

I.	ACKNOWLEDGEMENTS2	_
II.	EXECUTIVE SUMMARY	
III.	FLOOD PREPAREDNESS PILOT OVERVIEW	
	Major Milestones	
	Pilot Planning and Conduct Team	
	Participants	4
	Pilot Project Summary	6
	Purpose and Objectives	6
	Outcomes	7
IV.	MILESTONE 1. REQUIREMENTS GATHERING SESSION7	7
	Goal and Objectives	8 8 8
V.	MILESTONE 2. TABLETOP EXERCISE	
	Goal and Objectives	
	Exercise Assumptions and guidelines	8
	Rood Tabletop Exercise Scenario	S
VI.	MILESTONE 3. FINAL DRILL AND STRESS TEST10	
VI.	Goal	10
	Objectives	10
	Outcomes: Gaps and Needs Identified	11
	Preparedness: Additional Hazards	11
	Preparedness: Shelter Inventorying	12
	Preparedness/ Readiness: Resource Management	13
	Response: Transportation	16
	Response: Otizen Engagement (Inbound)	18
VII.	CONCLUSIONS21	1





Floods are the most common natural disaster in the United States and are only increasing in frequency, magnitude, and cost as a result of [freque)-4(nc)3(y,)]TJETQq0.00000912 0 612 792 reW* nBTver120



The problem public safety officials often face when making difficult decisions is not about the availability of data—rather, it is about how data becomes actionable information that changes the outcomes for survivors. For an effective response, the right information must be delivered to the right people at the right time in the right format.

To better understand the key challenges often faced by flood-prone communities, in 2017 NAPSG Foundation worked with first responders across the country to develop a national flood preparedness guideline. The guideline addresses key workflows, including the information needs of first responders, to help Geographic Information Systems (GIS) support staff compile and deliver critical information at the right time to support data-driven decision making.

Following the release of the guideline, NAPSG Foundation partnered with two pilot communities with experience in diffs@c0t00ppes@f2l0cdiag@azaw\dstrobesfcvaiadate).and9@filae418.9 Tm0 0 1 99

1. The key challenges and priority information needs





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After Action Report

Below is a summary of the major milestone



Validate decision maker information needs and inform enhancements to the prototype NCR Flood Stuational Awareness Toolkit Prototype.

Reliable, timely, and accessible information when a flood occurs is essential to the first responders who must make life and death decisions under considerable time constraints. The pilot activities aimed to identify the critical information needs at each phase of a flood event through the requirements gathering session. They also focused on developing a prototype situational awareness toolkit that brings this information into an actionable format, as well as testing the prototype and making refinements in a regional tabletop and drill/stress test, respectively. The Pilot Project is an opportunity to collectively:

Validate decision maker information needs for flood events from preparedness through recovery phases;

Test and evaluate a prototype situational awareness tool for flooding in the NCR that supports preparedness, readiness, response, and recovery;

Define additional functionality needed for improving decision support tools; Identify common data schemas for key incident workflows and facilitate cross-jurisdictional information sharing to fill gaps; and

Develop and use a geo-enabled planning scenario to prepare for a flood incident based on a historic event.

The tabletop exercise was designed to push players to identify information needs and the specific trigger points necessary to take action at each phase of a flood event, from preparedness activities through recovery. Participants and players had the opportunity to discuss the effects of the event, test the sharing of situational awareness information across jurisdictions, agencies or organizations, and systems.

Participant



This exercise provided a no-fault, neutral forum in order to maintain open dialogue and remain open to all perspectives.

The exercise was not intended to decide which, if any, existing system was better than the others.

The tabletop exercise was not intended to test GIS skills, though part of the exercise focused on specific production and information exchange workflow.

In any exercise, assumptions are necessary to complete discussions in the time allotted. During this exercise, the following assumptions applied:

 The scenario and likely affects to the communities and surrounding area(s) were plausible, and events occur as they are presented.

