

SARCOP and Geospatial Planning for Search & Rescue

National Hurricane Conference 2024



FEMA



Workshop Activity [Link](#)

March 28th, 2024

Paul Doherty, PhD, FEMA US&R Branch

Emily Zeilberger, FEMA Region 4

Bottom Line Up Front

- SARCOP is....
 - a life-saving resource for search and rescue mapping
 - a life-sustaining resource for emergency managers
 - successfully adopted across the US (beyond FEMA US&R)
 - more than just technology



FEMA

Federal Emergency Management Agency

Agenda

- Intro to SAR Common Operating Platform
 - People
 - Case Study 1 - Task Force (Tripp Hansen)
 - Process
 - Case Study 2 – US&R IST (Paul Doherty)
 - Technology
 - Case Study 3 – FEMA Region (Emily Zeilberger)
 - Conclusion & Discussion



Workshop Activity [Link](#)



FEMA



People



Process



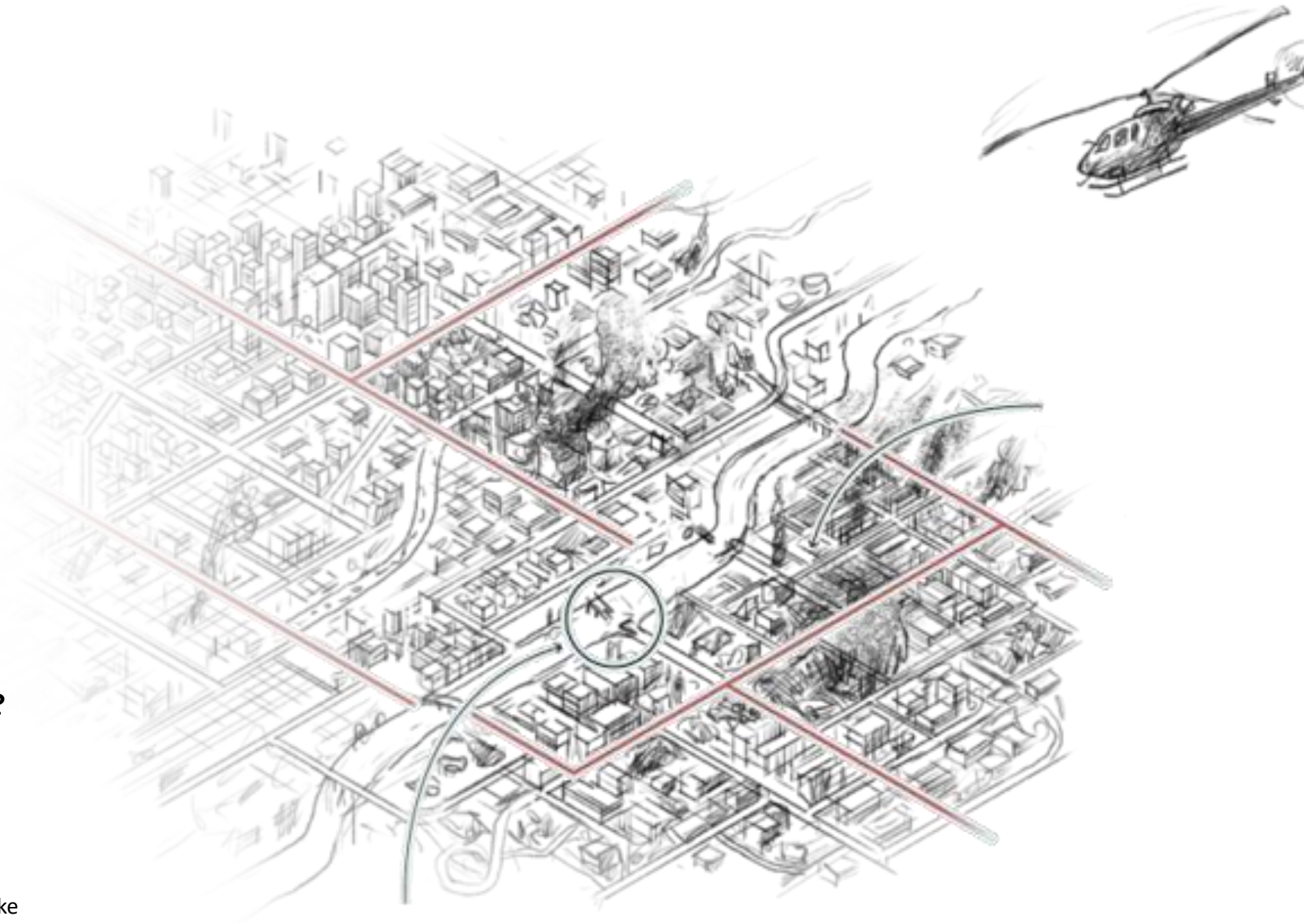
Technology



National Urban Search and Rescue Response System Established in 1989



Mission expanded to include
Wide Area Search and Water Operations

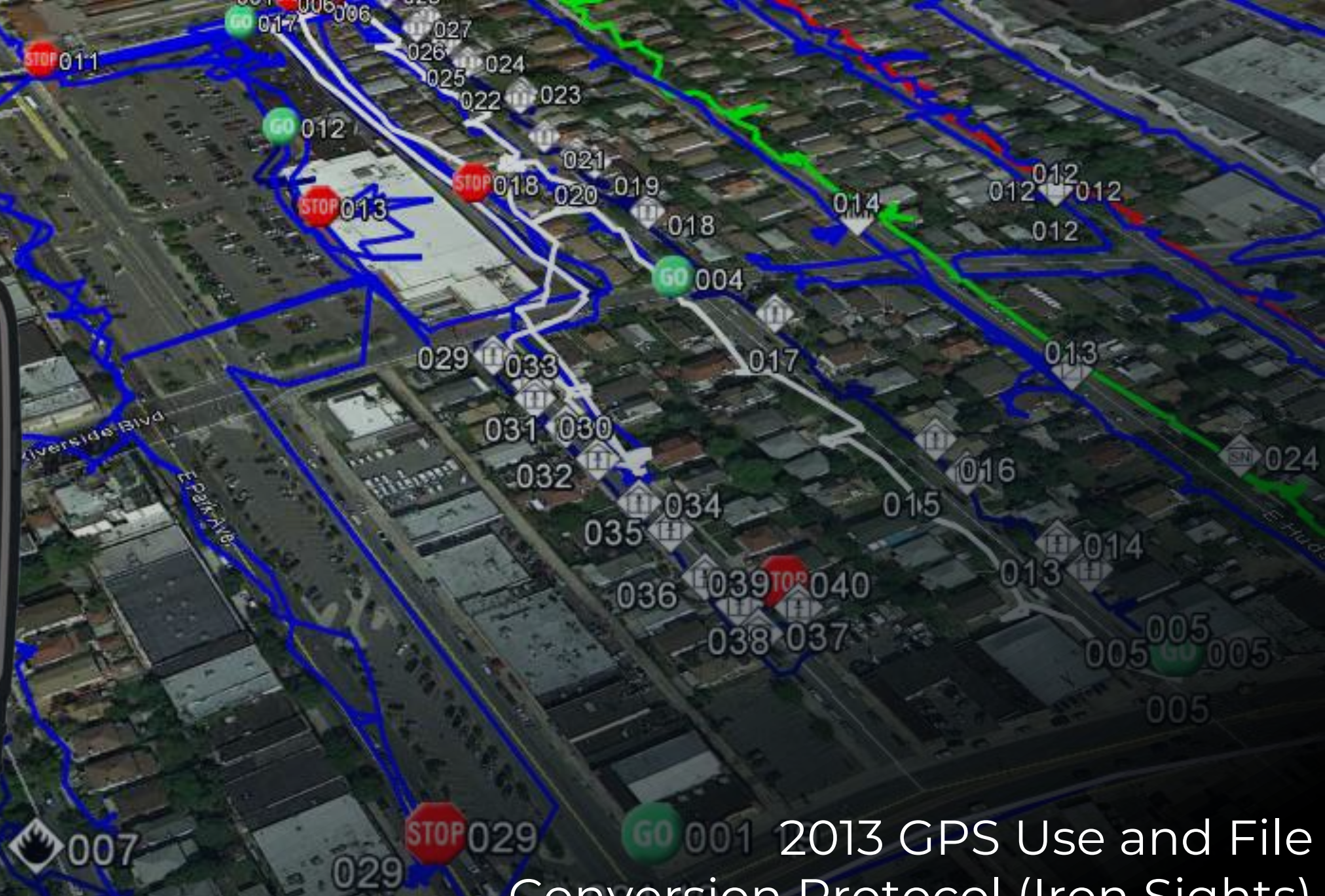


“The foundation of our concept of operations for effective search and rescue actions at large-scale catastrophic events is effective reconnaissance.”

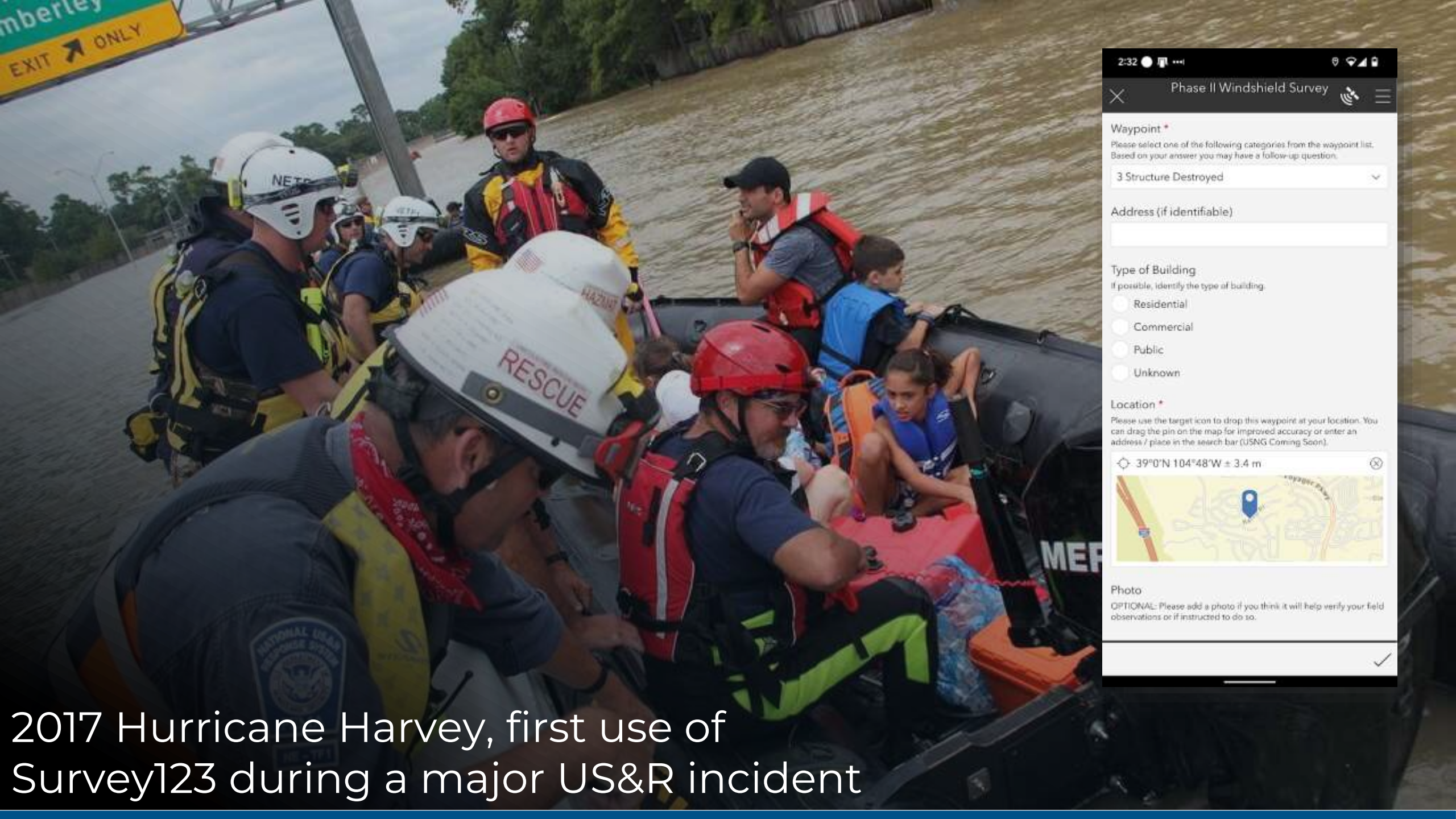
Chief Fred Endrikat 2010 following the Haiti Earthquake



Search and Rescue is an inherently spatial problem



2013 GPS Use and File Conversion Protocol (Iron Sights)



2:32 [status icons]

Phase II Windshield Survey [navigation icons]

Waypoint *

Please select one of the following categories from the waypoint list. Based on your answer you may have a follow-up question.

3 Structure Destroyed [dropdown arrow]

Address (if identifiable)

Type of Building


If possible, identify the type of building.

- Residential
- Commercial
- Public
- Unknown

Location *

Please use the target icon to drop this waypoint at your location. You can drag the pin on the map for improved accuracy or enter an address / place in the search bar (USNG Coming Soon).

39°0'N 104°48'W ± 3.4 m [close icon]



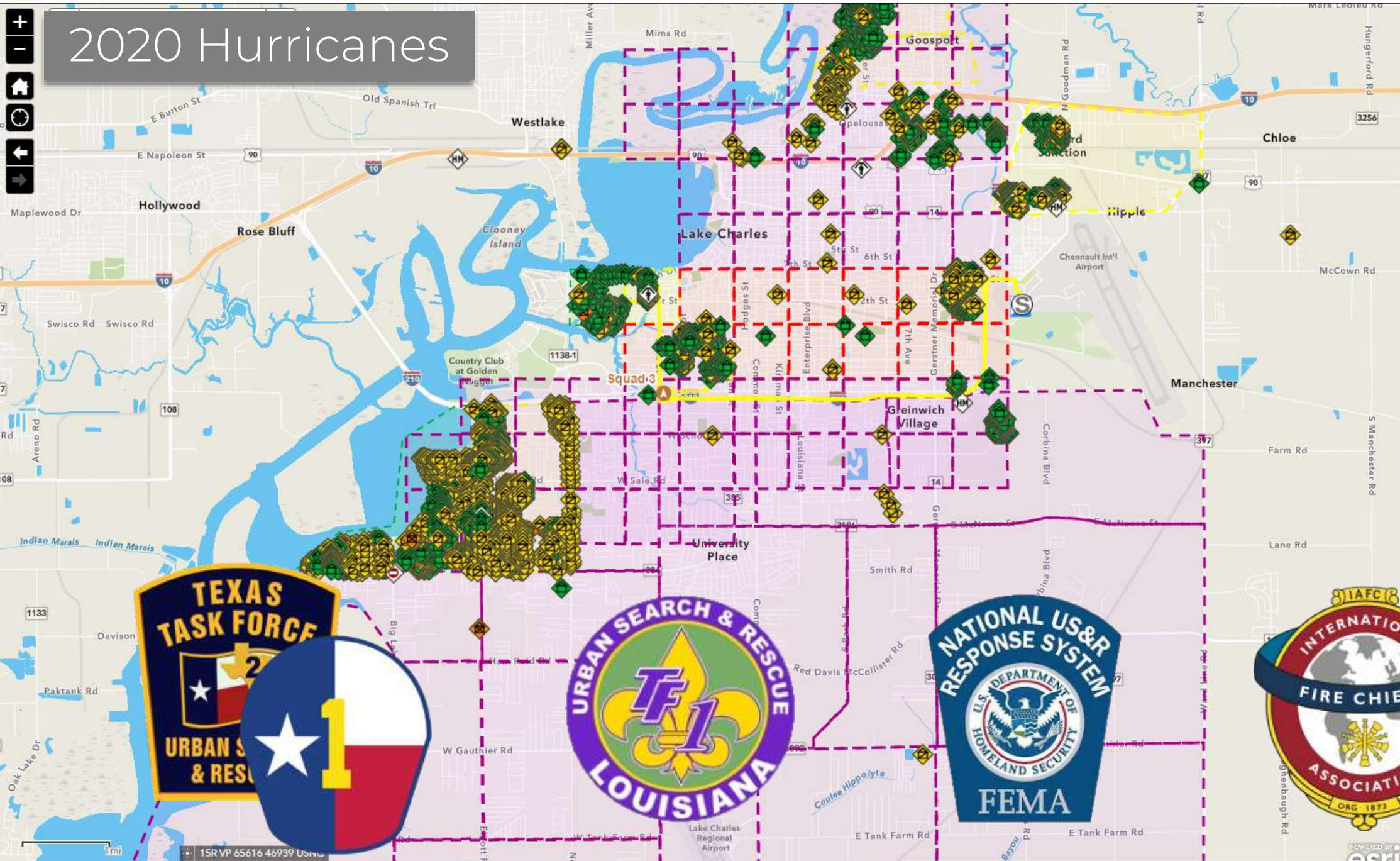
Photo

OPTIONAL: Please add a photo if you think it will help verify your field observations or if instructed to do so.

