COOPERATING TECHNICAL PARTNERS FEDERAL EMERGENCY MANAGEMENT AGENCY Mile High Flood Control District Risk MAP

MHFD's Approach to Early Flood Threat Recognition and Warning

FEMA Region 8

CHALLENGE

Protecting lives and property by enabling timely effective responses to developing flood threats.

SOLUTION

The Mile High Flood District (MHFD) is a special district that serves the 7-county greater Denver/Boulder metro area with a comprehensive work program that includes early detection and notification of flood threats. MHFD (formerly known as the Urban Drainage and Flood Control District) has provided these services for the past 42 years through partnerships with the National Weather Service, emergency management agencies, first responders, local news outlets, universities, research organizations, and others. MHFD's flood warning services have vastly evolved over the past four decades as technological advances continue to open new horizons for emergency communications, real-time data acquisition and processing, information sharing, and automation. The early flood detection aspect employs both human and automated processes starting with a forecast of potential threats using the services of a private sector meteorologist collaboratively with the public warning and forecast services of the NWS. This early prediction component focusing primarily on flash flooding is commonly known at the Flash Flood Prediction Program, or F2P2 for short. While the need for local flood warning enhancements was clearly stated during UDFCD's formative years (1969-1970), it was not until the notorious 1976 Big Thompson Canyon Flash Flood that more serious actions were taken that led to the 1979 introduction of the F2P2. In the years that followed, lessons from Big Thompson and many other lesser floods provided incentive to further improve services, thus increasing flood risk awareness and motivating local governments to become even better prepared to effectively manage their flood risks. Paralleling the prediction services was the deployment and expansion of what is now a large network of rain and stream gauges that provide continuous monitoring of threatening weather and flood conditions. Creative uses for radar-based precipitation products also evolved along with the use of real-time hydrologic models. Automated threat notifications via text, email and social media have become common and highly anticipated with the ultimate goal of invoking protective actions by individuals that save lives and reduces property damage when floods occur.

OUTCOMES

- Basin-specific warning plans were developed for a number of the highest risk watersheds. Those plans were incorporated into local emergency response plans by local governments, emergency action plans for dam safety, and standard flood operating procedures for the MHFD, NWS, F2P2 Meteorologist, and many local agencies.
- MHFD has maintained a Flood Disaster & Mitigation Plan (recently renamed *Flood Emergency Support Plan*) since the inception of the F2P2 in 1979. The plan is reviewed annually and periodically revised by resolution of the MHFD Board of Directors.
- Flood exercises and program reviews are routinely conducted by MHFD and their respective local governments.
- Communities have become increasingly aware of their respective flood risks and self-help programs are encouraged.



RISK MAP GOALS ADVANCES

The Risk MAP goals that were advanced through this project included:

- Advancing Action
- Identify Action
- Increasing Awareness

BENEFITS

- Communities become safer by recognizing potential flood threats and taking
 protective actions well before the onset of flooding. Emergency managers, first
 responders, and informed citizens are critical to this process. In addition to saving
 lives, early flood threat recognition provides more time to avoid or greatly reduce
 costly damages to infrastructure and property.
- Local governments become highly vested in the entire flood warning process. Close relationships with NWS and MHFD are more firmly established. Local public works and public safety agencies have new opportunities to collaborate and prepare for future flood emergencies and disasters. This process also allows elected officials and local government administrators to have personal ownership in a system they created and help maintain.
- Education, outreach and communication with the public occurs following impactful storms and floods. This is made possible in part by the wide availability of real-time flood data from MHFD, which has helped build relationships with local news organizations. MHFD and its partner agencies become trusted subject matter experts on floods and flood safety.
- As a regional agency, political boundaries are not obstacles but opportunities for increasing cooperation between local governments that share common flood risks. Regional flood warning and early flood threat detection becomes an effective catalyst for developing these close working relationships.
- Local flood warning programs depend on FEMA's mapping process and Risk MAP products to achieve desired outcomes; and the NFIP benefits from increased local knowledge about flood risks and the many effective ways to manage those risks.
- Flood insurance cost savings are realized through the FEMA CRS program.

LESSONS LEARNED

- Local flood warning programs have enabled a better understanding about extreme floods and their associated probabilities. Large floods happen far more often the estimated return periods suggest. The "100-year flood" is only one possibility in a wide-range of flood magnitudes. 100-year (1% AEP) rainfalls <u>do not</u> typically cause 100-year floods. Knowledge of these facts and more awareness about a region's flood history greatly helps people personalize their flood risks.
- Automated rain and stream gaging networks are very helpful for recognizing when flood threats are imminent, but other remote sensing technics using radar can result in greater lead times for responding to flash flood threats.
- Real-time hydrologic models are helpful tools for predicting impacts, but should not be heavily relied upon for smaller watersheds that are highly prone to flash floods. Impact forecasting meaningful to emergency management is a worthwhile undertaking.

RESOURCES

https://mhfd.org/services/flood-warning-program/ https://alert5.udfcd.org https://alert5.udfcd.org/news-release/