 Participants were asked to time constraints.



On September 9, 2013, a slow-moving cold front stalled over Colorado, clashing with warm humid monsoonal air from the south. This resulted in heavy rain and catastrophic flooding along Colorado's Front Range from Colorado Springs north to Fort Collins. The situation intensified on September 11th and 12th. Boulder County was the most affected area, with 9.08 inches recorded September 12th and up to 17 inches of rain recorded by September 15th, which is comparable to Boulder County's average annual precipitation (20.7 inches). This event has been referred to as the 2013 Colorado Front Range Flood, reflecting a more precise geographic extent in and along the Colorado Front Range Mountains.

The flood waters spread across a range of almost 200 miles from north to south, affecting 17 counties. Governor John Hickenlooper declared a disaster emergency on September 12, 2013, in 14 counties: Adams, Arapahoe, Broomfield, Boulder, Denver, ∃ Paso, Fremont, Jefferson, Larimer, Logan, Morgan, Pueblo, Washington and Weld. By September 15th, federal emergency declarations covered those 14 counties, as well as Clear Creek County.

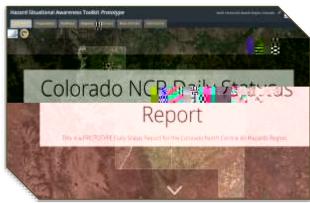
Validate decision maker needs and inform enhancements to the prototype Colorado North Central All-Hazards Region Stuational Awareness Toolkit.

Tabletop Exercise, define additional functionality needed for improving decision support tools;
Test and evaluate a prototype situational awareness tool for flooding in the Colorado NCR that supports preparedness, readiness, response, and

Based on feedback from the April 16th

recovery;
Refine common data schemas for key incident workflows and facilitate cross-

jurisdictional information sharing to fill gaps; and Identify priorities for future development in the Colorado NCR



Prototype Stuational Awareness Toolkit

View full agenda





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Add Missing Hazards: Geologic Rockfall/Landslide, Avalanche (Avalanche Information Center).

Follow up meeting NAPSG/Boulder EOCto prep tools for wildfire readiness and response.

Add subcategories for Vulnerable Populations (language spoken and number of households without cars).

Add placeholder for link to Hazard Mitigation Plan(s). Identify and incorporate Open Space Data.

Add links to and shapefiles generated from HM Plans.

Add layers for planned/future development.

Incorporate historic imagery (where available).

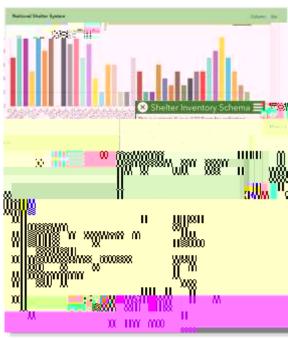
Follow up with DWR/ Dam Safety on incorporated dam inundation

Jurisdictions need to be able to populate additional fields as needed.

Data on generator pre-connects would be helpful and should be added as an additional field.

More Esri fields were confirmed as important because they were listed in plain English.

Mass Care Group has been newly formed and are currently in the process of



Shelter Schema Survey and Results



figuring out how to collect this information from each of the NCR jurisdictions.

Daily resource mobilization occurs through CAD systems, but views and data are not shared across jurisdictions. While there is a desire to be able to share such information, priority types of calls have not been agreed upon nor a method. State currently owns a Resource Mobilization system but challenges of accessibility exist due to security reasons which has led to minimal use of the system.

Large Scale mutual aid should occur through WebEOC however resource information within the system is not currently available spatially.

The National Mutual Aid System, a collaboration among the IAFC, WebEOC and Esri, is a doud-based, spatially enabled, resource management system.





GISstaff should reach out to get access to their respective Computer Aided Dispatch (CAD) Feed.

Determine a schema that could be used to aggregate CAD data across jurisdictions.

Integrate Resource Mobilization System WebEOC status feeds with GIS infrastructure.