[checkmark icon]

2017 Hurricane Harvey, first use of Survey123 during a major US&R incident

2020 Hurricanes



Instructions

About

Legend

TXTF Last Known Points



LATF Last Known Point

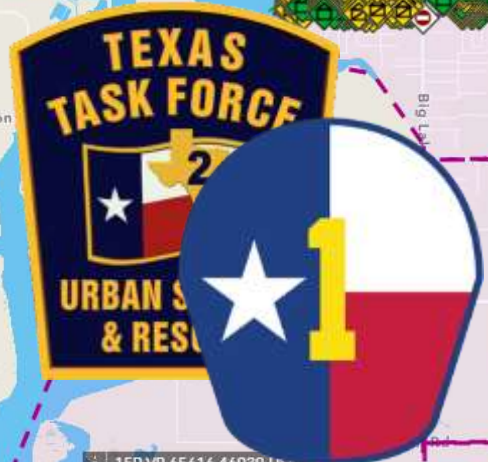


IAFC Last Known Point



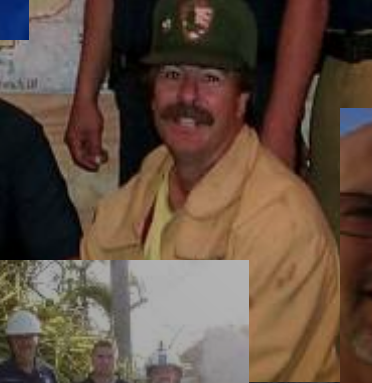
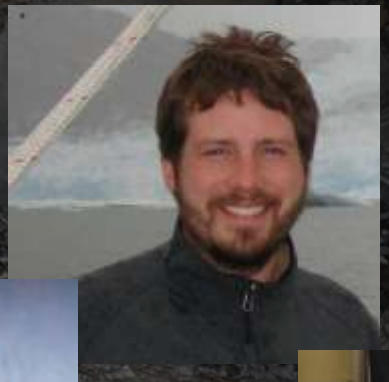
IAFC Surveys

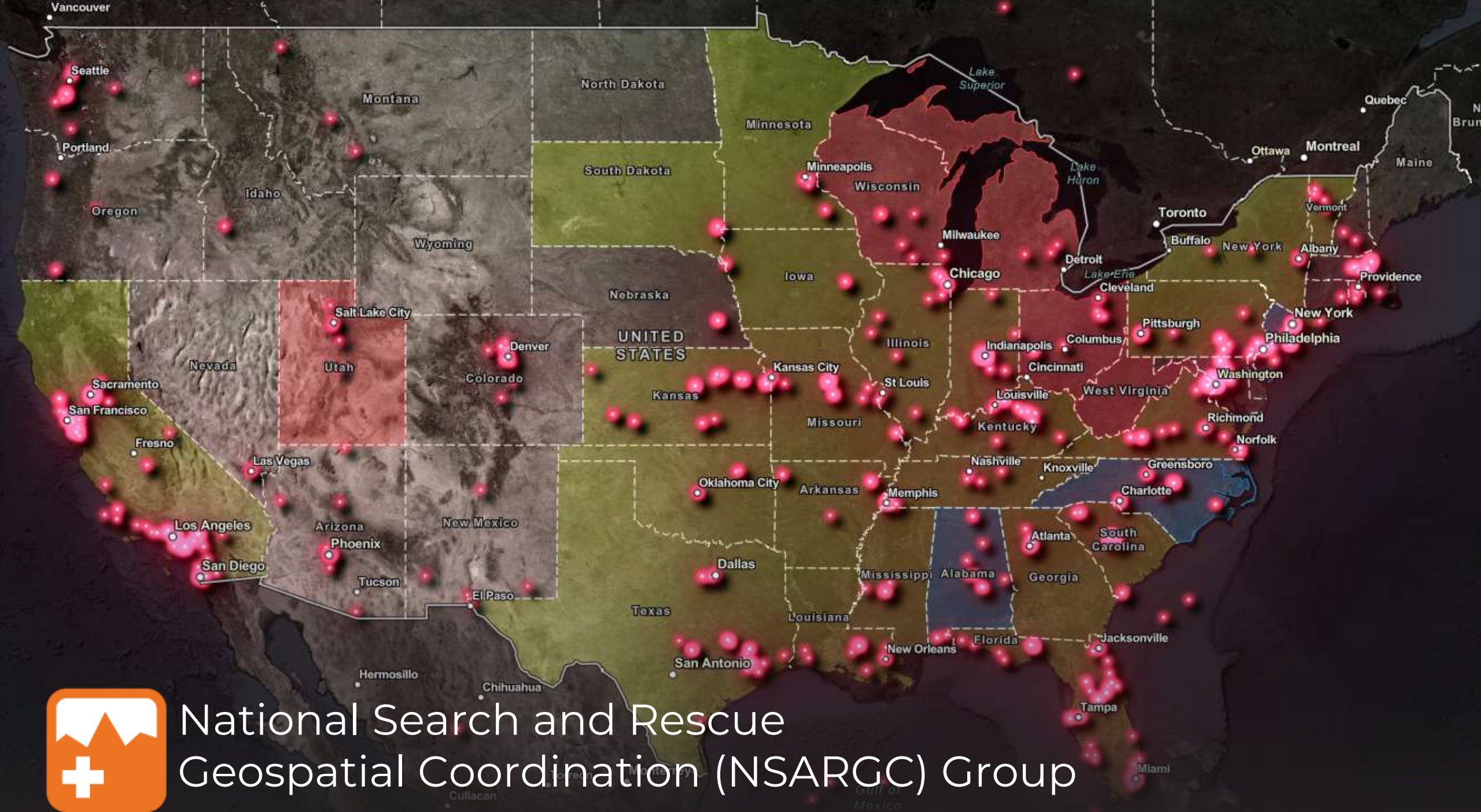
- Structure, no damage
- Structure, damaged
- Structure, failed
- Structure, destroyed
- Assisted
- Evacuated
- Rescued
- Victim, detected
- Victim, confirmed
- Human remains
- Human remains, removed
- Shelter in place
- Follow-up form
- Fire incident
- HAZMAT Incident
- Flood/water level
- Access blocked
- Fire Hazard
- Animal issue
- Targeted search
- Location update
- Incident command post
- Staging
- Safety zone
- Helicopter LZ
- Casualty Collection Point
- Firehouse (originally marked)





Supported by DHS Science and Technology





National Search and Rescue
Geospatial Coordination (NSARGC) Group

Task Force List

This list will show individual survey entries based on your filter selection, with most recent edits appearing at the top. Viewing or editing more details requires credentials.

Search...

CO-TF1

West Metro Fire Rescue
Last Edit: 11/14/2023, 3:53 PM
[View Form](#) | [Update Form](#)

CA-TF5

Orange County
Last Edit: 7/13/2023, 11:54 AM
[View Form](#) | [Update Form](#)

AZ-TF1

Phoenix Fire Department
Last Edit: 4/28/2023, 1:31 PM
[View Form](#) | [Update Form](#)

CA-TF1

City of Los Angeles
Last Edit: 4/28/2023, 1:31 PM
[View Form](#) | [Update Form](#)

CA-TF2

Los Angeles County
Last Edit: 4/28/2023, 1:31 PM
[View Form](#) | [Update Form](#)

CA-TF3

City of Menlo Park
Last Edit: 4/28/2023, 1:31 PM
[View Form](#) | [Update Form](#)

Last update: 14 seconds ago

Selected

28

Last update: 14 seconds ago

All FEMA US&R Task Forces



US&R Catalog

[Link](#)

Task Force List

This list will show individual survey entries based on your filter selection, with most recent edits appearing at the top. Viewing or editing more details requires credentials.

Search...

KY-TF1

Ky Emergency Management
Last Edit: 1/20/2024, 2:19 PM
[View Form](#) | [Update Form](#)

CO-TF1

West Metro Fire Rescue
Last Edit: 11/14/2023, 3:53 PM
[View Form](#) | [Update Form](#)

MS-TF2

Philadelphia Fire Department
Last Edit: 11/6/2023, 12:32 PM
[View Form](#) | [Update Form](#)

Ky-LexingtonFD

Lexington Fire Department
Last Edit: 8/14/2023, 2:20 PM
[View Form](#) | [Update Form](#)

CA-RTF11

Bakersfield Fire Department
Last Edit: 7/25/2023, 8:04 AM
[View Form](#) | [Update Form](#)

CA-RTF4

Pasadena FD/Multi-Agency
Last Edit: 7/25/2023, 8:03 AM
[View Form](#) | [Update Form](#)

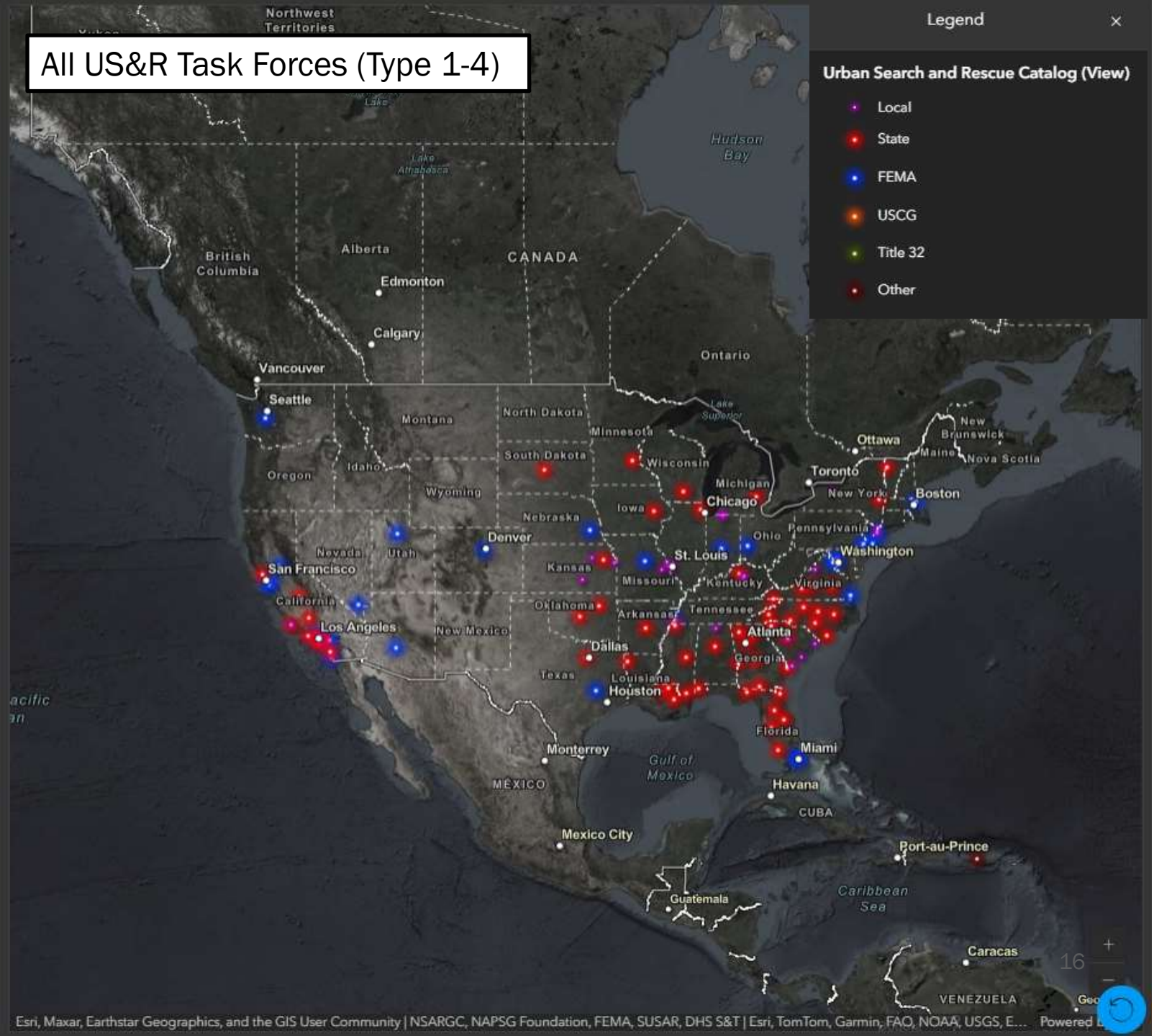
Last update: 5 seconds ago

Selected

116

Last update: 5 seconds ago

All US&R Task Forces (Type 1-4)



Task Force List

This list will show individual survey entries based on your filter selection, with most recent edits appearing at the top. Viewing or editing more details requires credentials.

Search...

KY-TF1

Ky Emergency Management
Last Edit: 1/20/2024, 2:19 PM
[View Form](#) | [Update Form](#)

CO-TF1

West Metro Fire Rescue
Last Edit: 11/14/2023, 3:53 PM
[View Form](#) | [Update Form](#)

MS-TF2

Philadelphia Fire Department
Last Edit: 11/6/2023, 12:32 PM
[View Form](#) | [Update Form](#)

USCG-MSST Cape Cod-FR

USCG
Last Edit: 9/14/2023, 10:58 AM
[View Form](#) | [Update Form](#)

CT-TF1

Connecticut Division of Emergency Management and Homeland Security
Last Edit: 9/12/2023, 12:14 PM
[View Form](#) | [Update Form](#)

USCG-ATL Strike Team-FR

USCG
Last Edit: 8/30/2023, 10:05 AM
[View Form](#) | [Update Form](#)

