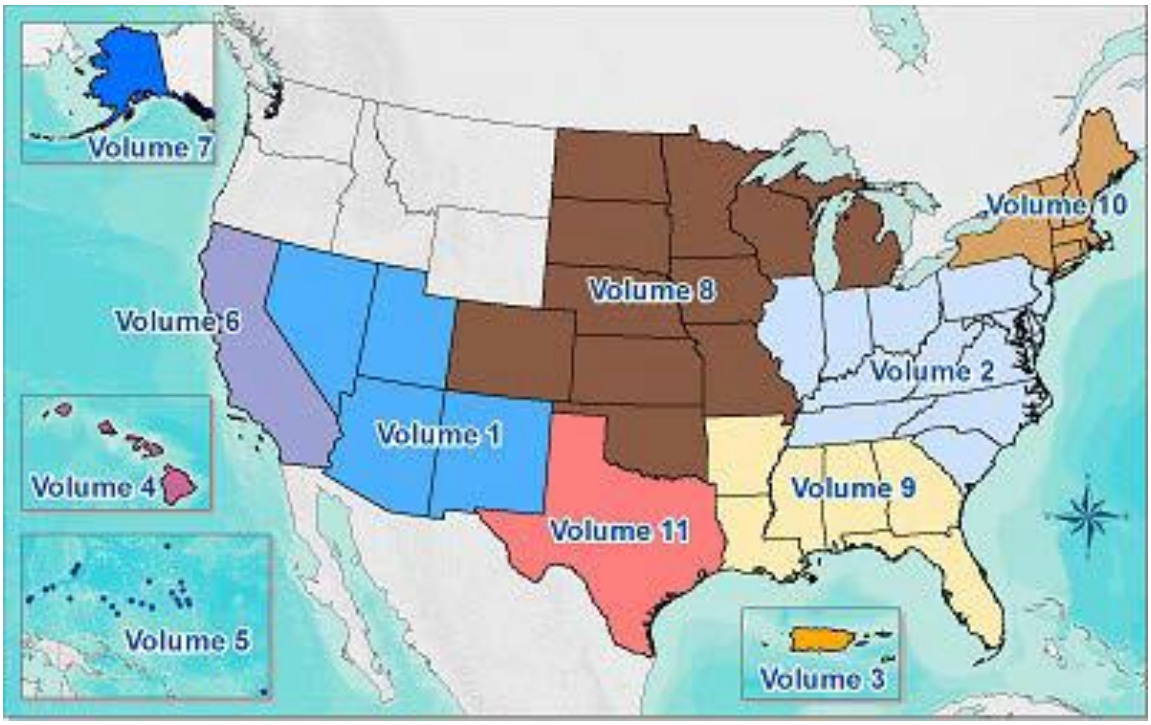
- ✓ Mark Perry, Dam Safety Branch, Division of Water Resources, Colorado Department of Natural Resources
- ✓ Bill McCormick, Chief, Dam Safety Branch, Division of Water Resources, Colorado Department of Natural Resources
- ✓ Dan Sullivan, Wisconsin Water Center and ACWI coordinator
- ✓ Tye Parzybok, President and Chief Meteorologist, MetStat Inc
- ✓ William Asquith, Texas Tech and USGS – Lubbock, TX
- ✓ Rajiv Prasad, Pacific Northwest National Laboratory
- ✓ Brian Nelson, National Center for Environmental Information (NCEI), Asheville, NC
- ✓ Boris Faybishenko, Lawrence Berkeley National Laboratory
- ✓ Elena Yegorova, Meteorologist, USNRC/RES
- ✓ Meredith Carr, Hydrologist, USNRC, RES
- ✓ Joseph Kanney, Hydrologist, USNRC, RES
- ✓ Will Thomas, Michael Baker Associates and Chair, Hydrologic Frequency Analysis Work Group, SOH
- ✓ Ken Kunkel, North Carolina State University and NCEI

Thomas Nicholson, ESEWG Chair, opened the meeting by introducing the attendees and thanking the meeting coordinator, Michael St. Laurent, NOAA, NWS Contractor, and Mark Glaudemans, Director, Geo-Intelligence Division, OWP, NWS, NOAA, for hosting the meeting. Thomas reviewed the meeting agenda and introduced Michael St. Laurent, the first presenter.

1. Michael provided an overview of ***NOAA Atlas 14*** precipitation frequency work and products discussed in their April 2019 NOAA Atlas 14 Progress Report.

