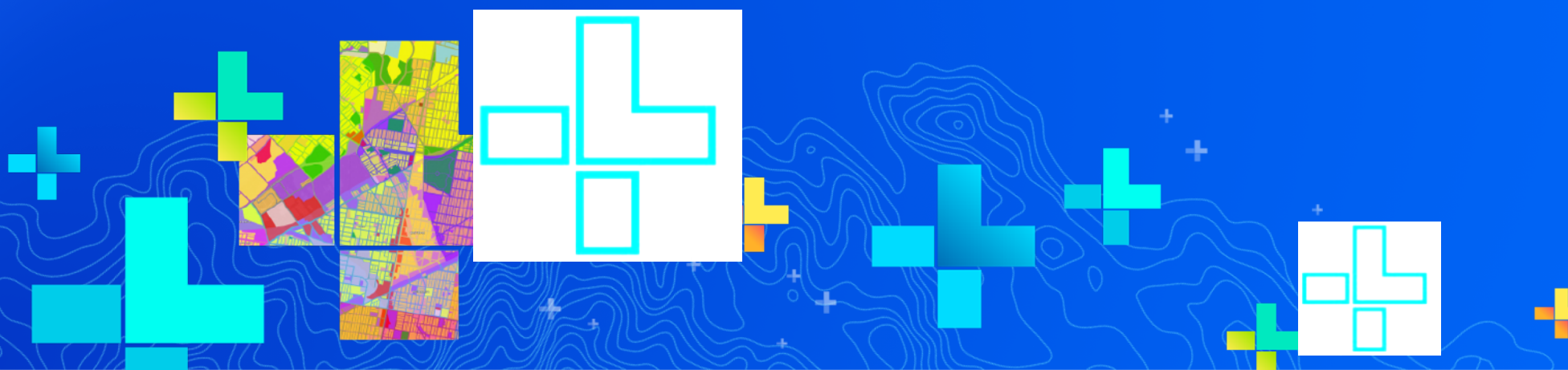




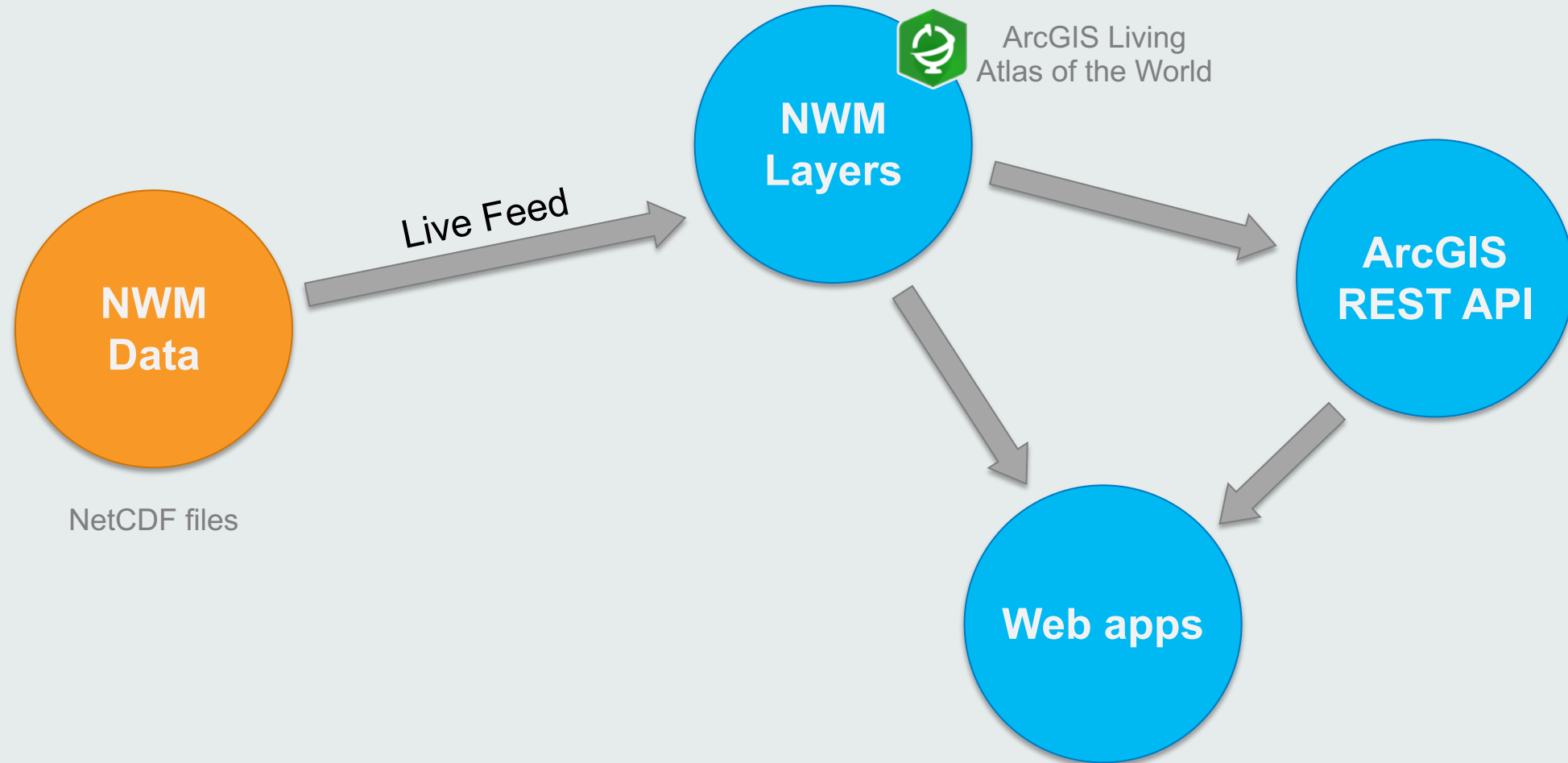
# Living Atlas: Layers & Apps for Flood Emergency Response