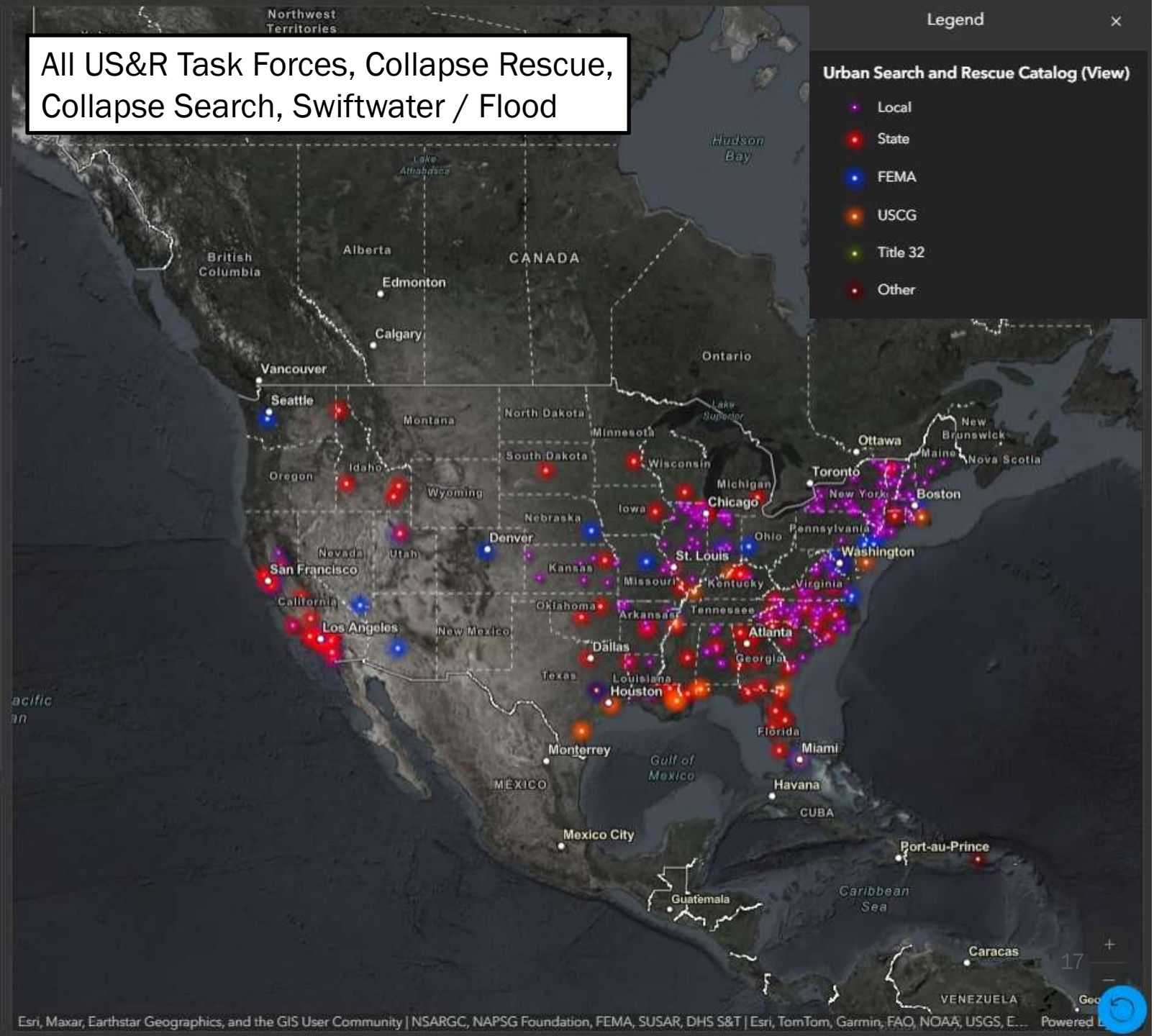
Last update: 8 seconds ago

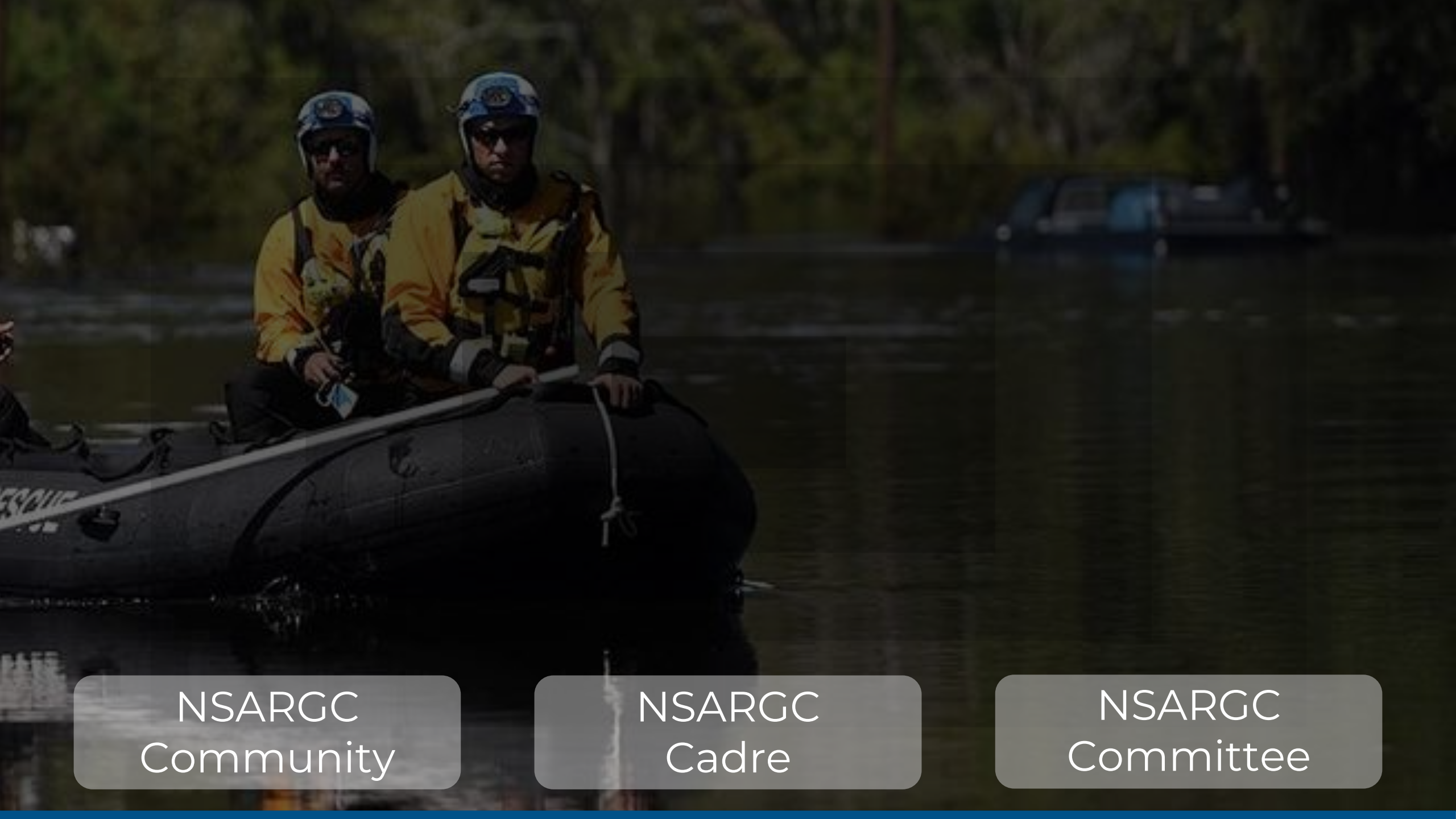
Selected

385

Last update: 8 seconds ago

All US&R Task Forces, Collapse Rescue, Collapse Search, Swiftwater / Flood





NSARGC
Community

NSARGC
Cadre

NSARGC
Committee

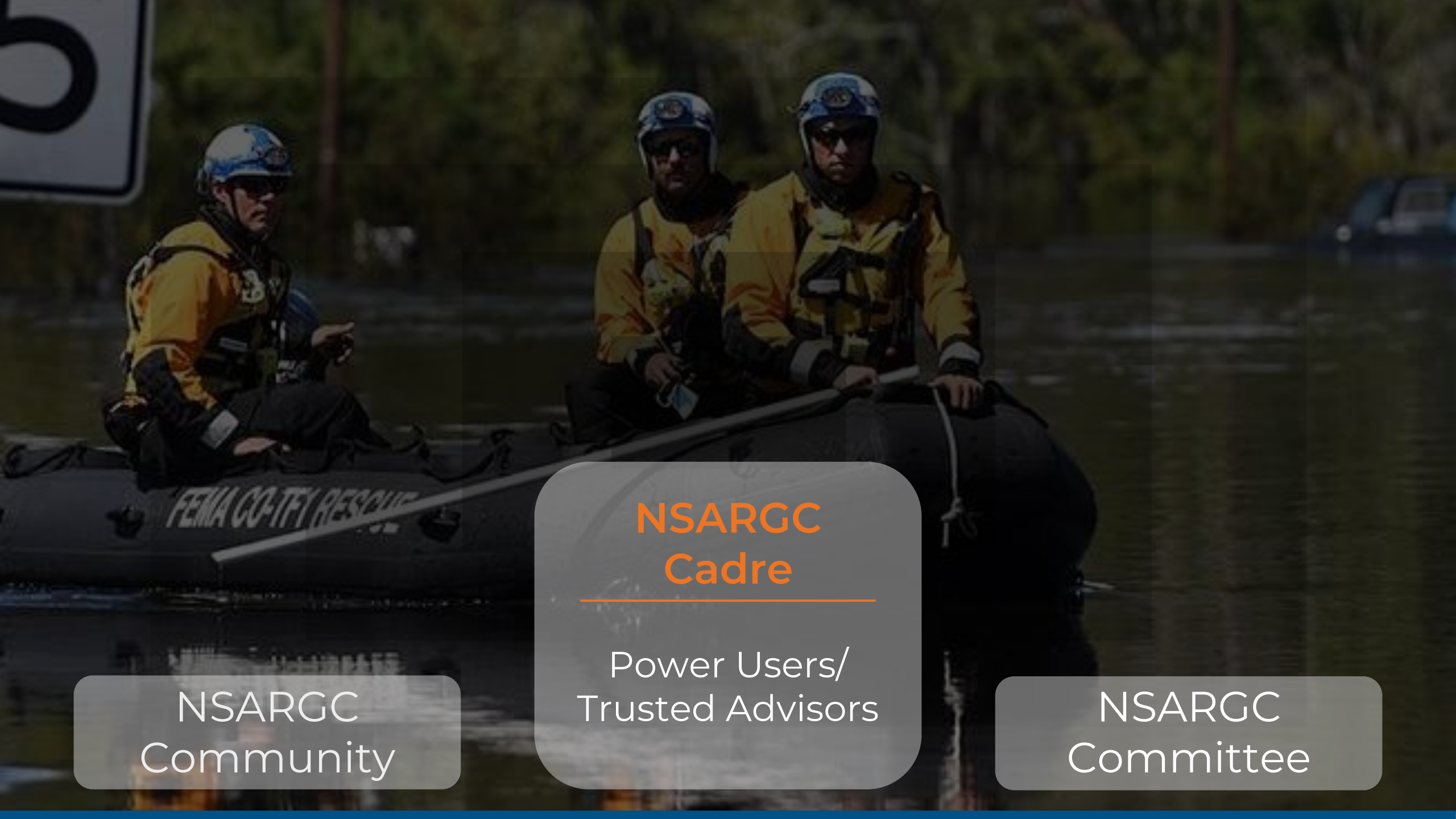
A photograph of two individuals wearing yellow high-visibility jackets and blue helmets, sitting in a boat on a body of water. The background is a blurred shoreline with trees. The image is overlaid with a dark semi-transparent layer.

