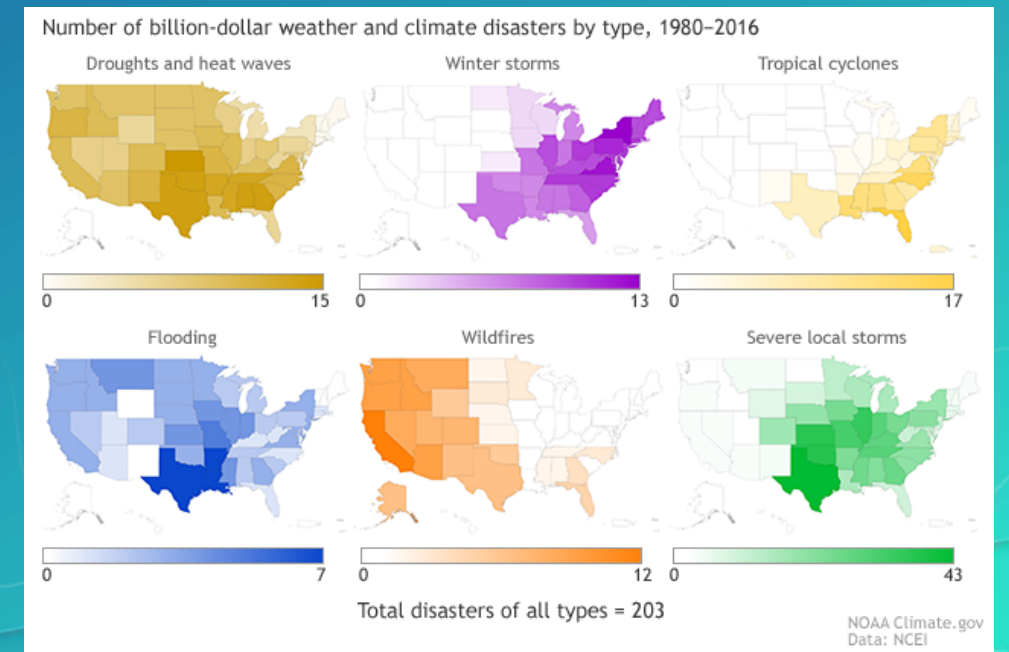
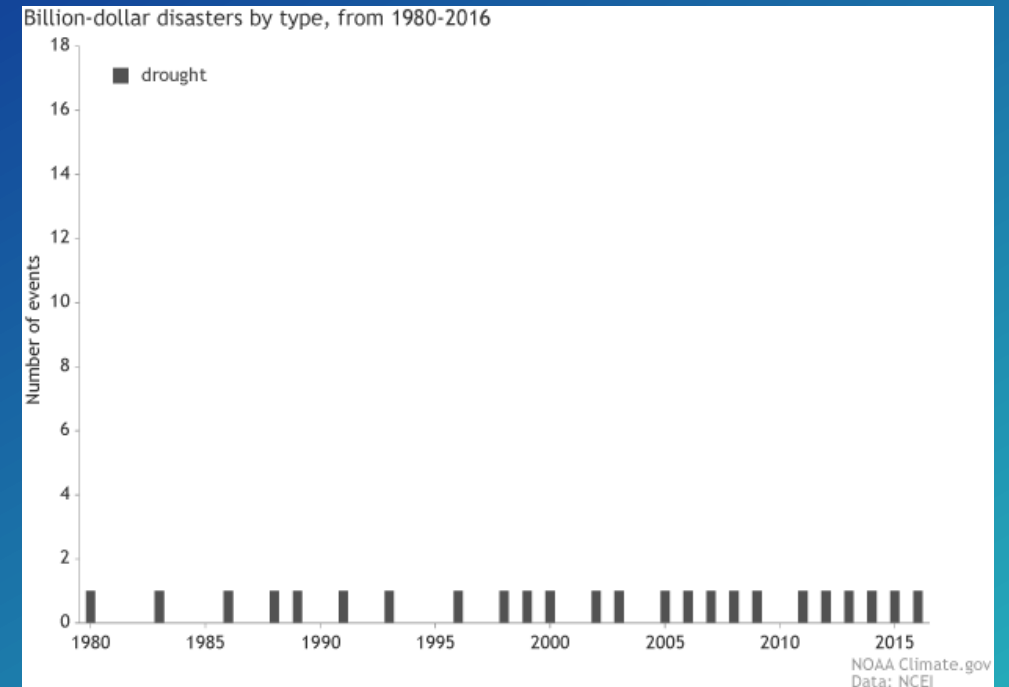