The Cascade Story Map format used as an example dynamic, geo-enabled Daily Report would ultimately need to be customized to jurisdiction and role by those adopting this approach.

The embedded weather maps in the geo-enabled daily status/situation report are useful in providing a regional view of common forecast data.

Wildfire is another significant hazard in the region. There are multiple, disparate sources for information on current wildfires, but no current authoritative source from the point of initial attack.

State does not currently maintain a data layer of EOC Status.

Other areas that should be monitored during the readiness phase include Public Health, USAR, Transportation, Emergency Notifications, and Planned Events. Public Health has data that would be beneficial if shared, i.e., live feed of Epidemiological Monitoring, EMS calls.

ESF9 Mountain Rescue are collecting and maintaining data, some in real-time, others at the end of the year. This information is not currently shared/consumed by region for situational awareness.

Information related to recovery efforts is incomplete or outdated.



Pre-Planned Events section is needed in the Daily Report including monitoring of social media at large gatherings.

Regional view of agreed upon high-priority dispatch feeds

A number of jurisdictions have Emergency Mass Notification systems (Everbridge, Code Red, and Swift Reach were identified) but data within the system is siloed and not accessible. Areas targeted and the locations of no-response are needed in Stuational Awareness applications and should be included in Daily Reports during an emergency.

Maps in the Daily Report should be large enough to interact with easily.



Align dynamic Daily Report with local perspective.

Include Transportation and Special Events sections into Daily

Include Transportation and Special Events sections into Daily Report.

Add links to all Wildfire Resources and data feeds related to initial attack for Wildfire Monitoring.

Mock up Editable Web Map for EOC status, add EOC polygon layers (if they exist) and add include link to editor dashboard in Daily Report.

Ensure maps included in a dynamic report are large enough to interact with or replace with embedded web apps.

Assign and train daily watch officer how to make updates to the apps.

Oustomized views (Agency/ESF/Local should feed Regional View.

Hashing alert should be added to the top of any dynamic Daily St Report for New/Critical Information.

Broker relationship with Mountain Rescue to begin sharing data.

Jurisdictions with Mass Emergency Notifications (Reverse 9-1-1) should work with vendors to consume feeds, i.e., areas notified (polygon), and locations not reached (points).

Jurisdictions vary on approach to managing road dosures with varying degrees of success. Typically, a sheriff has the authority to close a road and closures are communicated through radios and tracked in CAD systems. There is a need to establish



solid workflows for tracking road closures during day-to-day and transitioning to emergencies. Douglas County has an approach for tracking road closures that could serve as a foundation for a regional approach.

WebEOChas a road closure board where users can create/update records but they are not in a spatial or in an easily consumable format. Typically, a GIS person would capture road closures in their local WebEOC and manually add to their GIS.

The Waze Connected Otizens Programs could fill gaps in road closure information. Jurisdictions participating in the program would be the authority and could overwrite closure information. The program in its current form would require each local jurisdiction to purchase GeoEvent Server which may be cost-prohibitive.

The State DOT maintains state road closures but current policies make accessing the raw data feeds to allow their consumption into a local or regional application challenging. There is a need to for mass transit feeds including cameras.

Determine data availability RTD, Light Rail Cameras.

Engage Waze on potential regional partnership for tracking/managing road closures.

Broker relationship with CDOT to obtain access to state road dosure feeds for region.





Inbound Citizen Engagement Application

Standard form shared amongst jurisdictions to collect information with the ability for basic-level vetting of citizen information.

Potential for regional coordination of a Virtual Operations Support Team comprised of an agency liaison and citizen volunteers to fulfill vetting / flagging / coordination of reports to proper agency.

Develop basic schema for citizen form

Agree on approach for local or regional hosting of form and data

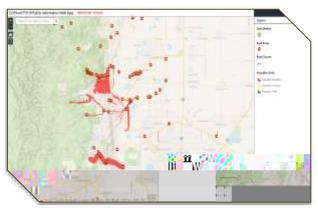
Power outage information is important to both response and recovery operations as well as to the public. While some information is available on outages, it is not in a consumable format.