NSARGC Community

All NSARGC
stakeholders

NSARGC
Cadre

NSARGC
Committee

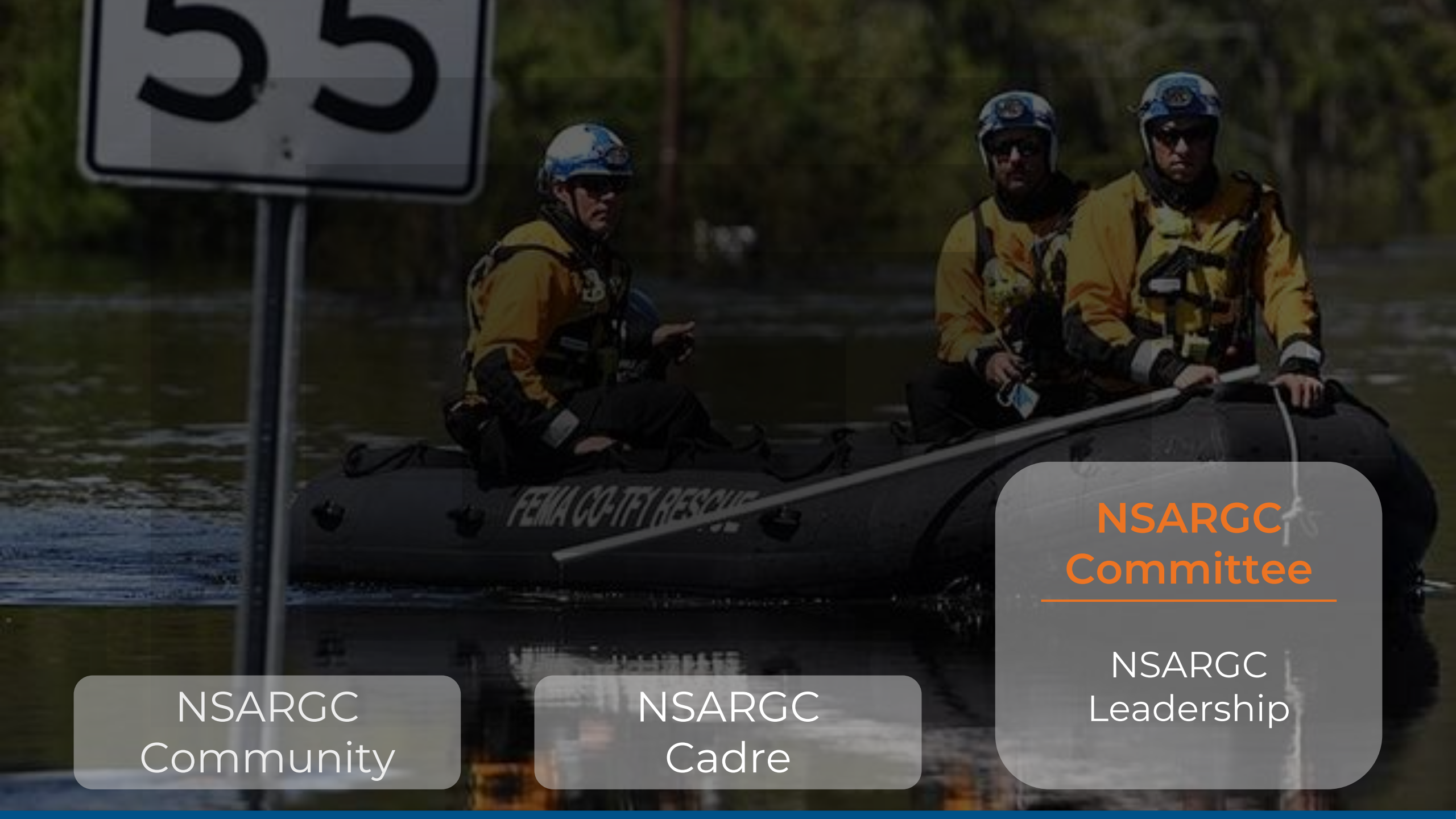


NSARGC Cadre

Power Users/
Trusted Advisors

NSARGC
Community

NSARGC
Committee



NSARGC
Community

NSARGC
Cadre

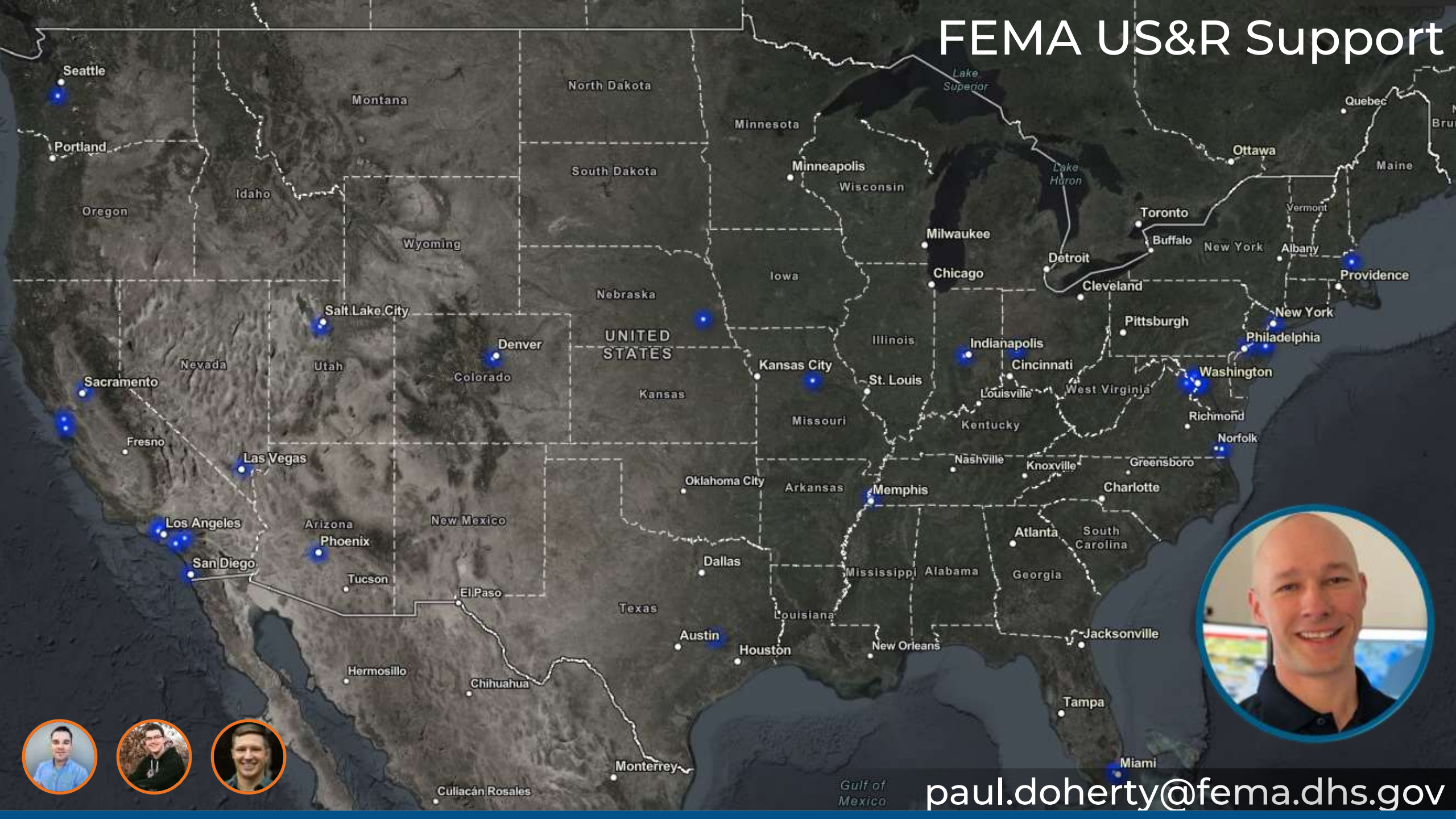
NSARGC
Committee

NSARGC
Leadership

NSARGC Committee Participating Agencies

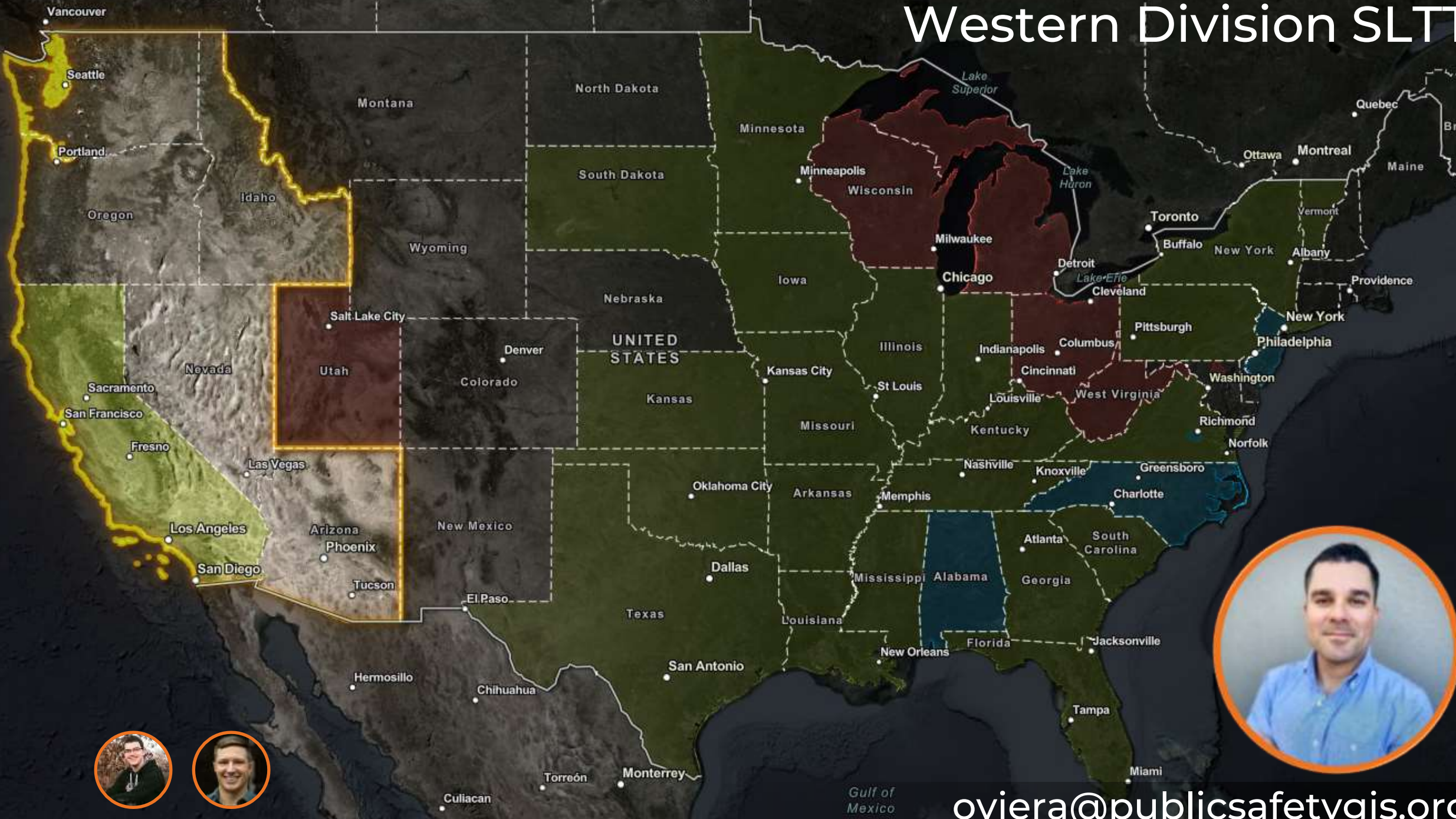


FEMA US&R Support

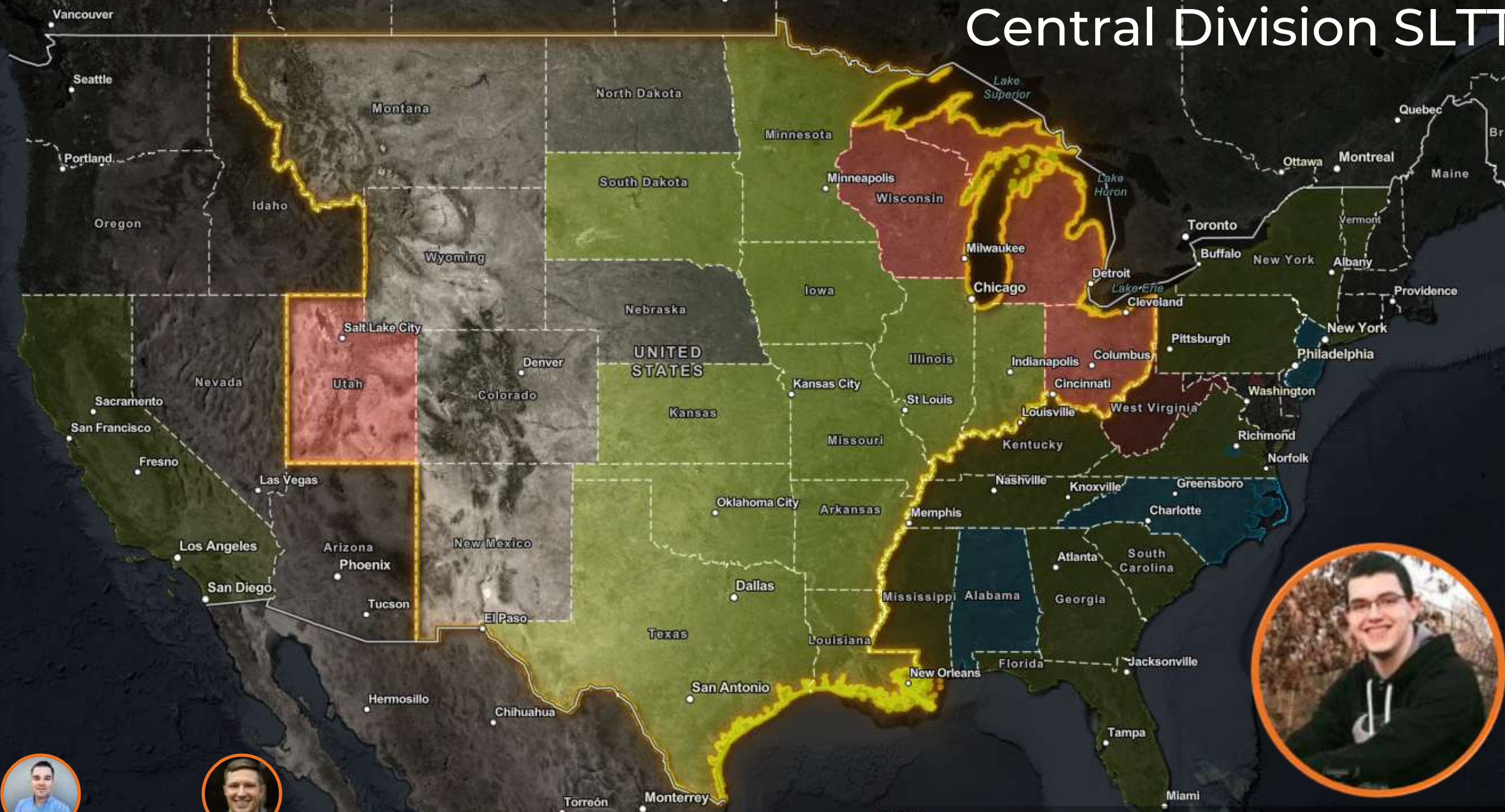


paul.doherty@fema.dhs.gov

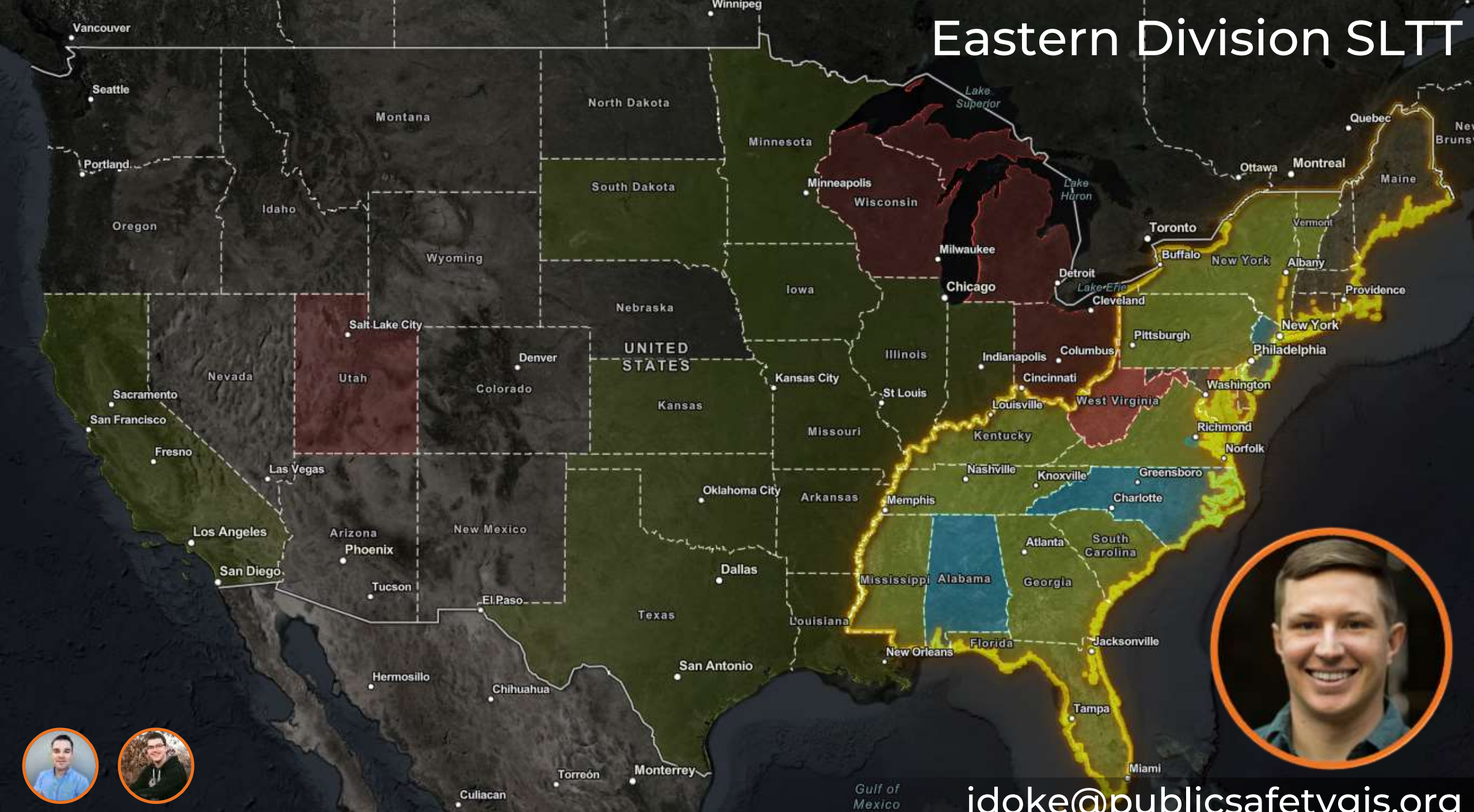
Western Division SLTT



Central Division SLTT

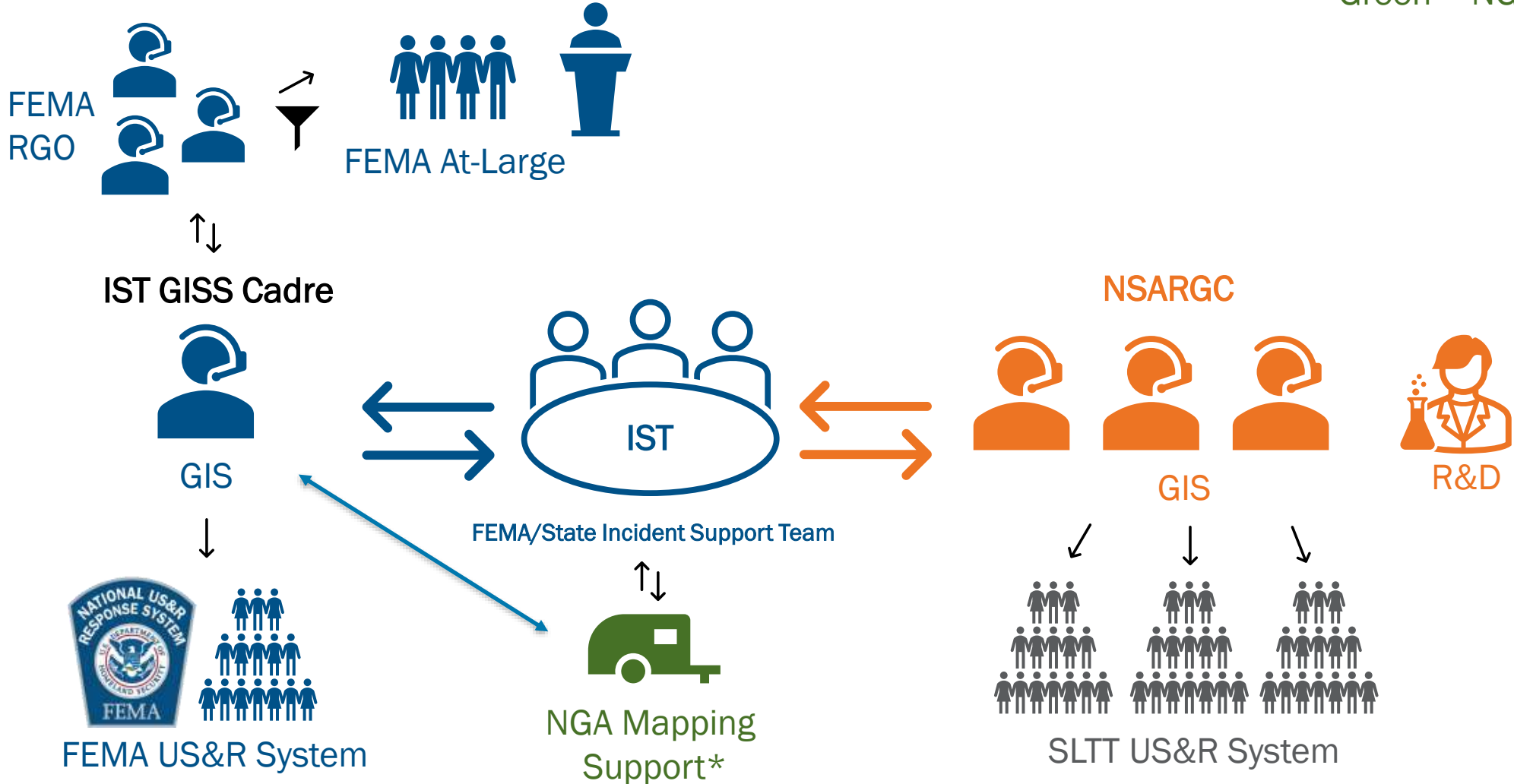


Eastern Division SLTT

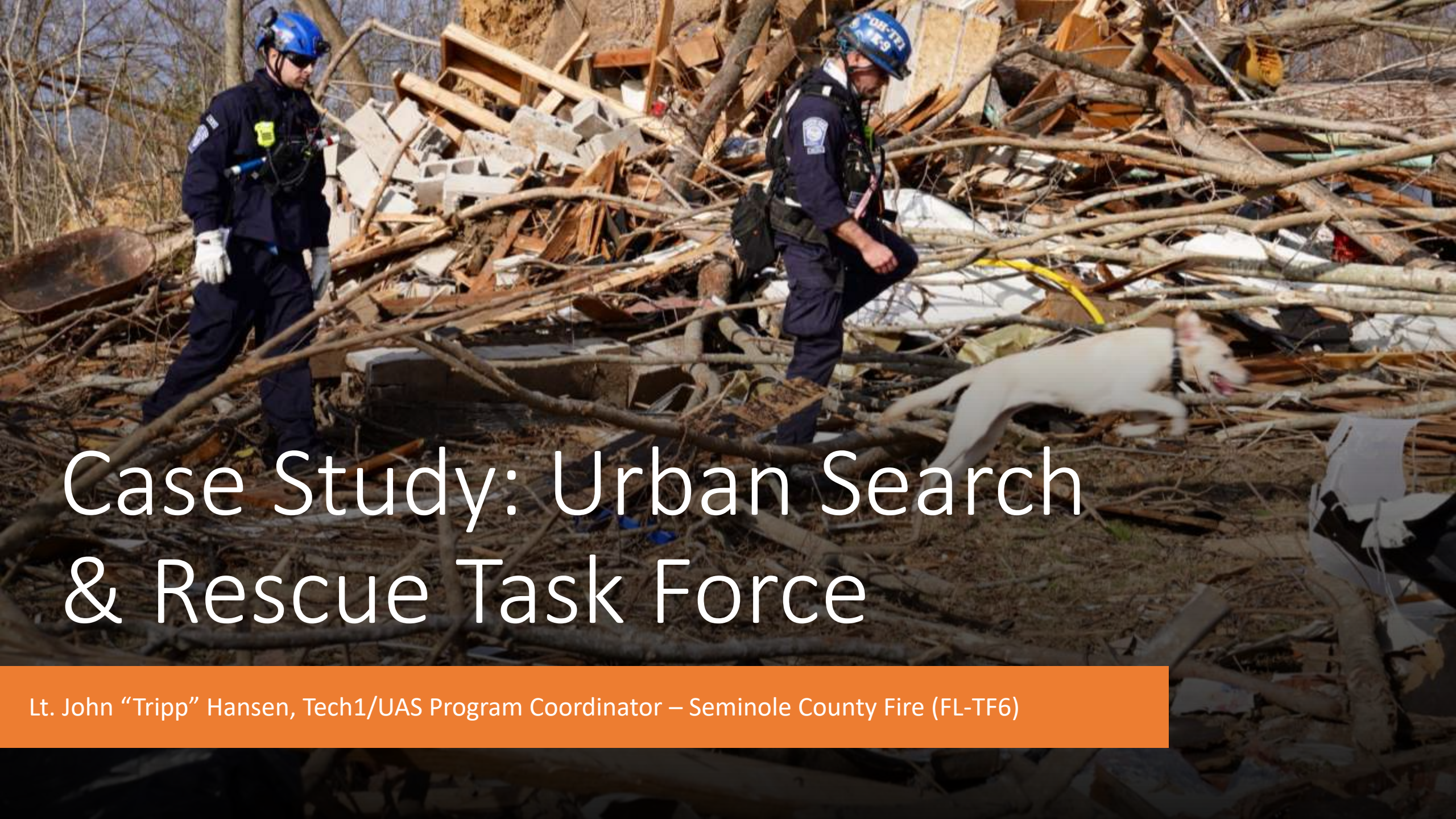


SARCOP – People (Response)

FEMA = Blue
Orange = NSARGC
Grey = SLTT
Green = NGA



*Via ESF9 Mission Assignment when incident scope and complexity requires.



Case Study: Urban Search & Rescue Task Force

Lt. John "Tripp" Hansen, Tech1/UAS Program Coordinator – Seminole County Fire (FL-TF6)





People



Process

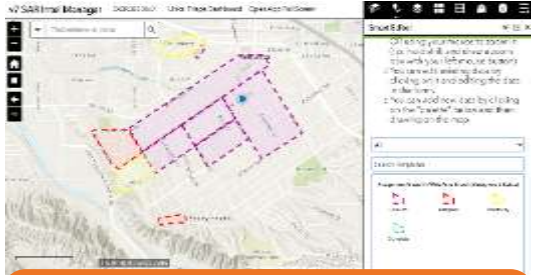


Technology



Integrate into existing processes
while developing new ones to support the mission

“Geospatial” Planning P



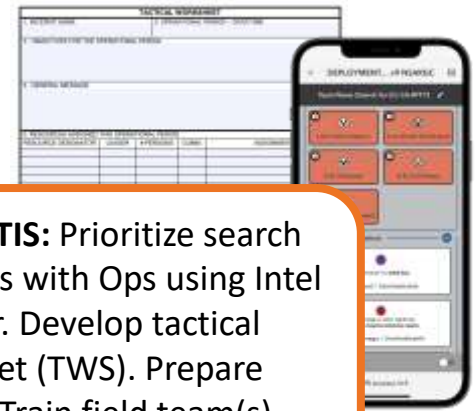
2 Plans/TIS: Create search segments using Intel Manager.

1 Plans/TIS: Refine common operating map with forecasts/early impacts. Determine objectives. Review Search Data Documentation Requirements (SDDR).

0 Plans/TIS: Prep the common operating map, forecast, and early impacts. **Field:** Use QuickCapture to document initial searches (recon, hasty, if applicable).



- Initial UC Meeting
- Incident Brief ICS-201
- Initial Response
- Notification
- Incident/Event

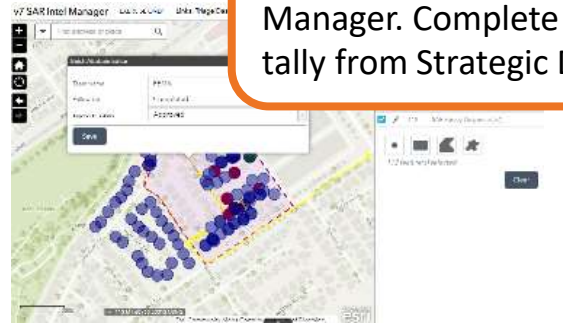


3 Plans/TIS: Prioritize search segments with Ops using Intel Manager. Develop tactical worksheet (TWS). Prepare devices. Train field team(s).

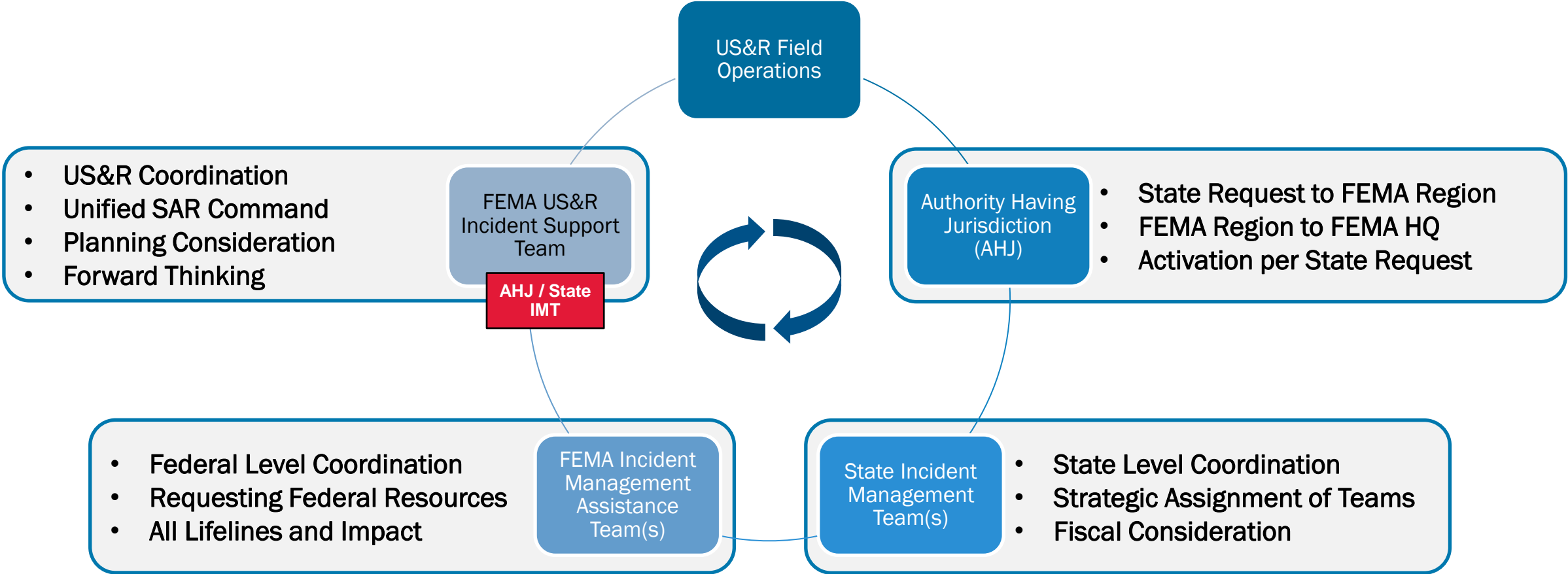
4 Plans/TIS: Monitor Tactical Dashboard. **Field:** Use QuickCapture for tracklogs and waypoints and Field Maps for SA.