Using the National Water Model to Inform Flood Preparedness and Response

By Ariel Low

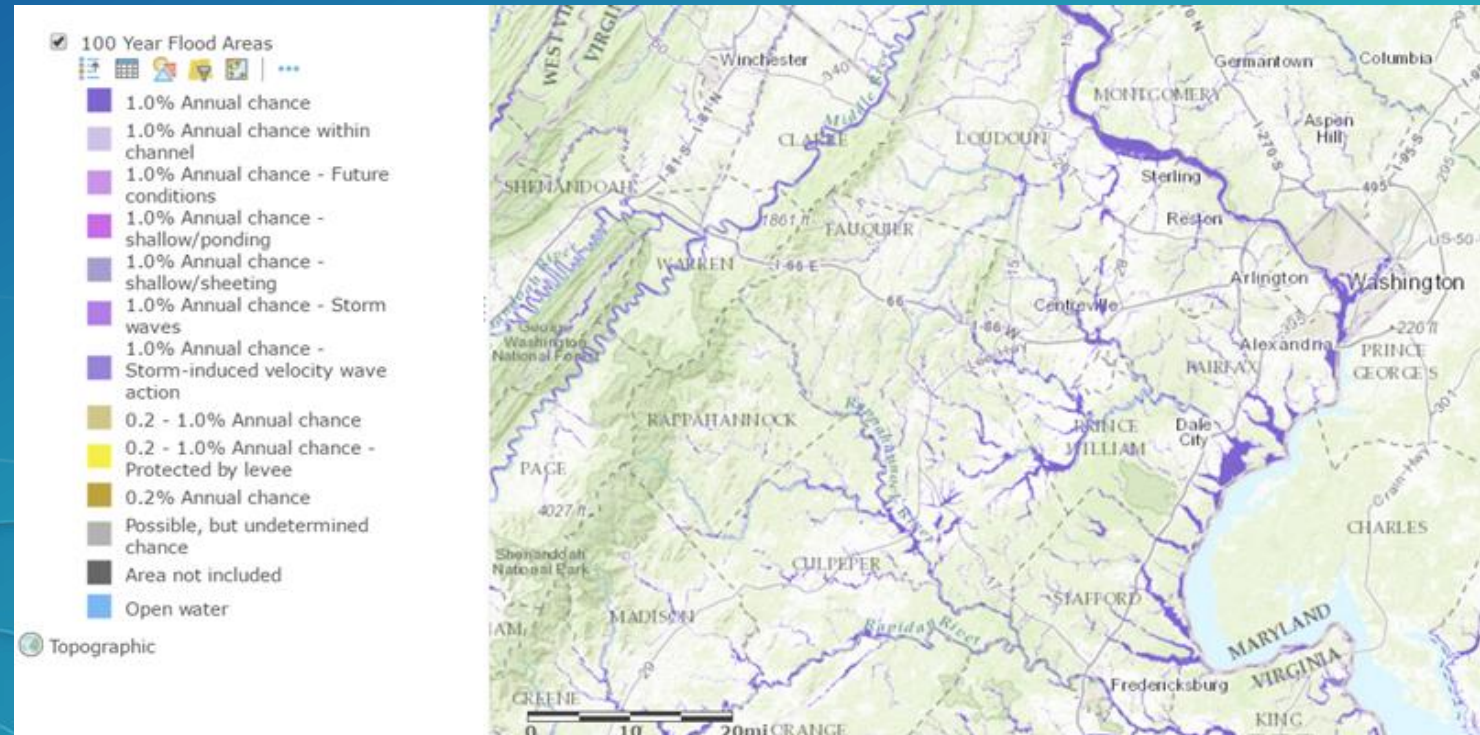
Impacts of Flooding

- Most common cause of weather related fatalities in 2016
- 4 separate billion-dollar inland flood events during 2016
 - Caused over 15 billion in damage
- Higher frequency of billion-dollar inland flood events in recent years
- Flooding can also be related to tropical cyclones and severe storms



100 Year Flood Zones

- National Flood Hazard Layer (NFHL) data presents flood risk information
- Risk information from Flood Insurance Rate Map (FIRM) data
- 1% annual exceedance probability flood



Actionable Information for Responders

- When might flooding occur?
- What areas might be affected by flooding?
- What areas should be targeted for preliminary damage assessment?