Gonzalo E. Espinoza



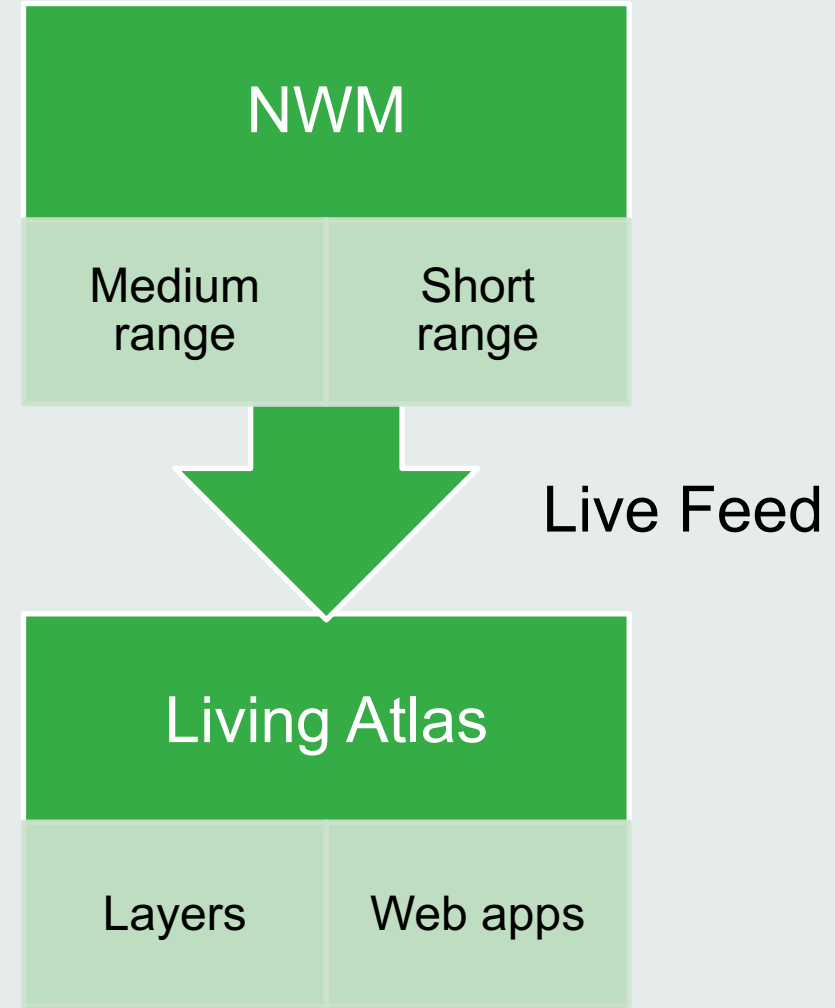
SEE  
WHAT  
OTHERS  
CAN'T

# Living Atlas Layers for Flood Emergency Response



# How these layers were created?

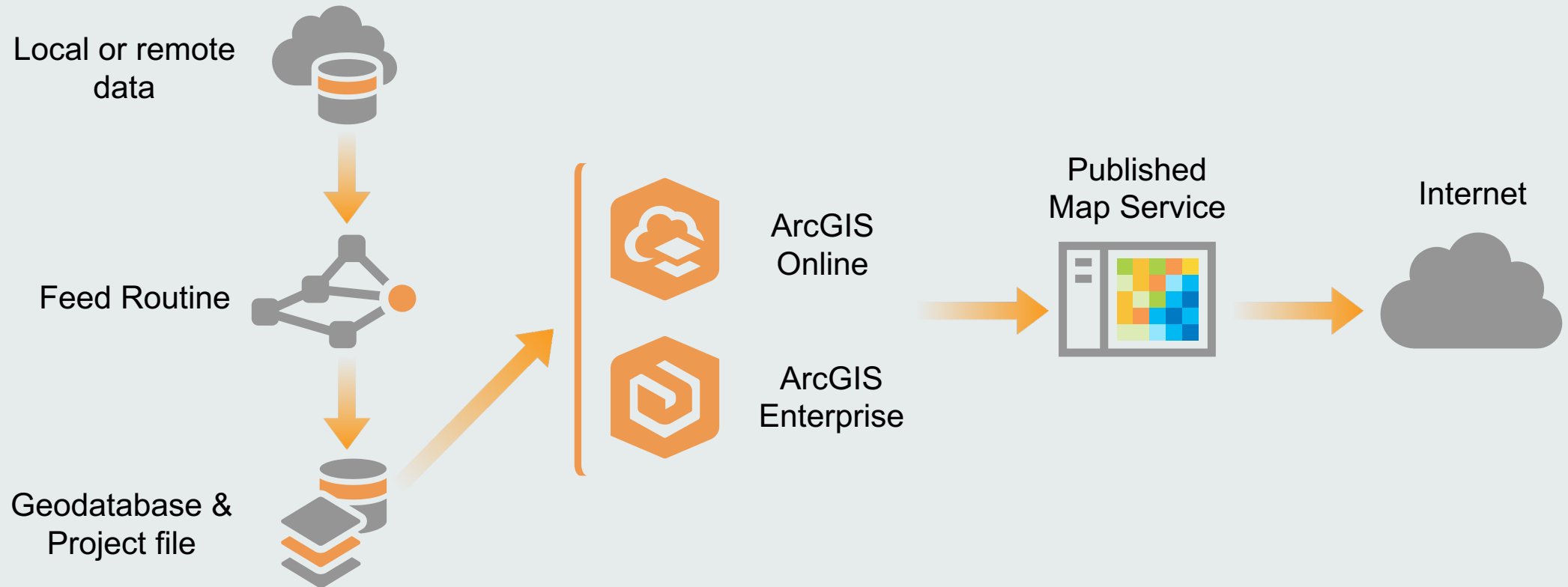
- **Data retrieved from NWM**
  - Automated feed routine
  - Geodatabase
  - Multiprocessing
  - Short term (@ 1 hour)
  - Medium Term (@ 6 hours)
- **Living Atlas layers**
  - Optimized for drawing
  - Multi-scale
  - Dissolve by stream order (e.g. identify tool)
- **Analysis**
  - Values & geometries available through the ArcGIS REST API



# NWM layers are part of our Live Feeds

## Aggregated Live Feed (ALF) Methodology

- **Automated updates**



# National Water Model Layers

ArcGIS Living  
Atlas of the World



Map Image Layer

National Water Model (10  
Day Anomaly Forecast)

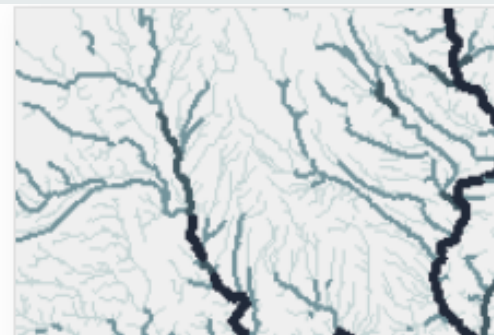
 By esri



Map Image Layer

National Water Model  
(Hourly Anomaly Forecast)