5 Plans/TIS: Review, assign follow-ups, approve data using Intel Manager. Complete an ICS 209 with tally from Strategic Dashboard.



US&R Field Operations



FEMA

FEMA US&R – Type 1 Task Force

Type I Task Force: 70 personnel

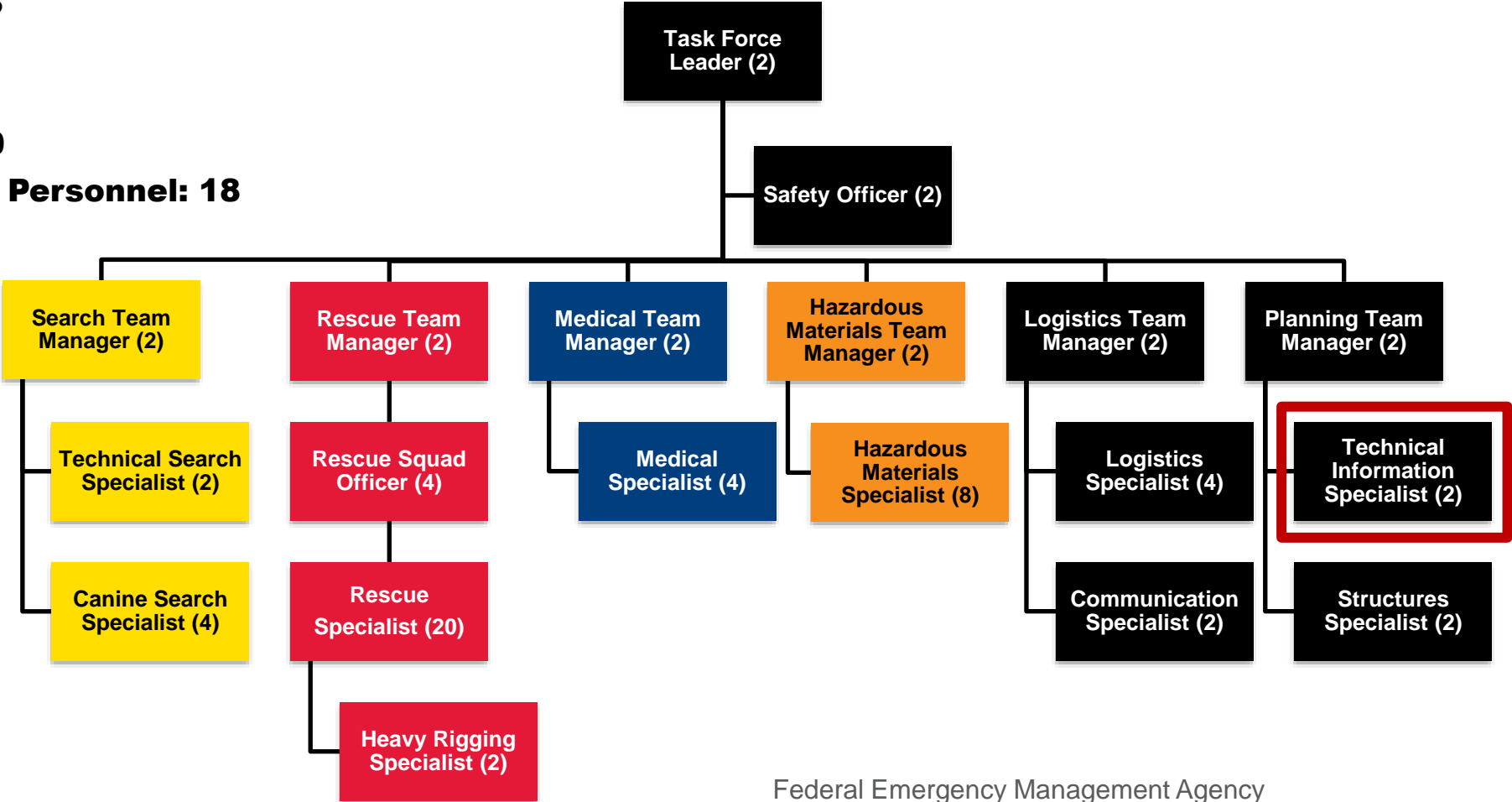
Rescue Personnel: 28

Search Personnel: 8

Medical Personnel: 6

HazMat Personnel: 10

Command/Logs/Plans Personnel: 18



FEMA

Canine Search

- Live Find (LF)
- Human Remains Detection (HRD)
- Handlers work 30+ hours a week training their canine
- 4 deploy with a Type 1
- Lives with the handler
- Certification Evaluation





Technical Search

- Search Cameras
- Delsar Listening Devices
- Other Equipment

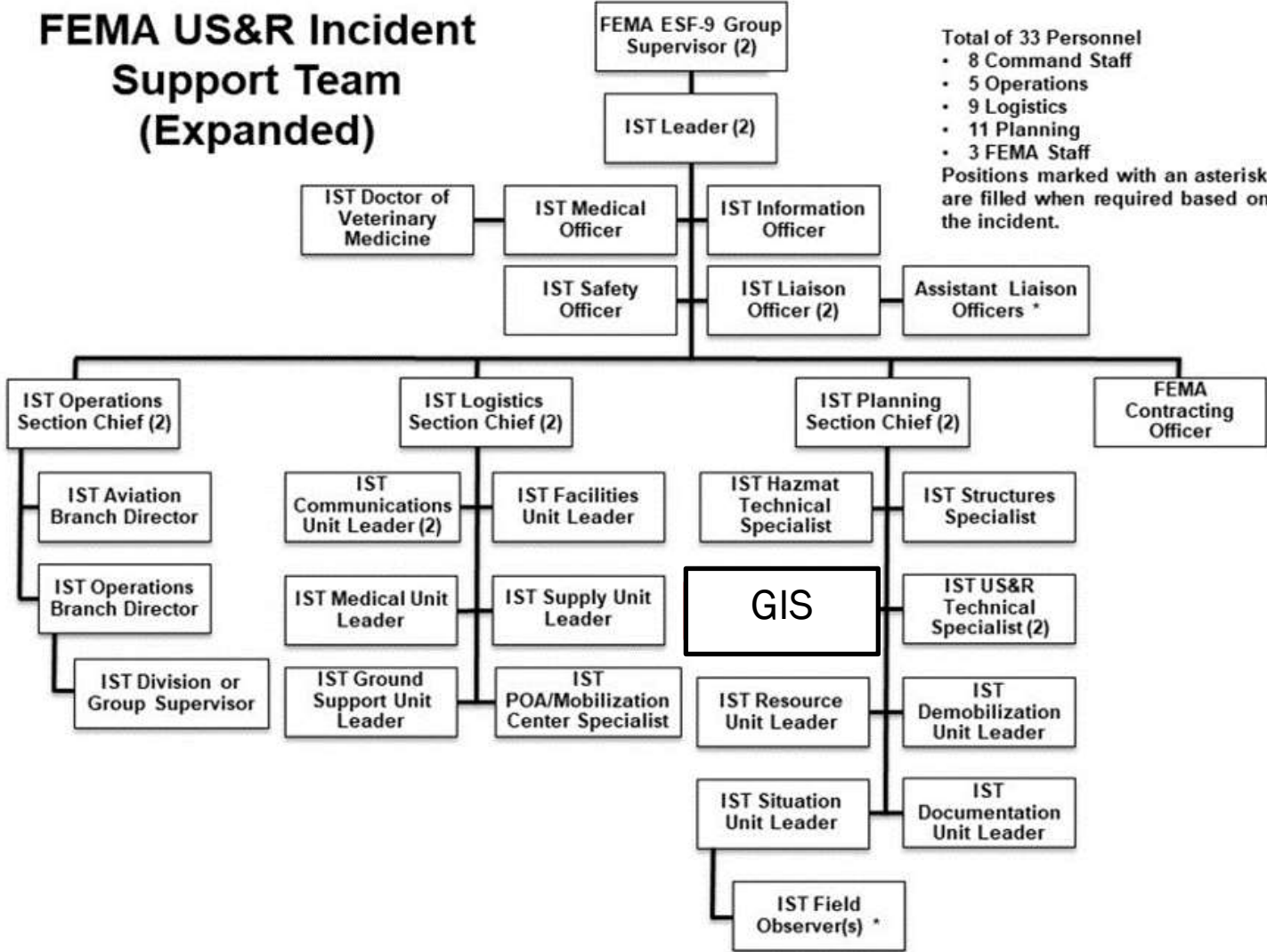
Rescue

- Breaching
- Lift and Moving
- Shoring
- Rope Rescue
- Confined Space



FEMA US&R – Incident Support Team

FEMA US&R Incident Support Team (Expanded)



FEMA

Incident Support Team - One Team, One Fight



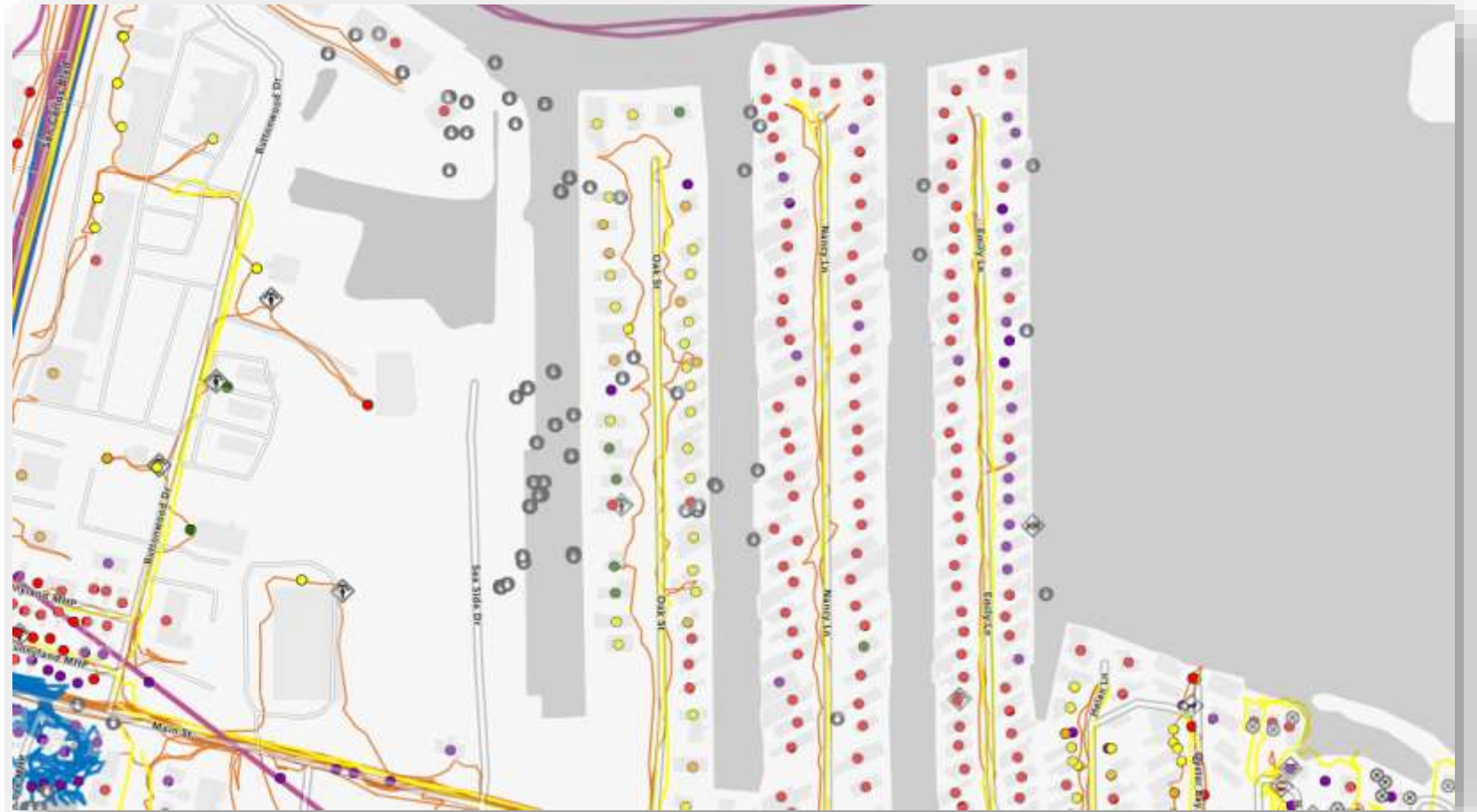
FEMA

Wide Area Search Process

Where are areas that have/have not already been covered?

Tracklog for Wide Area Search

- Recon
- Hasty / Rapid
- Primary
- Secondary, high
- Secondary, low
- Targeted



Tracklogs and waypoints created by Task Forces (FEMA, State, Local) in the field.

Life Sustaining Mission

Inspections/Assessments after a Disaster

Assessments are an essential part of the response and recovery process and are critical for assessing the size, scope, and severity of an event.

THE CHALLENGE

When a home is damaged as a result of a natural or man-made disaster, numerous damage assessments are performed to assess the safety of the structure, quantify the damage, and determine financial aid from the government and/or insurance company. While each assessment is conducted for a specific purpose, this puts a significant burden on the survivors and community and often times delays recovery efforts.

THE SOLUTION

Consistent standards and data sharing mechanisms are needed so various programs and agencies (e.g., state and local authorities, federal agencies, statutory authorities, non-profit organizations) can leverage the same data collected during the preliminary damage assessment. This will help avoid duplication of effort, conflicting information, and delays in bringing relief to the homeowner.



 **Urban Search and Rescue (US&R)**
Assess if the house is safe to enter for rescue operations.



Feed The Information Up

- How many Task Forces?
- How many personnel?
- Staged in what cities?
- Where are teams now?
- What are the conditions there?
- How many rescues as of right now?
- How many rescues last night?
- How many combined rescues over the 4 states, by federal, state and volunteer teams, broken down by day and by hour?
- I can see on CNN that....



FEMA

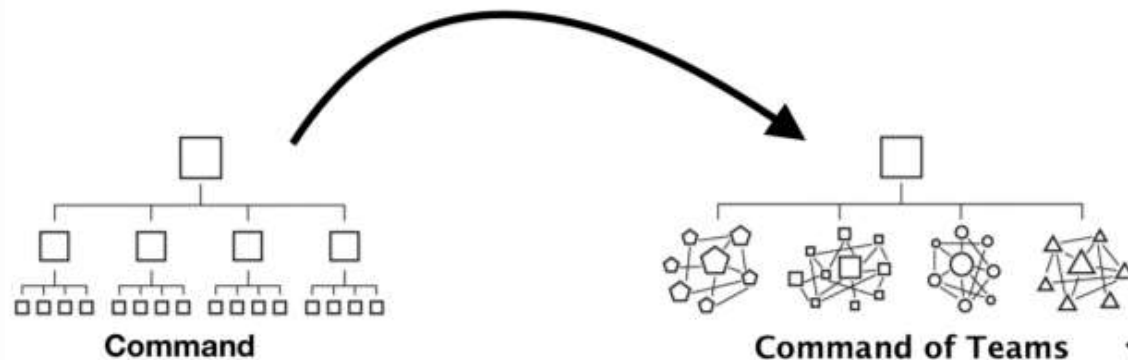
Wide Area Search Process





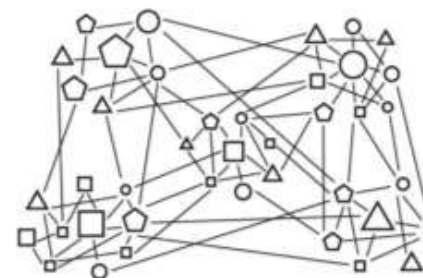
Case Study: US&R Incident Support Team

Paul Doherty – US&R Incident Support Team GIS Specialist



A traditional top-down structure. The connections that matter are between workers and their managers.

Small teams operate independently but still within a more rigid superstructure



Team of Teams

The relationship among teams resembles the closeness among individuals on those teams.



People



Process



Technology

What is SARCOP?

Intel Manager provides team managers search operation and review field with the ability to plan the data.

Intel Manager



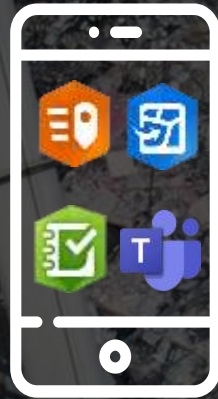
Dashboards



Dashboards provide command with real-time tracking and situation reports.

These can be filtered based on the audience.

QuickCapture



Mobile apps provide field data collection, navigation, and shared situational awareness in the field.

QuickCapture, Field Maps, and Survey123.

We also use Microsoft Teams for sharing situation updates and remote tasking.

ArcGIS Pro



ArcGIS Pro provides GIS Specialist with map production, spatial analysis, and the integration of AI.



Search and Rescue Common Operating Platform

Access the SARCOP Sandbox for Training

The screenshot shows the SARCOP website with a navigation menu at the top: Home, The System, Information, Administrative Readiness, Advisory Organization, and Training/Exercise/Incident. A dropdown menu is open under 'Information', listing: DHS Performance Documents, System Calendar, SAR Common Operating Picture (SARCOP), System Contact Information - BRANCH, System Definitions, System Doctrine, System Forms, and System Meeting Notes & Agendas. A 'Quick Links' section contains three orange buttons: 'Pandemic Info', '2023a AO Solicitation', and 'Post-Mission Instructions'. The main content area features a search bar for 'Search & Rescue Common Operating Platform (SARCOP)'. Below the search bar, a text block states: 'The following references should be used for field data collection as well as current SARCOP documentation'. Two large buttons are displayed: a blue button labeled 'REAL WORLD ONLY!' with 'SAR Common Operating Platform' and a red button labeled 'TRAINING ONLY!' with 'Training Sandbox'. A third button at the bottom is labeled 'SARCOP Training and Documentation'. Three callout boxes are present: 1. A circle with the number '1' points to the 'SAR Common Operating Picture (SARCOP)' menu item. 2. A circle with the number '2' points to the red 'TRAINING ONLY!' button. 3. A circle with the number '3' points to the 'SARCOP Training and Documentation' button.