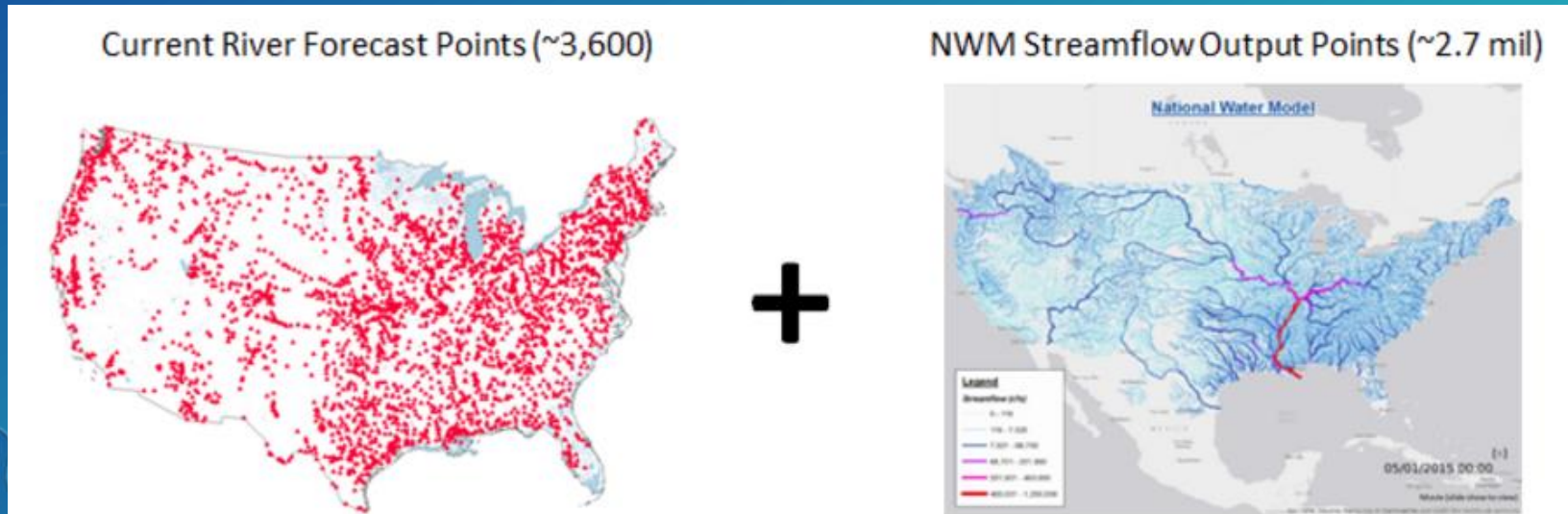


The National Water Model



What is the National Water Model?

- Simulates observed and forecasted streamflow
- Four different models:
 - Analysis and assimilation: snapshot of current hydrologic conditions
 - Short-Range: 18-hour deterministic (single value) forecast
 - Medium-Range: 10-day deterministic (single value) forecast
 - Long-Range: 30-day ensemble forecast



Creating Multi-Scale Temporal Map Services

Multi-scale
Temporal
Map Services



- National Water Model map services in Living Atlas
 - National Water Model (Hourly Anomaly Forecast)
 - National Water Model (Hourly Forecast)
 - National Water Model (10 Day Anomaly Forecast)
 - National Water Model (10 Day Forecast)

