An Initial Climatology of Extreme Precipitation Events in Arizona Desert Areas

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Arizona is noted as a state with a high frequency of flash flooding and floods despite its semi-arid to desert climate (Osterkamp and Friedman, 2000). However, individual basins experience flash floods on an infrequent basis. Most of the flooding events occur during the summer monsoon season. Thus it is quite likely that many flood retarding structures (FRS) can go for months and even years without being impacted by a flash flooding event. A steadily increasing population, fertile growing areas and important public transportation roads are located near many FRS. Thus public safety issues caused by flooding or flash flooding are important considerations in the rehabilitation of the FRS.

Three primary causes of flooding and flash flooding exist in Arizona according to Hales, 1974 and Maddox et al, 1995:

1. Short-duration, high intensity thunderstorms during the monsoon season from July to September.
2. Passage of decaying sub-tropical storms or hurricanes during August to November.
3. Passage of general storms from the Pacific Ocean from December to March.

The daily distribution of 114 extreme precipitation events shown in HMR-49 and the NOAA publication, ***Storm Data***, were evaluated. The observed distribution of extreme events follows closely the referenced articles on flash flood occurrence. The maximum number of extreme precipitation events occurs from June to September with a secondary general storm maximum from December to March. August 28 is the day with the highest occurrence of flash flood events.

Extreme precipitation is identified as a precipitation event that has a 100-yr (once every 100 years) frequency or more (Osterkamp and Friedman, 2000). Review of the causes of these events includes both local thunderstorm produced flash floods and general storm flood events caused by the passage of sub-tropical disturbances and winter Pacific storm systems. WSR-88D Doppler radar data was used in a GIS environment to evaluate both the spatial rainfall fields and depth-area-duration characteristics of the most intense storms since 1994. In general, Arizona extreme local storms were smaller in spatial size than indicated by design standards, had shorter duration but could reach extreme intensities.