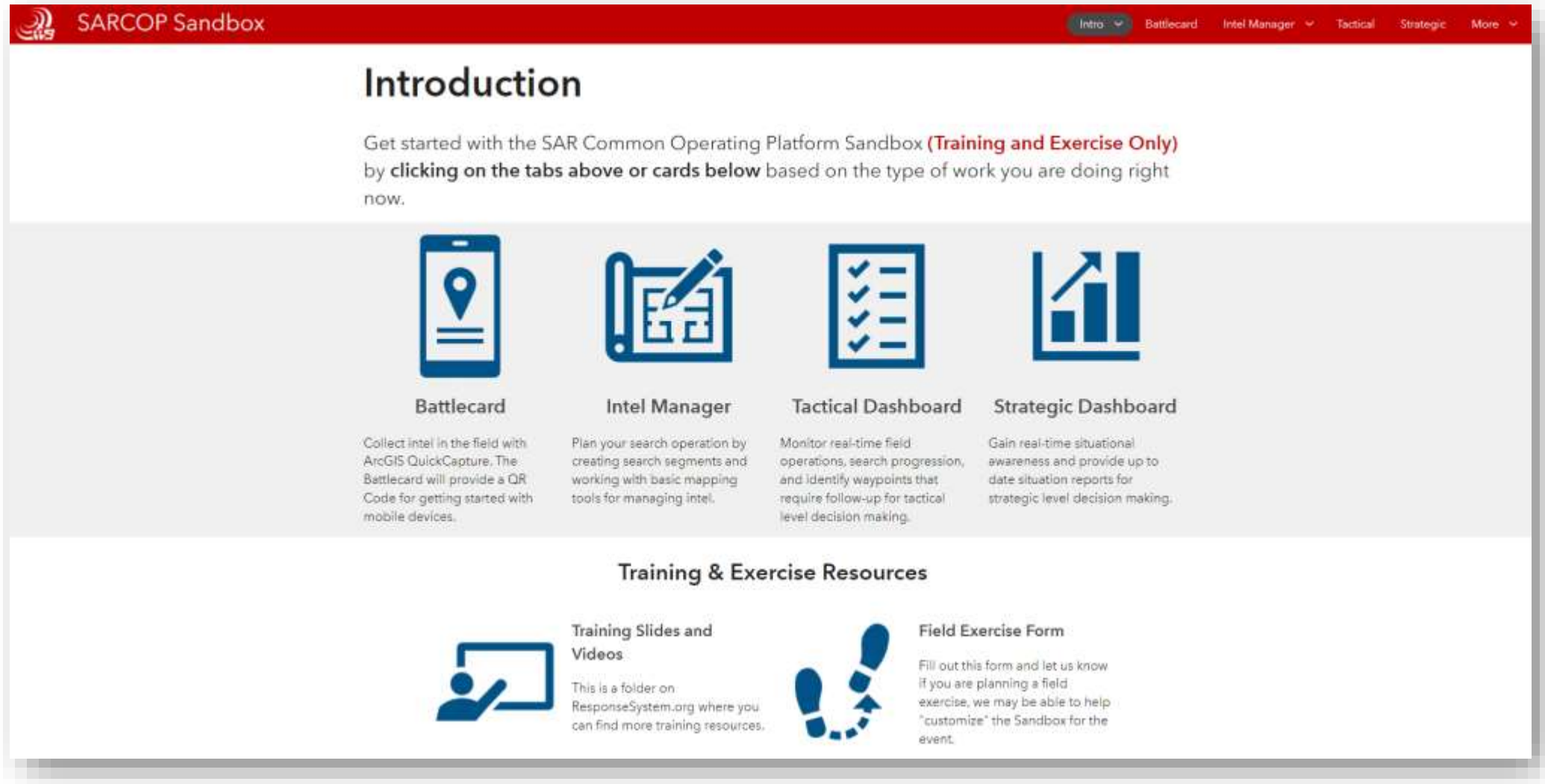
The Blue Button is for real-world use only!

The Red Button is for training and exercises only!

Training & Documentation



SARCOP Sandbox (Red = Training Only!)




The screenshot shows the SARCOP Sandbox website. At the top, there is a red navigation bar with the SARCOP logo and the text "SARCOP Sandbox". To the right of the logo, there are several menu items: "Intro", "Battlecard", "Intel Manager", "Tactical", "Strategic", and "More". Below the navigation bar, the main content area has a white background. The first section is titled "Introduction" and contains a paragraph: "Get started with the SAR Common Operating Platform Sandbox (Training and Exercise Only) by clicking on the tabs above or cards below based on the type of work you are doing right now." Below this text, there are four cards, each with an icon and a title. The first card has a smartphone icon with a location pin and is titled "Battlecard". The second card has a tablet with a pencil and a map icon and is titled "Intel Manager". The third card has a checklist icon and is titled "Tactical Dashboard". The fourth card has a bar chart icon and is titled "Strategic Dashboard". Below these cards, there is a section titled "Training & Exercise Resources" with two items. The first item has a person at a computer icon and is titled "Training Slides and Videos". The second item has a footprint icon and is titled "Field Exercise Form".

SARCOP Sandbox

Intro Battlecard Intel Manager Tactical Strategic More


Introduction

Get started with the SAR Common Operating Platform Sandbox (**Training and Exercise Only**) by clicking on the tabs above or cards below based on the type of work you are doing right now.




Battlecard

Collect intel in the field with ArcGIS QuickCapture. The Battlecard will provide a QR Code for getting started with mobile devices.




Intel Manager

Plan your search operation by creating search segments and working with basic mapping tools for managing intel.



Tactical Dashboard


Monitor real-time field operations, search progression, and identify waypoints that require follow-up for tactical level decision making.



Strategic Dashboard


Gain real-time situational awareness and provide up to date situation reports for strategic level decision making.

Training & Exercise Resources



Training Slides and Videos

This is a folder on ResponseSystem.org where you can find more training resources.



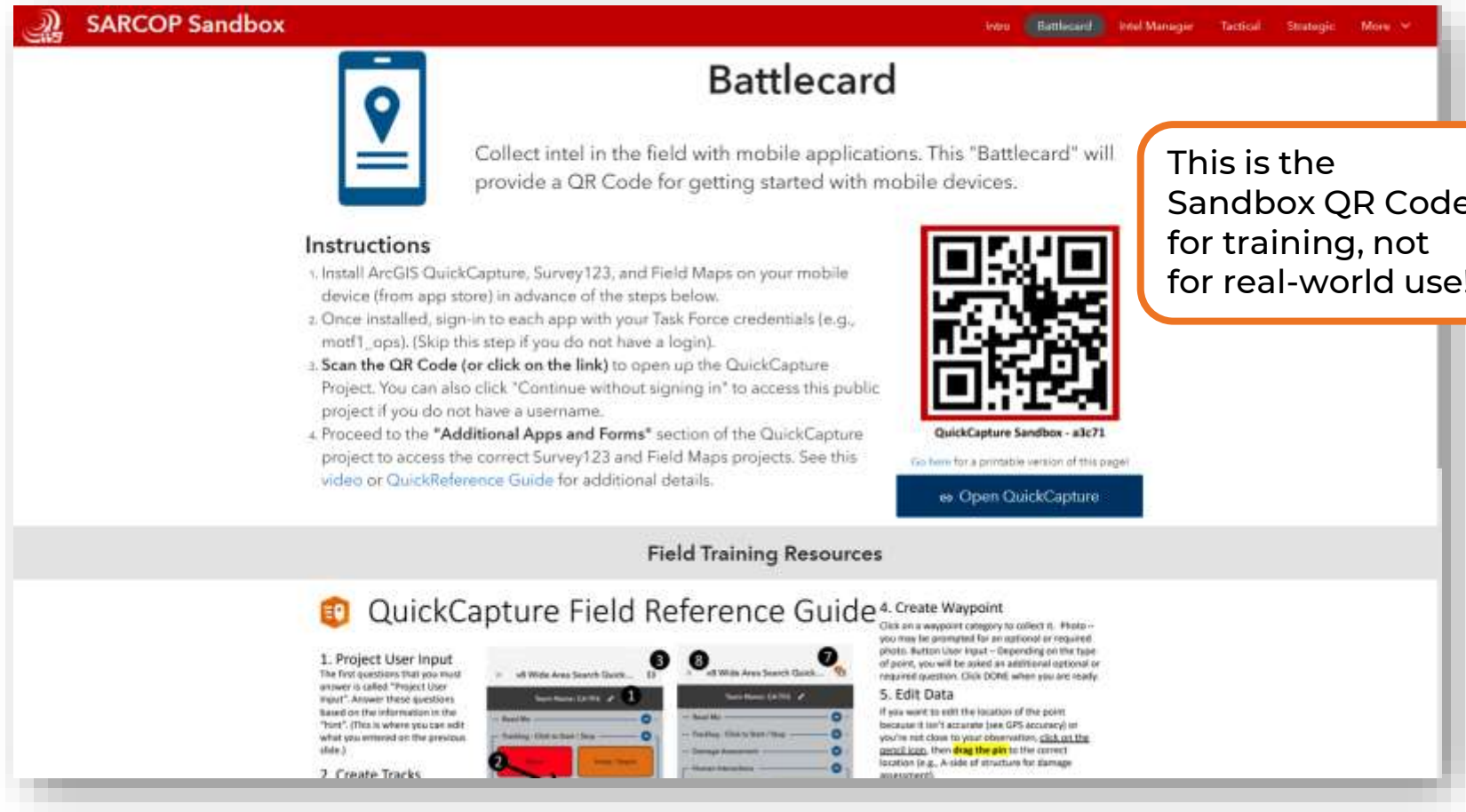
Field Exercise Form

Fill out this form and let us know if you are planning a field exercise, we may be able to help "customize" the Sandbox for the event.



Battlecard

- A battlecard is a simple way to deploy field apps via a QR Code.
- It is set up to start with QuickCapture, then to install additional forms and apps from there.
- **Note:** For real-world, the Deployment (blue) QR code is used for all incidents (is not incident-specific).



SARCOP Sandbox Battlecard

Collect intel in the field with mobile applications. This "Battlecard" will provide a QR Code for getting started with mobile devices.

Instructions

1. Install ArcGIS QuickCapture, Survey123, and Field Maps on your mobile device (from app store) in advance of the steps below.
2. Once installed, sign-in to each app with your Task Force credentials (e.g., motf1_ops). (Skip this step if you do not have a login).
3. **Scan the QR Code (or click on the link)** to open up the QuickCapture Project. You can also click "Continue without signing in" to access this public project if you do not have a username.
4. Proceed to the **"Additional Apps and Forms"** section of the QuickCapture project to access the correct Survey123 and Field Maps projects. See this [video](#) or [QuickReference Guide](#) for additional details.

QuickCapture Sandbox - a3c71

Go here for a printable version of this page

Open QuickCapture

Field Training Resources

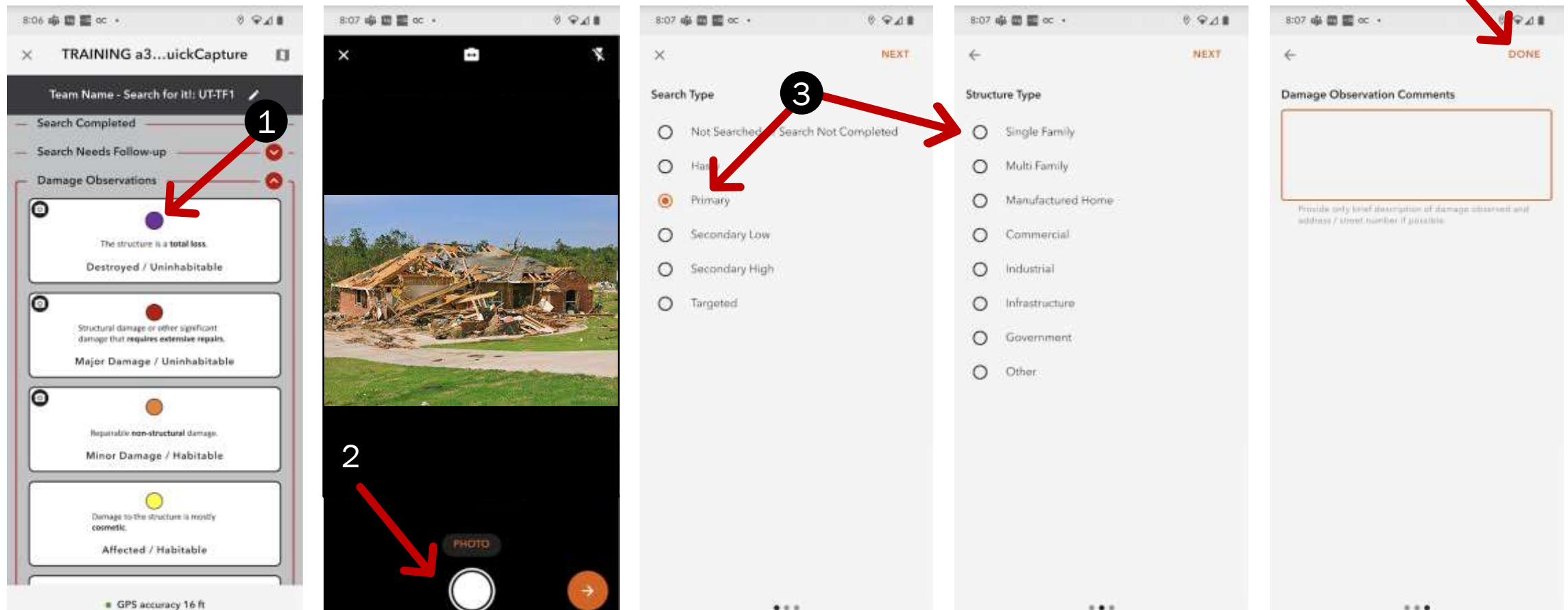
QuickCapture Field Reference Guide

1. Project User Input
The first questions that you find answer is called "Project User input". Answer these questions based on the information in the "form". (This is where you can edit what you entered on the previous slide.)
2. Create Tracks
3. all Wide Area Search Quick...
4. Create Waypoint
Click on a waypoint category to collect it. Photo - you may be prompted for an optional or required photo. Button User Input - depending on the type of point, you will be asked an additional optional or required question. Click DONE when you are ready.
5. Edit Data
If you want to edit the location of the point because it isn't accurate (see GPS accuracy) or you're not close to your observation, [click on the pencil icon](#), then [drag the pin](#) to the correct location (e.g., A side of structure for damage assessment).

This is the Sandbox QR Code for training, not for real-world use!



QuickCapture for Wide Area Search



1. Click on a waypoint category.
2. Photo – you may be prompted for an optional or required photo. Landscape preferred!
3. Button User Input – Depending on the type of point, you will be asked an additional optional or required question.
4. Click DONE when you are ready.

*This sends the information to database and maps (when connected, stores on device when offline).

Purpose of SAR COP

*What needs to be searched?
What have we searched?
What needs follow-up?
Where do we search next?*



SARCOP is not....

01

A Preliminary
Damage
Assessment
(PDA) tool

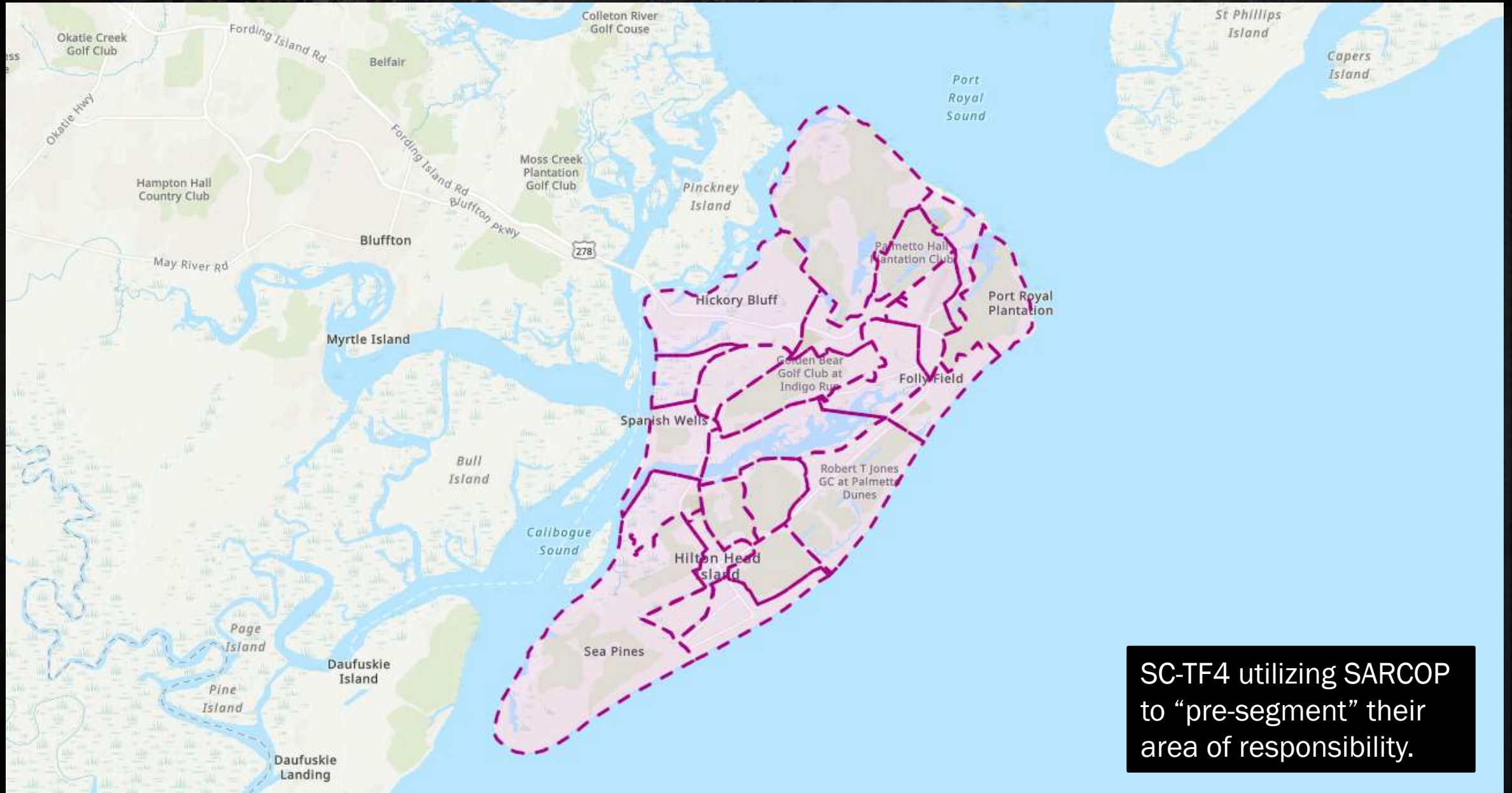
A system to store
Personally
Identifiable
Information (PII)

02

Why Use SARCOP?