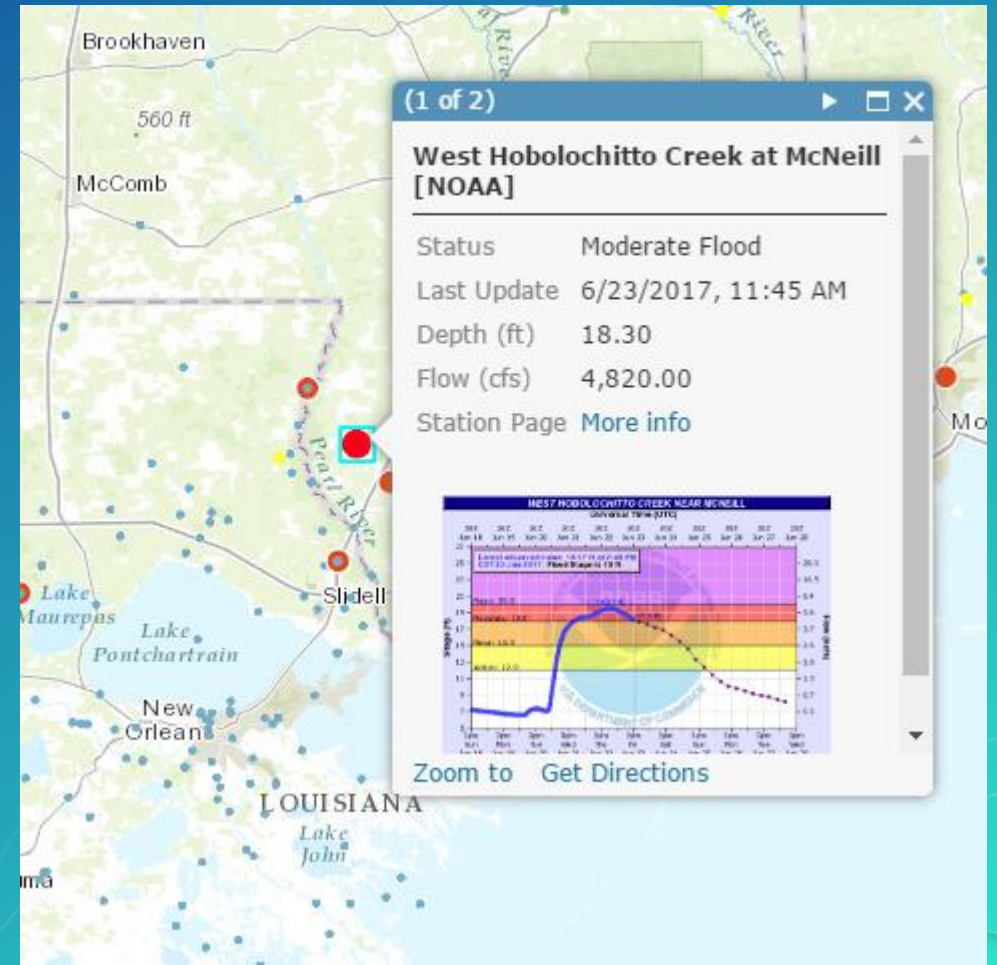
What does the National Water Model Layer tell you?

- Streamflow in cfs (cubic feet per second)
 - Volume of water per unit time
- Deviation from normal flow
- The above information for each forecast time



Stream Gauges

- Additional Esri Content Layer: Stream Gauges
- Streamgauging involves 3 steps:
 - Measuring stream stage - the height of the water surface
 - The discharge measurement - the quantity of water passing a location
 - The stage-discharge relation – results in estimates of streamflow or discharge



Flood Impacts

Calculating Impact with the National Water Model



How can the National Water Model be Extended?

- What areas might be flooded, how deeply, and when?
- What infrastructure might be impacted by the flood and when?