Michael highlighted the following NOAA/NWS/HDSC accomplishments and ongoing work:

- ✓ NOAA Atlas 14, Volume 11 Version 2.0: Texas. The supporting documentation was published in February 2019, following the September 2018 online posting of the precipitation frequency estimates.
- ✓ NOAA Atlas 14 Volume 10 Version 3 for the U.S. Northeastern States was issued in March 2019. It includes minor revisions to estimates in Version 2 and provides the supporting documentation. In particular, it discusses adjustments to precipitation frequency estimates at the Warren, NH and Woonsocket, RI stations, improvements to the shape of the depth-duration-frequency curves, and adjustments on the lower bounds of 90% confidence intervals.
- ✓ Analysis conducted for impacts of non-stationary climate on NOAA Atlas 14 estimates. Penn State University has worked on assessing the suitability of different non-stationary frequency analysis methods with respect to NOAA Atlas 14. HDSC staff has performed analysis on methods using daily and hourly precipitation data from NOAA Atlas 14 Volume 10.
- ✓ In collaboration with University of Illinois – Urbana-Champaign, and University of Wisconsin – Madison, the HDSC staff is testing the feasibility of incorporating future climatic projections into precipitation frequency analysis. A NWS report assessing these methods is planned for the Spring 2020.
- ✓ Mark Glaudemans, Director of the Geo-Intelligence Division, NOAA/NWS, gave a presentation on "NOAA Atlas 14 – Planned Updates and Upgrades" at the Association of State Dam Safety Officials' West Regional Conference: Engineering for Extremes – Precipitation Hydrology and Hydraulics, March 25 – 27, 2019 in Westminster, CO.
- ✓ No funding is available to extend NOAA Atlas 14 coverage to the remaining five U.S. Northwestern States of Idaho, Montana, Oregon, Washington and Wyoming designated as future Volume 12. Proposal solicitation #1490 posted for Federal Highway Administration Pooled Fund program at: https://www.pooledfund.org/Details/Solicitation/1490 .



Map of the U.S. showing geographic regions covered by the NOAA Atlas 14 Volumes.

Current NOAA Atlas 14 Volumes 1 – 11, and earlier NOAA Atlas 2 Volumes, and precipitation reports (e.g., NOAA Technical Report 40) can be downloaded at: https://www.nws.noaa.gov/oh/hdsc/currentpf.html

Information on the NOAA Atlas 14 Point Precipitation Frequency Estimates by State can be downloaded at:
https://hdsc.nws.noaa.gov/hdsc/pfds/

2. Victor Hom, NOAA/NWS and past Chair, Subcommittee on Hydrology (SOH) of ACWI, discussed the status of the ***Extreme Rainfall Product Needs Proposal.*** (Please view and download the ***Proposal*** from *https://acwi.gov/hydrology/extreme-storm/product_needs_proposal_20181010.pdf)*

Victor mentioned that the ***Proposal*** had been reviewed at a public meeting at the U.S. NRC Headquarters, Rockville, MD on August 20, 2019 (see meeting minutes at: https://acwi.gov/hydrology/extreme-storm/minutes/minutes_esewg_08-20-2018_final.pdf). Following review of comments received, the ***Proposal*** was edited and sent to the ESEWG members for their review and approval in September 2019. Upon unanimous approval, the ESEWG sent the October 2019 final ***Proposal*** to the Subcommittee on Hydrology (SOH) for their review and approval.

At the SOH quarterly meeting on October 18, 2019, Tom Nicholson, Chair of ESEWG, reported on the ESEWG's approval of the ***Proposal***, and their unanimous vote to send it to the SOH for their approval and transmission to the ACWI. Upon discussion, Victor noted that not all the SOH members had reviewed the Proposal and recommended that the SOH organizational representative read the Proposal and then vote on whether to approve it or not within 30 days. At the April 18, 2019 SOH quarterly meeting, the results of the voting on approving the ***ESEWG Extreme Rainfall Product Needs Proposal*** was reported. Sixteen of the SOH member organizations voted on the ***Proposal,*** with fifteen "yes" votes and one "no" vote. SOH is sending the ***Proposal*** onto ACWI for their review and action.