Pre-Incident Planning



SC-TF4 utilizing SARCOP to “pre-segment” their area of responsibility.

Real-Time Tracking (Interagency)

SARCOP Instructions Battlecard **Tactical** Strategic Operational Intel Manager Search Progression Imagery More

FEMA US&R Tactical Dashboard 07c34d Follow-up Status All Needs Follow-Up Completed Assigned Category Hazard Human Interaction Structure Show All

Last Known Location (NSARGC)

The dashboard checks for updates every 30 seconds when connectivity allows. Most devices will attempt to share LKL every 30 seconds when moving.

- webster**
PATF1 OPS08
Activity: Stationary (0.96 km/h) as of October 3, 2022
Last seen just now
+- 3.22m accuracy
- Nash**
WHITEIST HAZARDOUS MATERIALS SPECIALIST
Activity: Stationary (0.00 km/h) as of October 3, 2022
Last seen just now
+- 4.80m accuracy
- Veldheer**
OHTF1 OPS16
Activity: Automotive (18.25 km/h) as of October 3, 2022
Last seen just now
+- 6.73m accuracy
- Gelabert**
FLTF1 OPS24
Activity: Walking (1.49 km/h) as of October 3, 2022
Last seen just now
+- 4.73m accuracy
- Peters**
NYTF1 OPS07
Activity: Walking (0.00 km/h) as of October 3, 2022
Last update: 14 seconds ago

Map WAS Victim Rescue Progress HR Progress RST/ HAZ

University of South Florida, County of Collier, County of Lee, FL, FDEP, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA | NHC, JTWC, Esri | Esri, NOAA | Source: USGS, NOAA and the ... Powered by Esri

Legend

- Location Tracking
- Last Known Locations (NSARGC)
- Last Known Locations (IAFC)
- Custom
+ > 100
- < 37
- Last Known Locations (State of Texas)
- Last Known Locations (CalOES)

We were able to see where both Federal and State Task Forces were working, in real-time, on one map thanks to Location Sharing in QuickCapture.

Search Coverage Analysis

Search Coverage Analysis

Select an Event

20230810 HI Wildfires DR-472...

Select a State

No State selected

Select a Model Run

2023-08-18, 20:31:51

Select a Branch

No branch selected

Select a Division

No division selected

Search Coverage Analysis

Select latest run using the filters in the header.

Summary: This analysis uses the building footprints that are believed to be destroyed or affected and their distance from tracklogs and waypoints to estimate search progress. This analysis *does not* factor in delayering and search effort required at complex worksites.

PRE-DECISIONAL

Based on Impact Analysis from GIS, how many more structures do we need to search?



Search Coverage Analyzed Structures

Meters from Search Point/Track

- More than 15
- Less than 15

SARCOP v9 SIFS Internal View

SARCOP Divisions

Search Progress:

84.92%

of affected structures

Total Structures

2,063

Structures within 15m

1,752

of a Tracklog or Waypoint
of a search track/point

Structures beyond 15m

311

of a Tracklog or Waypoint
from a search track/point

Search Coverage Analysis



External Dashboard (Damage Only)

Search and Rescue Dashboard

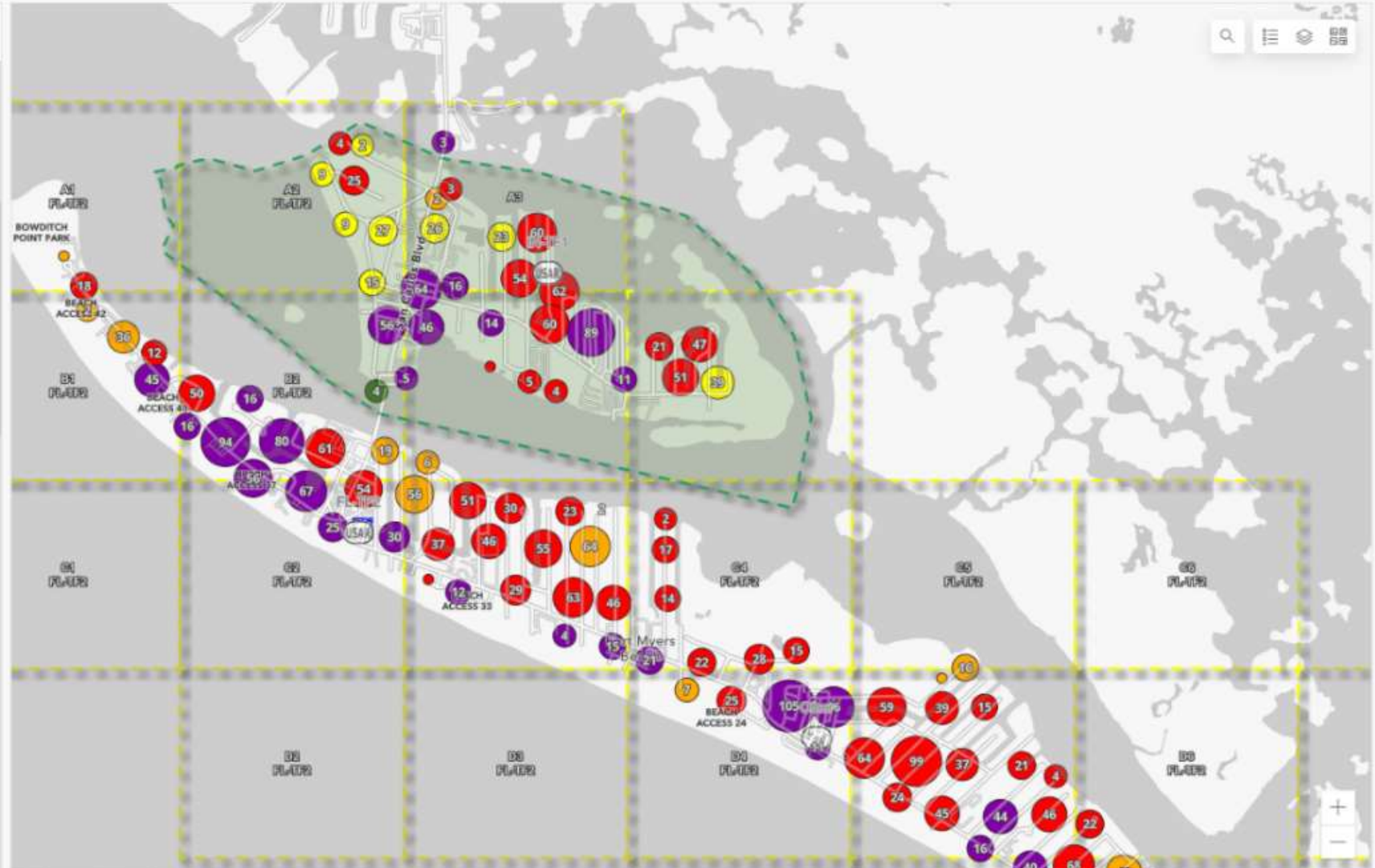
External Stakeholders - EXERCISE ONLY

Legend

Incident Data - Wide Area Search

Waypoints

- Structure - Unaffected
- Structure - Affected
- Structure - Minor
- Structure - Major
- Structure - Destroyed
- Structure - Unknown
- Pet Evacuation
- Animal hazard
- Fire incident
- HAZMAT incident
- Flood/water level
- Route blocked
- Other Hazard
- Targeted search
- Searched Per Rules of Engagement
- Casualty Collection Point
- Situation Report
- Lifeline
- Extra 21
- Extra 22
- Extra 23
- Extra 24



Esri Community Maps Contributors, University of South Florida, County of Lee, FL, FDEP, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA | NSARGC, N... Powered by Esri