Creating Multi-Scale Temporal Map Services

- Flooded Area
- Flood Depth
- Impacted Address Points
- Impacted Demographics



Applications

Using Flood Layers for Decision Making



Integration with EM Workflows

- Preparedness/ Mitigation
- Situation Awareness
- Damage Assessment



Operations
Dashboard



Survey123
for ArcGIS



Workforce
for ArcGIS



SceneViewer



ArcGIS
Enterprise



StoryMaps
For ArcGIS

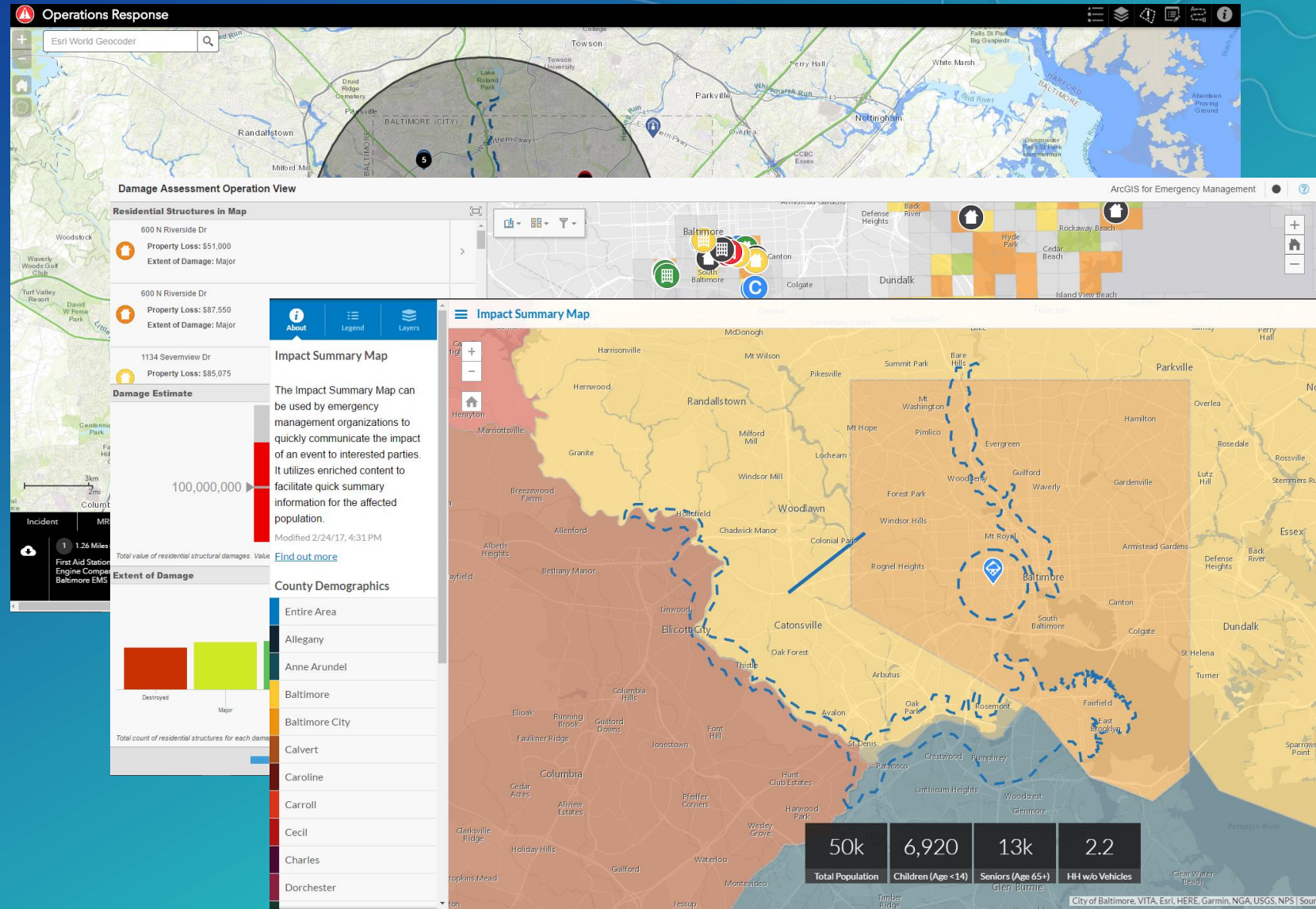


Collector
for ArcGIS



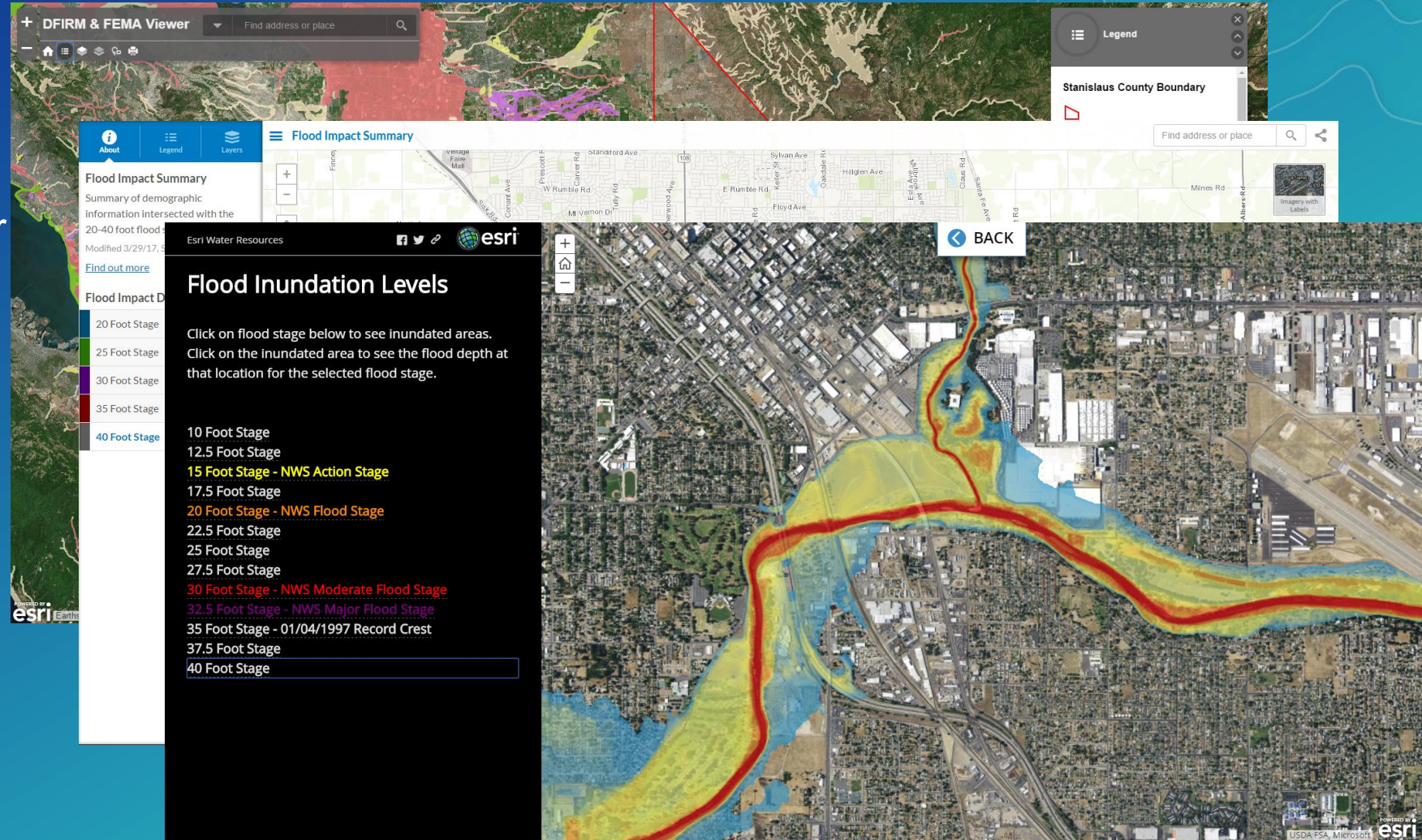
Integrate with Emergency Management Solutions