3. Mark Perry, Dam Safety Branch, Colorado Department of Natural Resources reported on the Association of State Dam Safety Officials West Region Conference Engineering for Extremes: Precipitation, Hydrology, and Hydraulics. Attached are Mark's slide presentation on ***Summary of the ASDSO West Region Conference Engineering for Extremes: Precipitation, Hydrology, and Hydraulic***.

Key points:

- ✓ ASDSO's West Region Conference was held in Westminster, Colorado, on May 25-27, 2019. Presentation slides are available at the following Google Drive link: https://drive.google.com/open?id=1tVrE1VbbRlxfMFIcvgahlv_7KIBY19kV
- ✓ The conference focused on hydrologic extremes in the Western U.S. as they impact dam safety regulation and dam design.
- ✓ Federal, State, academic, and private consultant experts presented on topics of characterizing extreme precipitation and floods in the Western U.S., estimation and prediction of extremes, climate change impacts on extreme hydrologic events, available extreme precipitation and flood tools, and applications for dam safety.
- ✓ Colorado State Climatologist R. Schumacher provided an overview of "Strange Floods: The Upper Tail of Flood Peaks in the United States" (Smith et. al, 2018), wherein the most extreme ratios of maximum peak discharge-to-10 year ARI peak discharge are shown to occur in the Western U.S.
- ✓ D. Curtis, West Consultants, presented on "Climate Extremes in the Pacific Northwest" and showed that coefficient of variation in water year precipitation increases in the Western U.S., with a maximum in the Southern California.
- ✓ California State Climatologist M. Anderson discussed variability on multiple scales associated with atmospheric rivers.
- ✓ R. Klinger, U.S. Bureau of Reclamation discussed the use of paleoflood studies to help extend flood frequency curves for use in dam safety risk analysis.
- ✓ Various presenters discussed the recently completed Colorado-New Mexico Regional Extreme Precipitation Study (CO-NM REPS), which includes modern estimates of probable maximum precipitation, extreme precipitation frequency, and dynamical modeling analysis using the HRRR model.

4. Jason Giovannettone, Senior Engineer/Meteorologist, Dewberry Co., made two presentations: (1) an overview of a ***Water Resources Research*** paper on ***Using a Novel Method to Map Flood Susceptibility of the Lower Connecticut River Region;*** and, (2) ***Assessing the Relationship between Low-Frequency Oscillations of Global Hydro-Climate Indices and Long-Term Precipitation throughout the United States*.** Attached are Jason's slide presentation for both presentations.

Key points for the first portion of the presentation on ***Using a Novel Method to Map Flood Susceptibility of the Lower Connecticut River Region*** were:

- Correlated several non-climatic flood risk factors to 100-year FEMA flood hazard area.
- Logistic regression showed that "Elevation" and "Distance to Water" contribute most to flood susceptibility in urban and coastal sub-regions.
- "Surficial Materials" and "Distance to Water" contribute most in rural sub-region.
- Contribution of "Land Use" to flood susceptibility increased by over 200% between rural and urban sub-regions.
- Flood susceptibility map showed a large area of "very high" and "high" flood susceptibility outside of the FEMA flood map (though FEMA map should still be used for insurance purposes).

Key points for the second portion of the presentation on ***Assessing the Relationship between Low-Frequency Oscillations of Global Hydro-Climate Indices and Long-Term Precipitation throughout the United States*** were:

- 7 Hydro-Climate Indices (HCI's) were found to have strong and significant correlation regionally with long-term precipitation at a 12-month lag time.
- 8 HCI's were found to exhibit strong and significant correlation at a 48-month lag time.
- Analyses allow a simple yet accurate method by which to forecast 12- and 48-month accumulated precipitation.
- Most influential indices include:
  - Madden-Julian Oscillation (MJO)
  - ENSO Precipitation Index (EPI)
  - North Atlantic Oscillation (NAO)
  - Pacific-Decadal Oscillation (PDO)
  - Tropical South Atlantic Index (TSA)

The meeting concluded with compliments from the ESEWG Chair to the meeting host; NOAA/NWS/HDSC staff; and the three presenters: Victor Hom, NOAA/NWS; Mark Perry, Dam Safety Branch, Colorado Department of Natural Resources; and Jason Giovannettone, Senior Engineer/Meteorologist, Dewberry Co. There was discussion on developing the next ESEWG meeting possibly in August 2019 on QA/QC of meteorological data bases and gridded precipitation products. The Chair will contact the ESEWG members for interest and volunteered presentations on QA/QC of precipitation data bases and gridded precipitation products.