Desire to embed the Public Information Map directly into communicating emergency information.



In addition to data layers shown in the demo Public Information Map, the following should be available to be turned on when needed / relevant:

- Assistance or Recovery Centers
 No current feeds exist.
- Family assistance reunification centers Add as placeholder.
 Should be one map the public knows to go to.
- Points of Distribution
- o Incident Impact Area
- Public View of Damage Assessments
- Donation Stes
- o Debris Collection
- Power Gas and Water Outages
- Reason for Road Closure



Sample Public Information Map

Identify which data layers currently exist and add to Public Information Map. Create, symbolize feature classes for the remaining these may be empty.

Identify power companies that serve the region and broker access to their feeds.

Identify Public Information Map(s) approach which provides thematic information based on phase of disaster.





There is a desire for the capability to both track mobile teams and collect data in the field. Limitations with resources, specifically mobile devices

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- Public Works asset collection (sign reflectivity)
- Health inspections

Share template XLSForms and feature layer schemas that could be deployed locally by jurisdictions, specifically for damage assessment.

Evaluate use-cases for regionally hosted field capability for feasibility. Develop a repository for field data collection templates to facilitate best practices and data standardization.

Over the course of the Plot Project, key information requirements through each phase of a flood event were identified and sources, where they existed, were compiled. Where gaps existed, available national datasets or broadly used schemas were used to create templates as a starting point for regional discussion. Additionally, workflows, maps, and mission focused applications were developed to facilitate cross-jurisdictional information sharing and to transform data into actionable information for decision makers and first responders.

The Toolkit is available to all the NCR stakeholders to test, inform enhancements, adapt and/or adopt elements as needed. All components have been shared in a public ArcGIS Online group and will serve as the national core information model for Flood Preparedness.

AAR stakeholder review and feedback

Address Short-Term Action Items

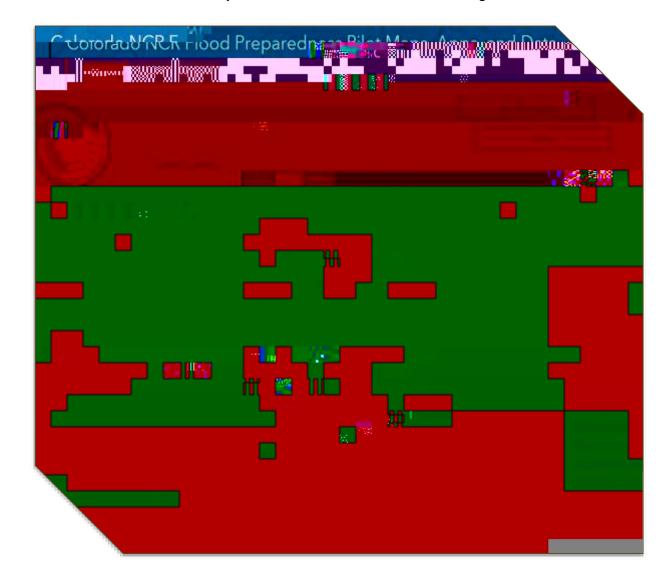
CCTA full-scale exercise in 2020. Goal for players to be using this tool. Would need to be completed 6 months prior to allow for training/using.

Emergency Manager implementation of Predictive Analysis in Preparedness Phase.



Emergency Operations Center

- o Preparation, testing and usage of Prototype for Wildfire
- Address Resource Management
- ** Address reliability and confidence in information feeding tool



NCR Stuational Awareness Toolkit: https://arcg.is/11WC4P
Colorado NCR Flood Preparedness Pilot Maps, Apps, and Data: https://arcg.is/04K50G
Share folder for NCR agendas and meeting notes: https://arcg.is/KO11j