- Impact Summary App
- Damage Assessment App
- Public Information App
- Situation Awareness Viewer
- Incident Briefing
- Incident Status Dashboard



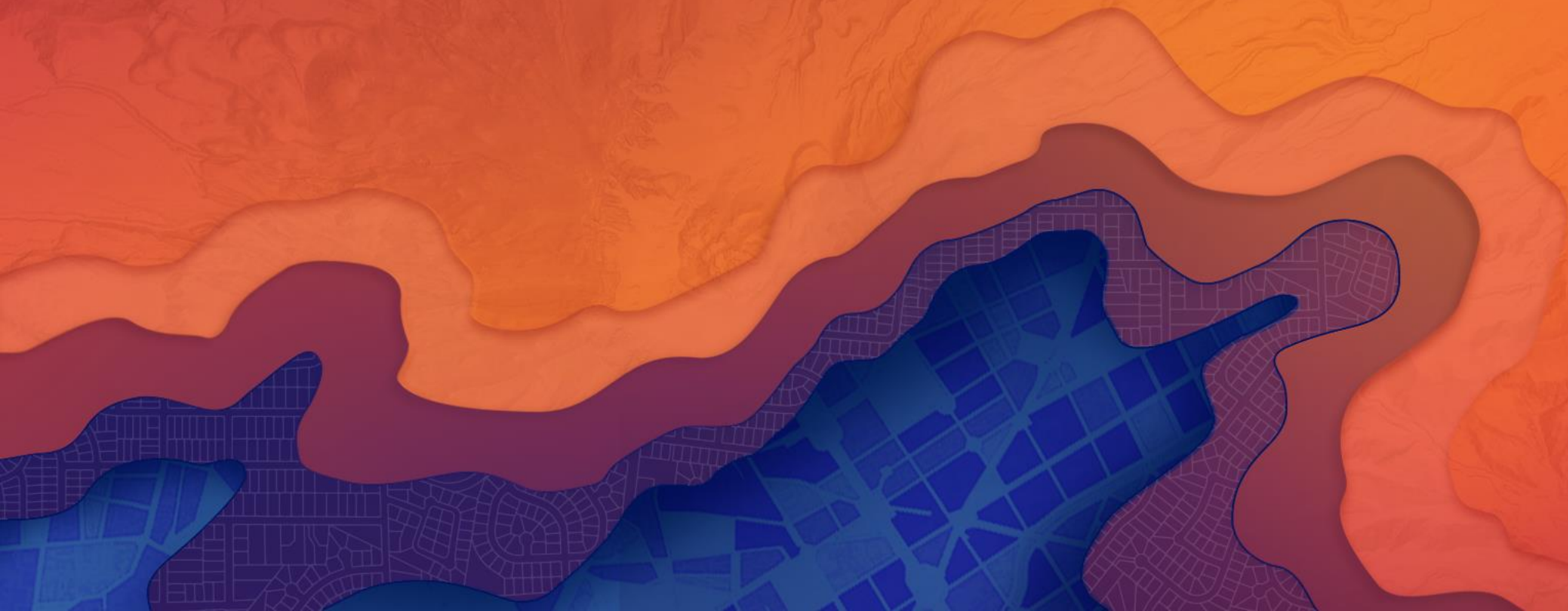
Use Flood Specific Solutions

- DFIRM Viewer
- Flood Impact Summary
- Flood Response Planner
- Flood Inundation Viewer