Number of features

About

Map legend

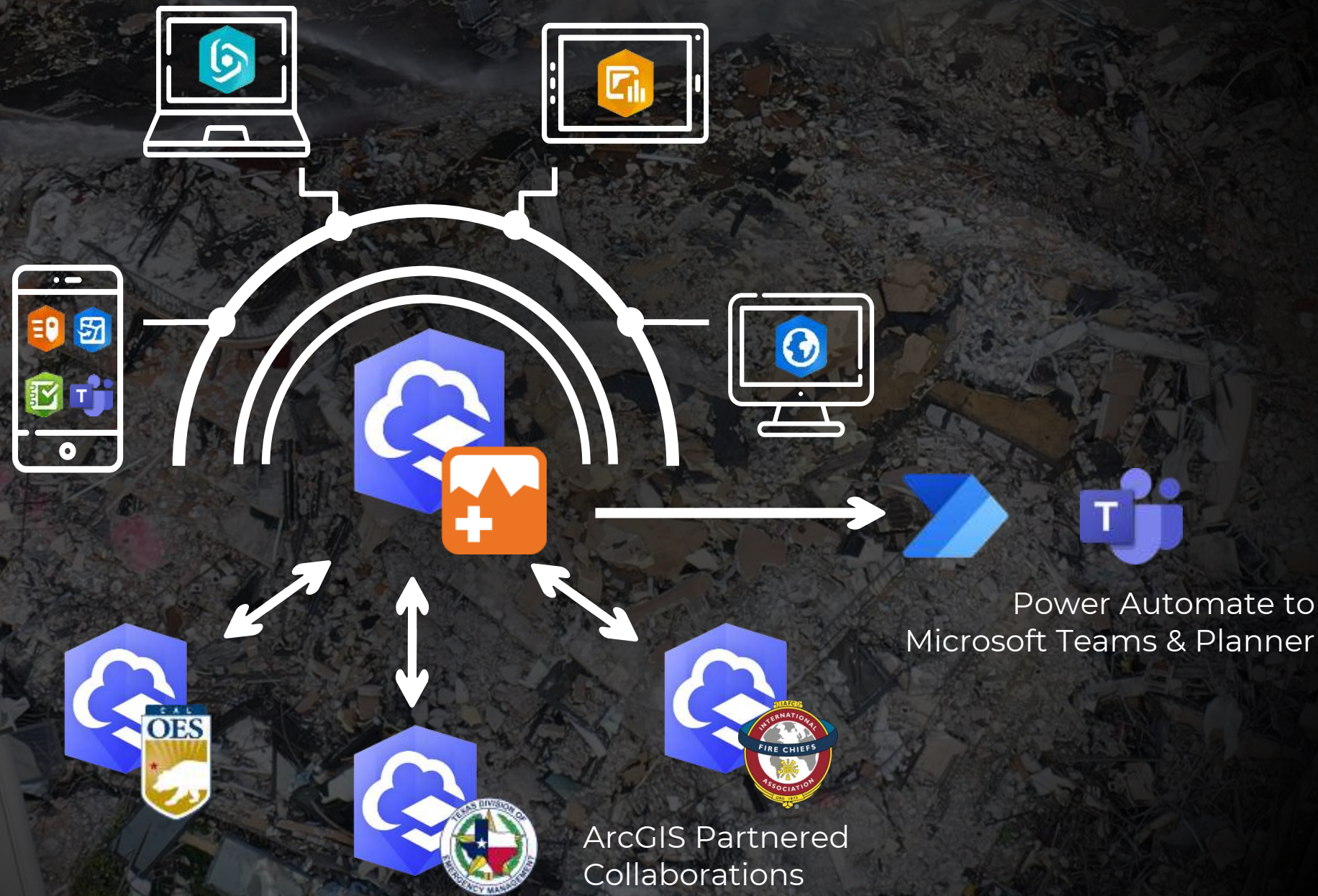
Incident List

Map

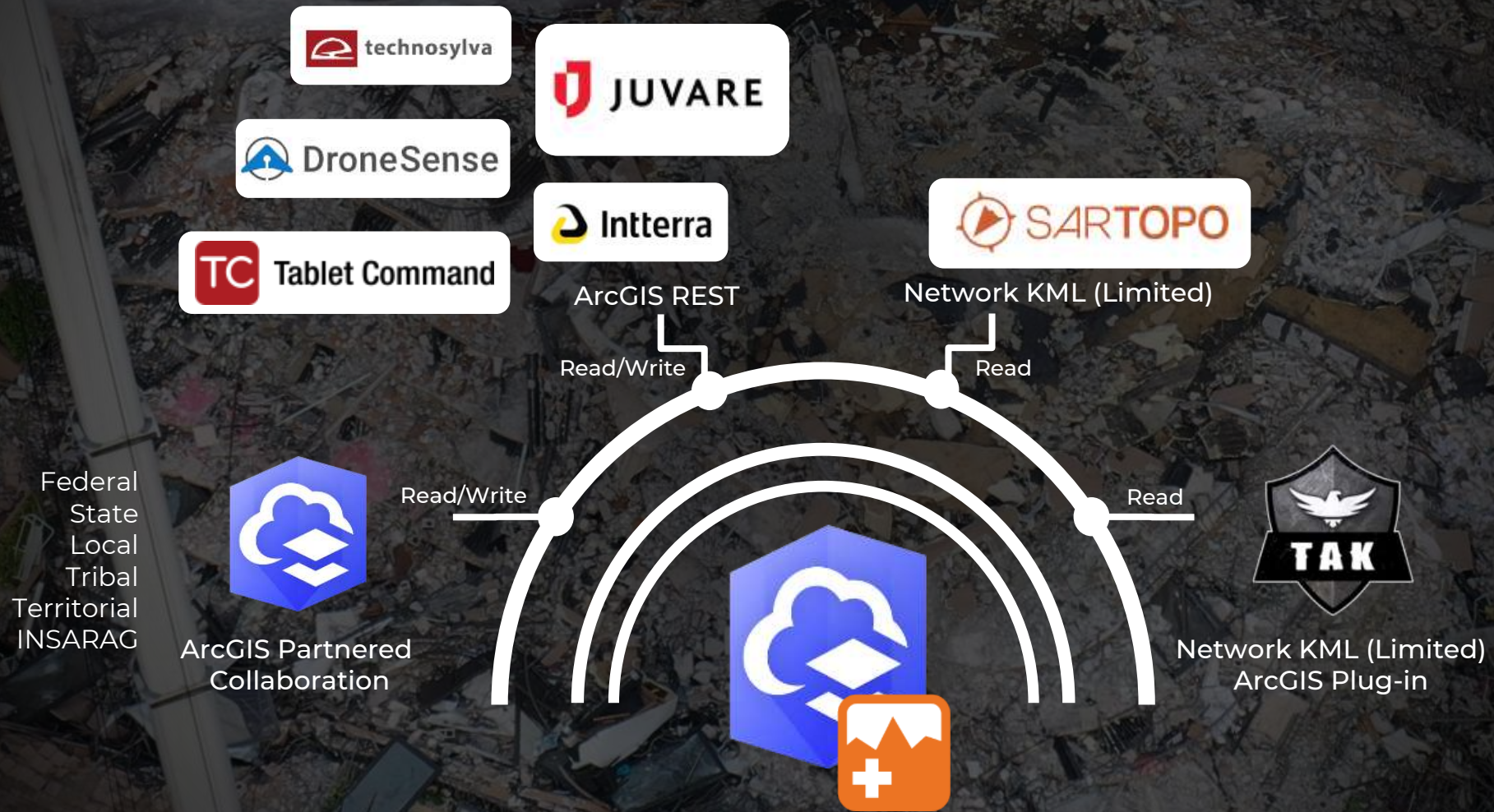
Division Status



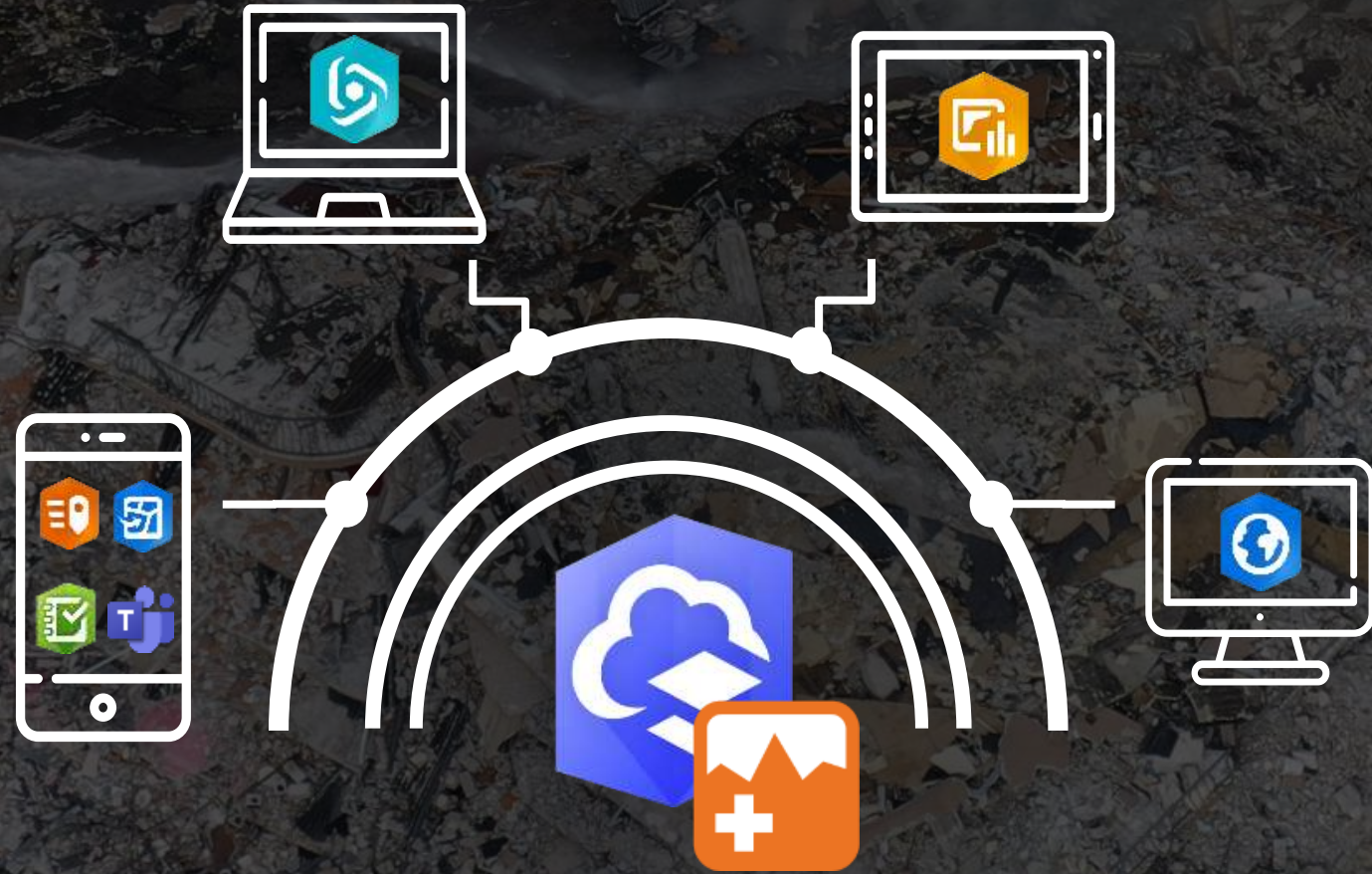
SARCOP Interoperability



SARCOP Interoperability Continued

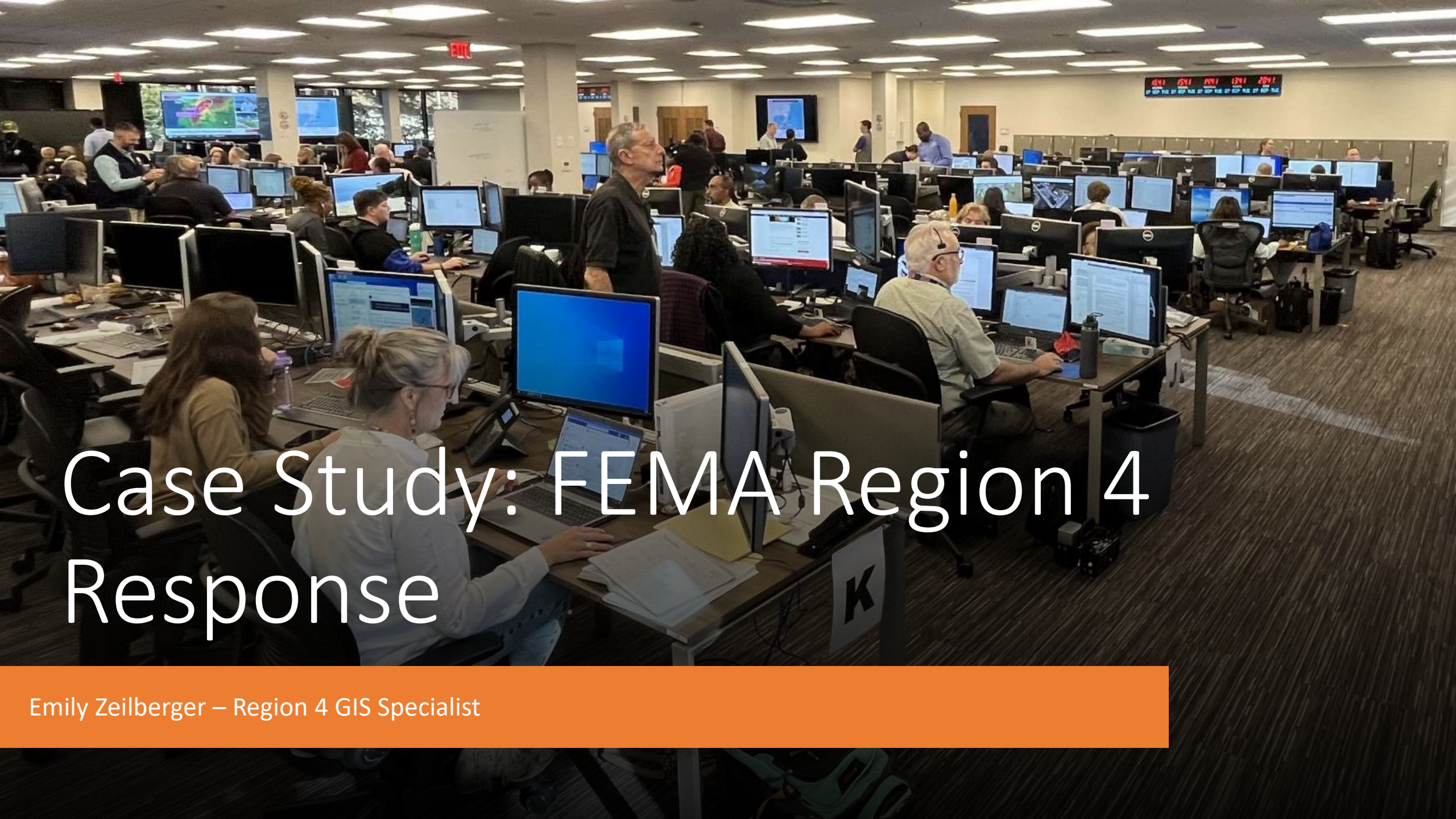


Imagery in SARCOP



#PhotoMappers



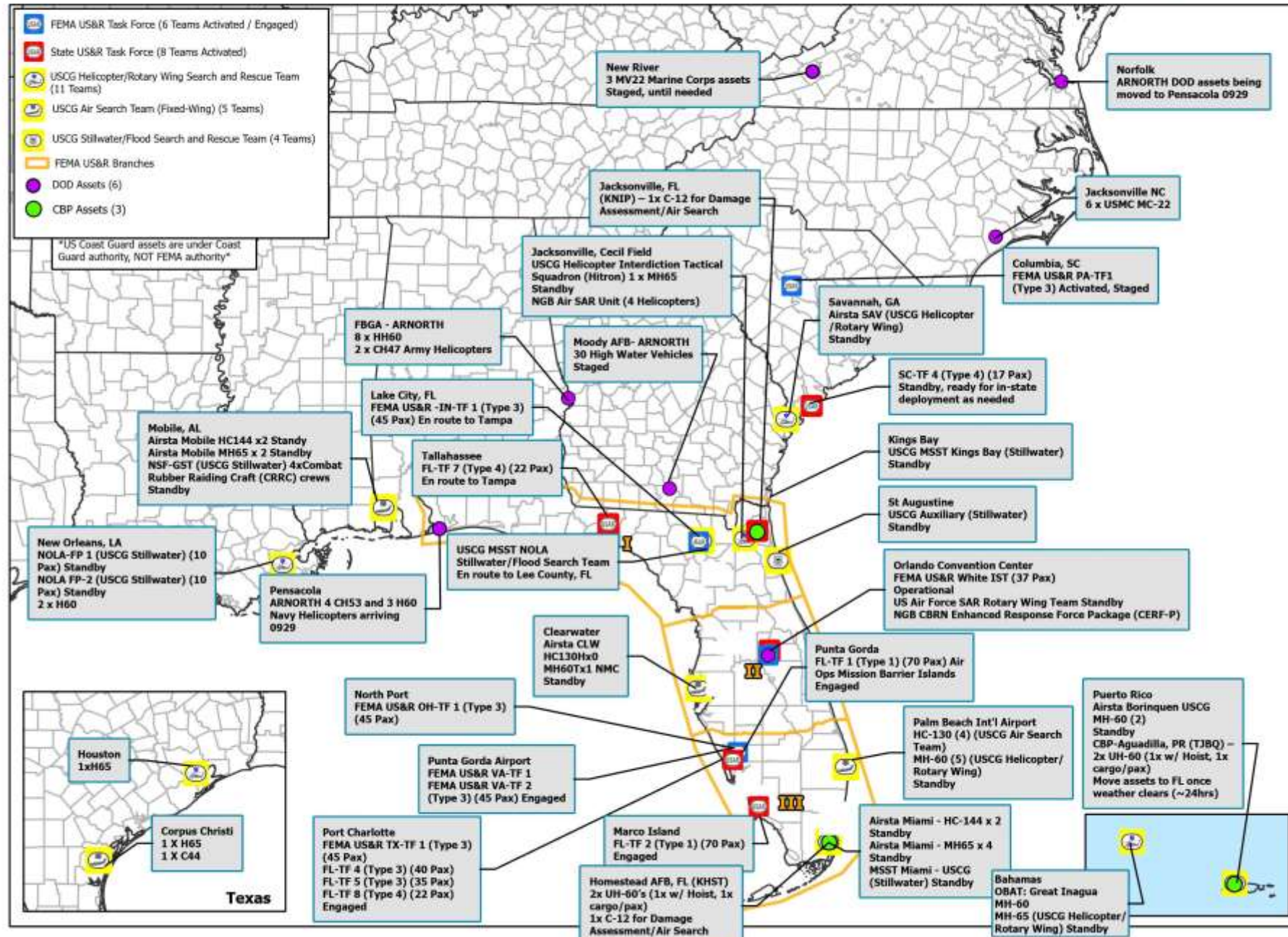


Case Study: FEMA Region 4 Response

Emily Zeilberger – Region 4 GIS Specialist

Search and Rescue (ESF-9) Force Laydown as of 9/29/22 1600 EST

Hurricane Ian



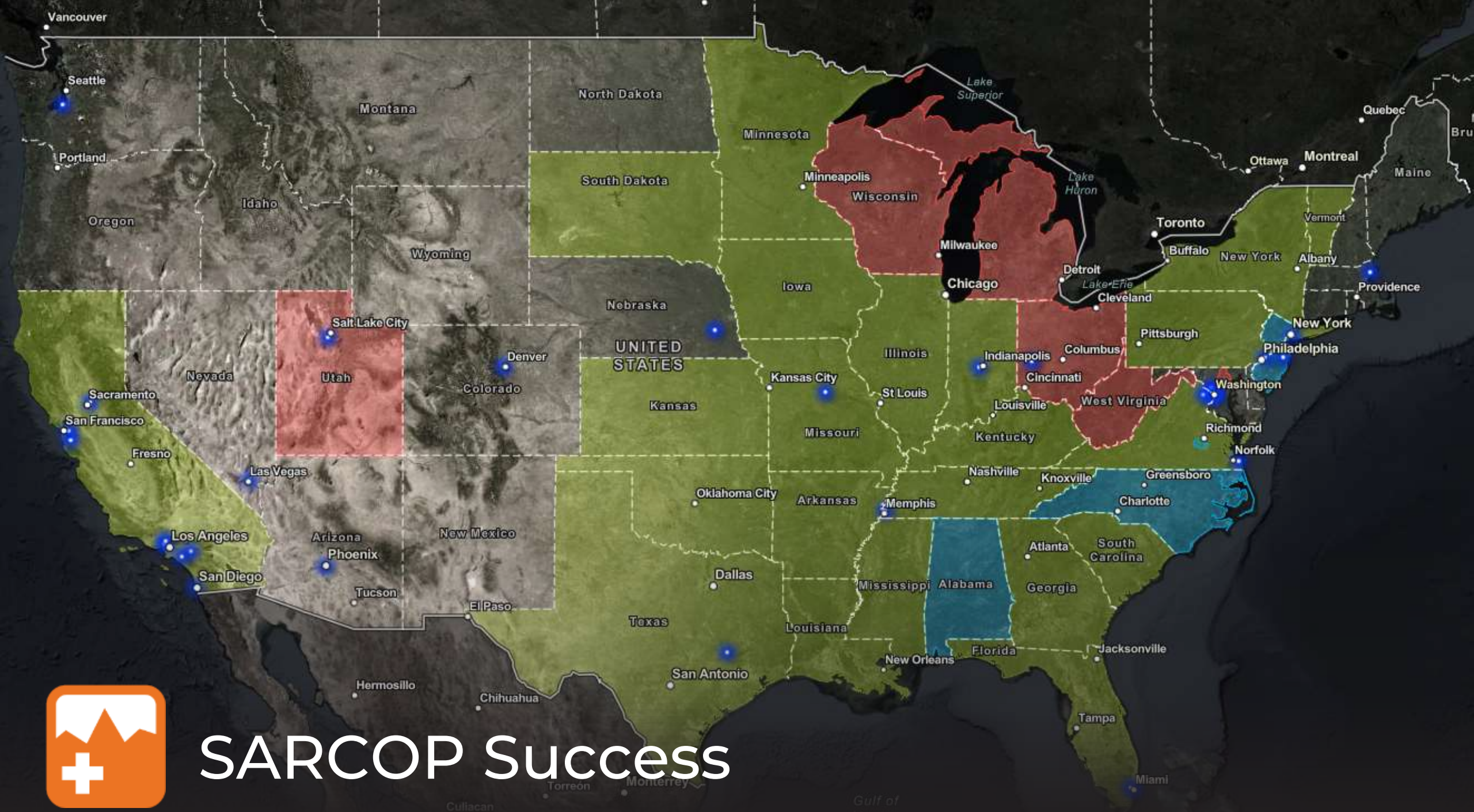
< > 1 of 4

Structure - Destroyed 17R MK 04743 26284

Zoom to Pan

Point ID:	QC
Team Name	
Team Name Filter (REPEAT Name Above)	FL-TF2
Squad ID	1
Operator Name	Ramos
Search Type	
usng	17R MK 04743 26284
mgrs	17RMK0474326284
Degree Decimal Minutes	26°27.2224'N 81°57.3299'W
Waypoint	Structure - Destroyed
Original Waypoint	Structure - Destroyed
waypoint_cat_cal	Structure
Street Address	200 Old San Carlos Blvd
Structure Type	
Start Time	9/29/2022, 3:35 AM
End Time	9/29/2022, 3:35 AM





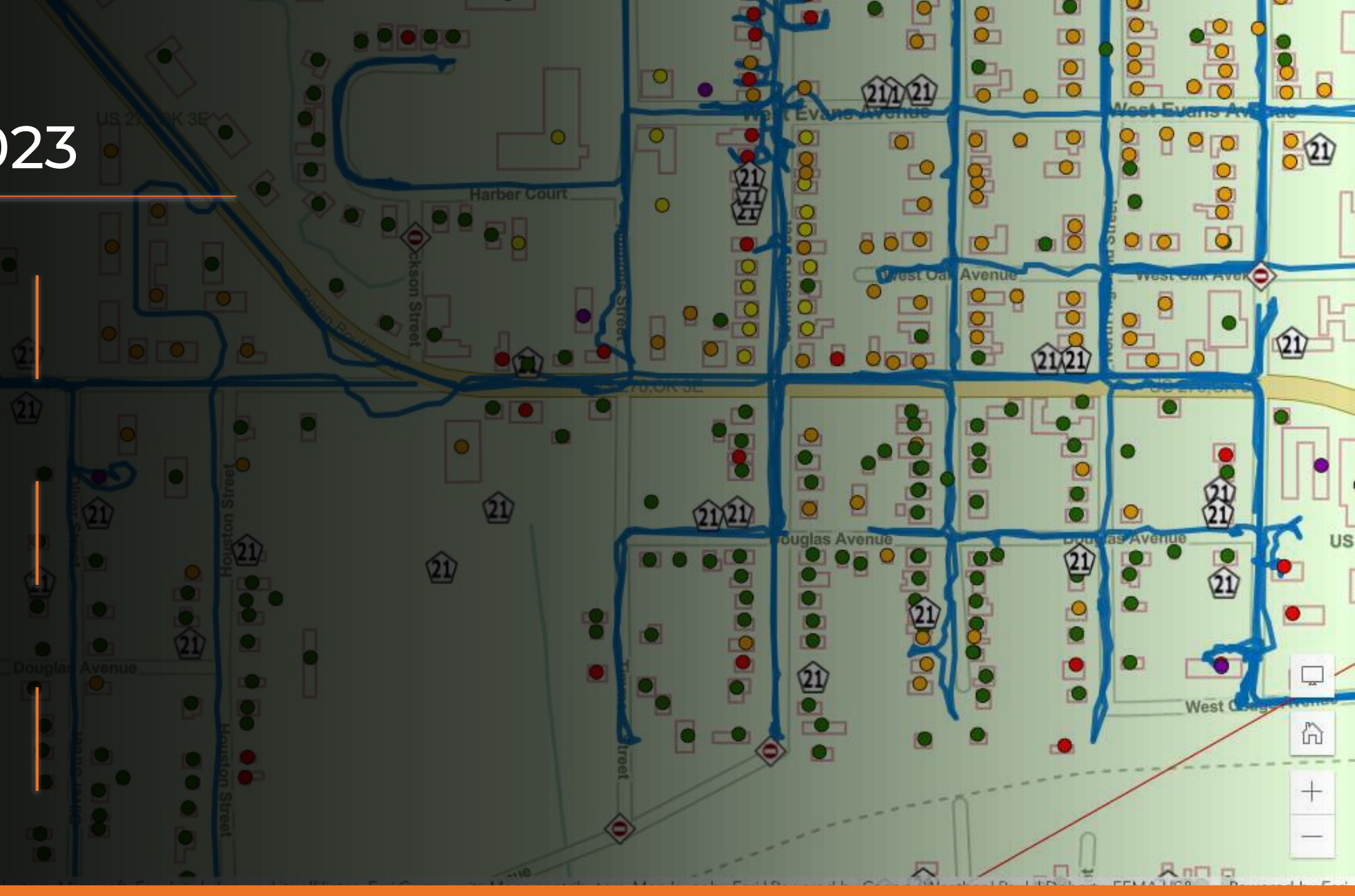
SARCOP Success

In 2023

57

177

1,232



In 2023

57 | Deployments Supported

177

1,232



In 2023

57 | Deployments Supported

177 | Registered Exercises

1,232



In 2023

57 | Deployments Supported

177 | Registered Exercises

1,232 | NSARGC Community Members

Key Points

- SARCOP is....
 - a life-saving resource for search and rescue mapping
 - a life-sustaining resource for emergency managers
 - successfully adopted across the US (beyond FEMA US&R)
 - more than just technology



FEMA

THANKS!

nsargc@publicsafetygis.org

nsargc.napsgfoundation.org



SARGeo Interest List

Sandbox: <https://www.responsesystem.org/sarcop>
General Information <https://nsargc.napsgfoundation.org/>



An aerial photograph of a coastal town, likely in New England, featuring a harbor filled with numerous sailboats and a dense forest of green trees surrounding the buildings. The image is overlaid with a semi-transparent blue filter. The text "Preparedness Discussion" is centered in white, bold font.

Preparedness Discussion