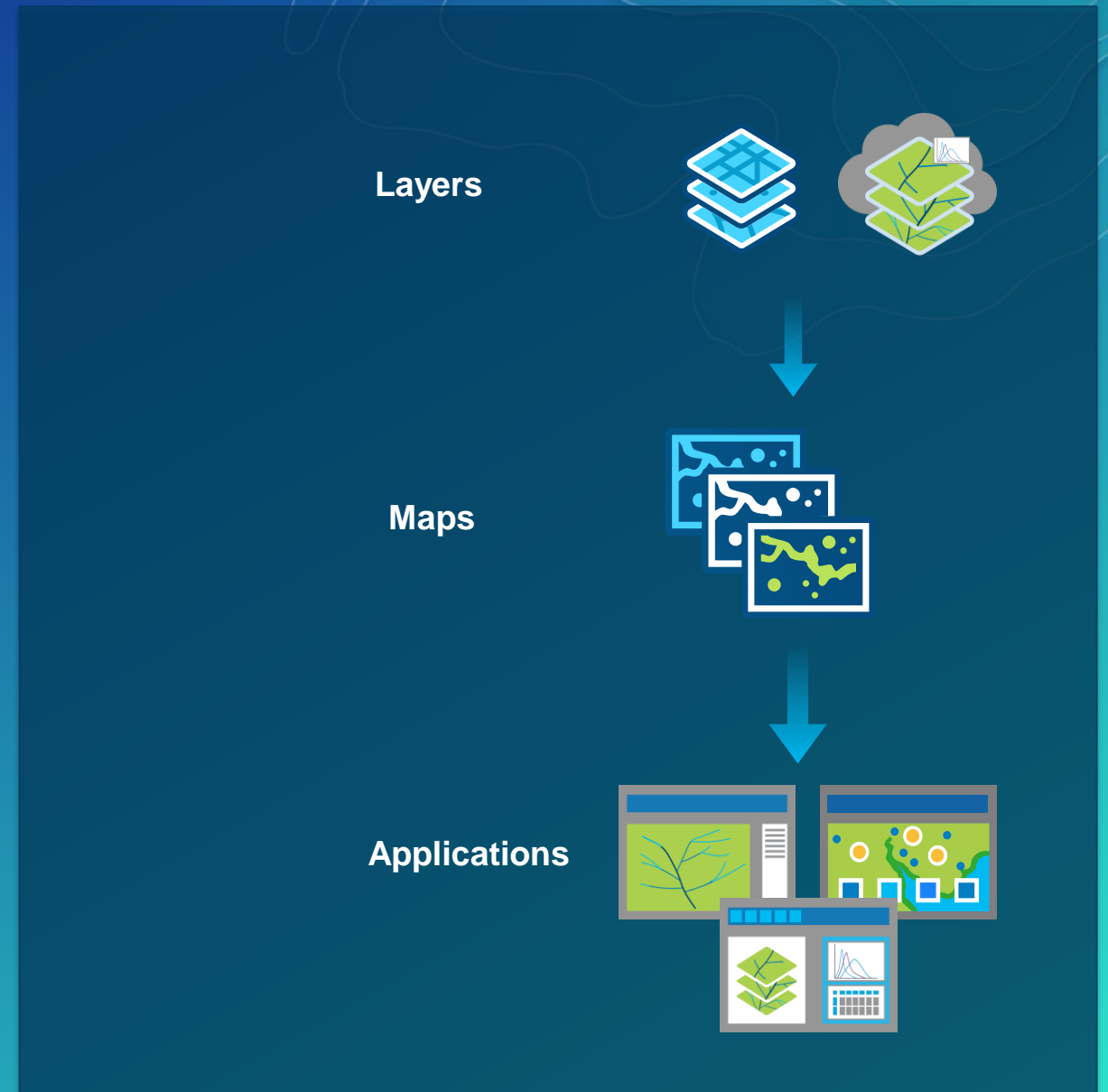
Summary

Steps Forward



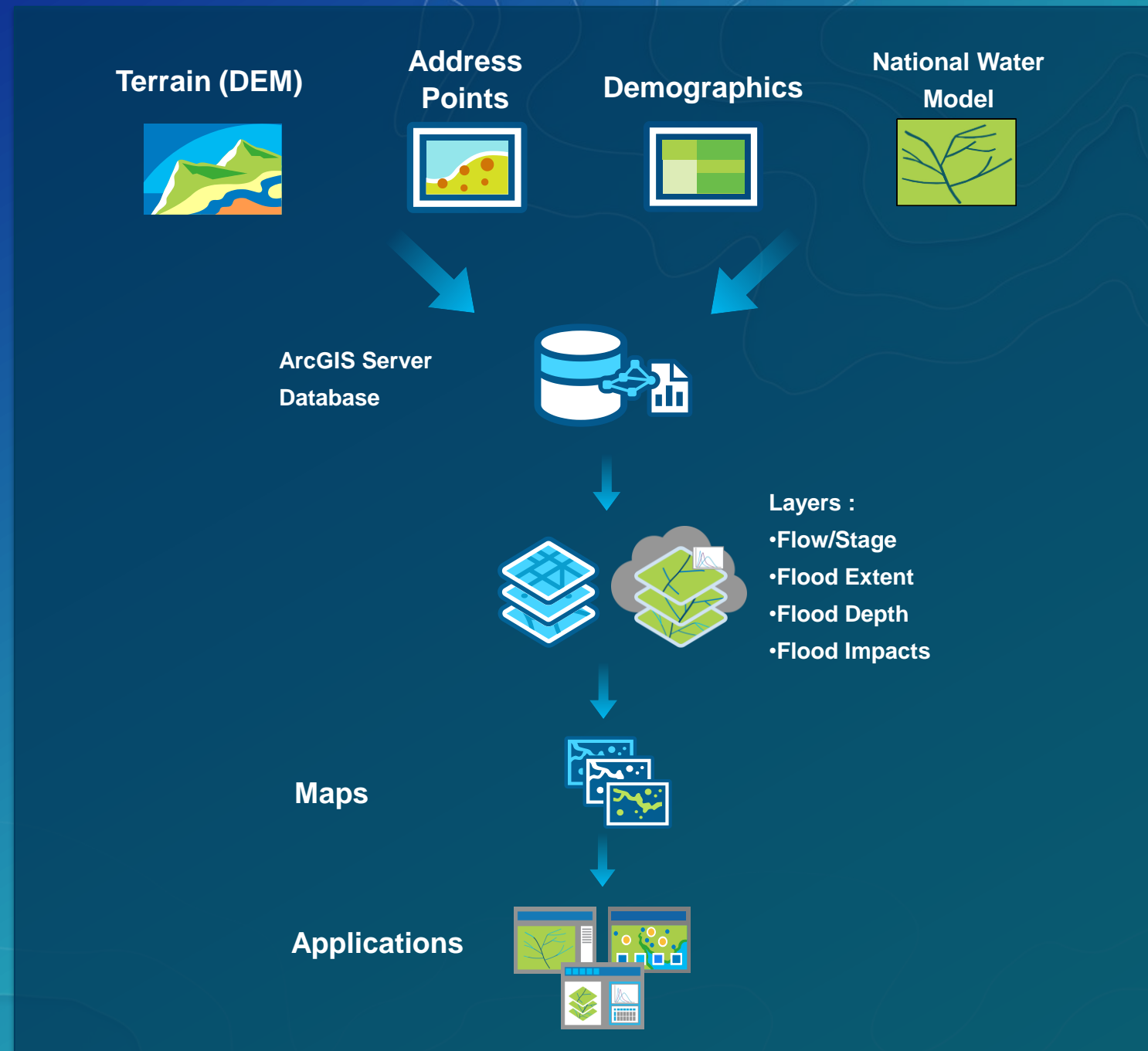
Getting Started

- Services:
 - National Water Model Services
 - Flood Gauge Service
- Solutions Applications
 - Impact Summary App
 - Damage Assessment App
 - Public Information App
 - Situation Awareness Viewer
 - Incident Briefing
 - Incident Status Dashboard



Additional Components

- National Water Model
- Terrain Model (DEM)
- Address Points
- Demographic Information
- ArcGIS Enterprise or ArcGIS Server



Summary

- Now have real time river/stream conditions and forecasts
- Can be used to determine areas at risk of being flooded
- New information drives more informed response



esri

THE
SCIENCE
OF
WHERE