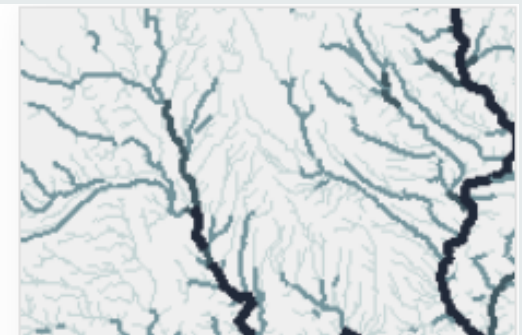
 By esri



Map Image Layer

National Water Model (10  
Day Forecast)

 By esri



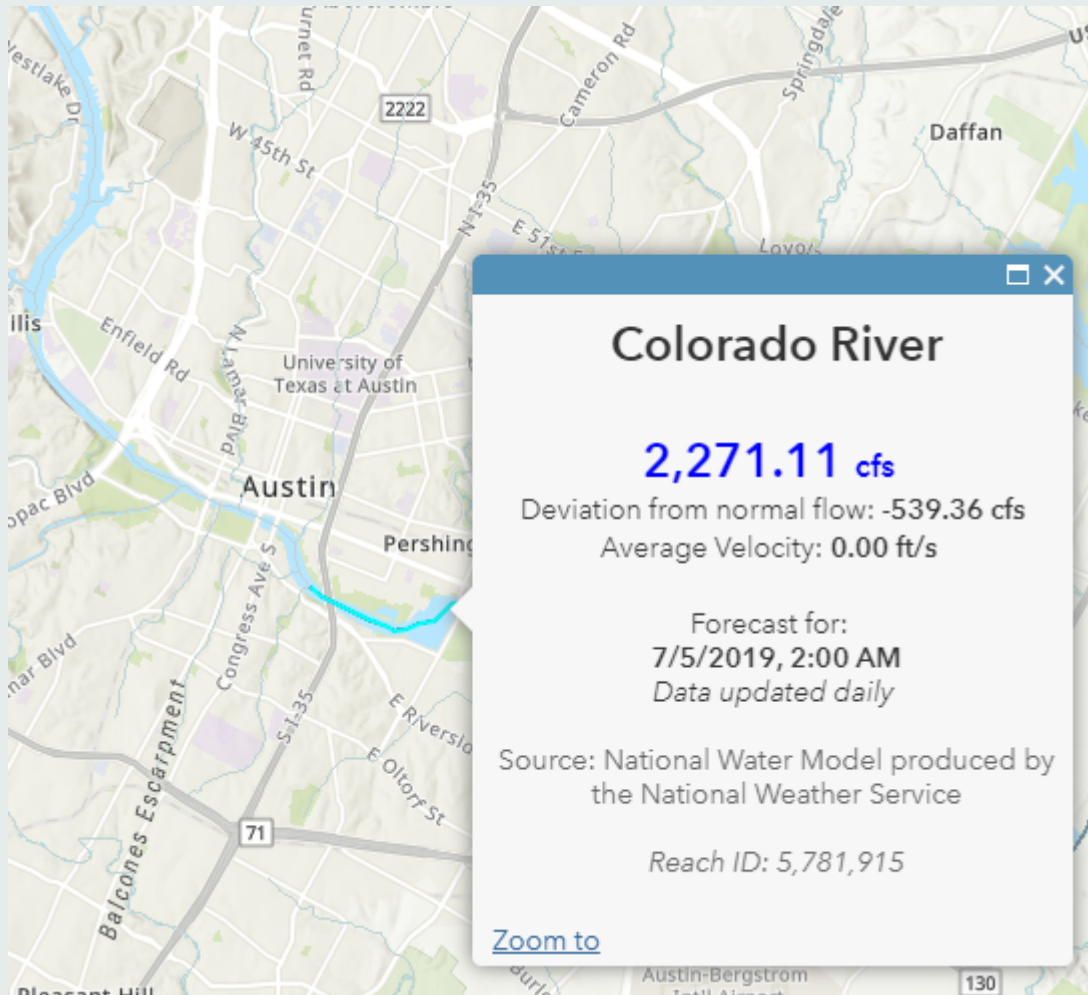
Map Image Layer

National Water Model  
(Hourly Forecast)

 By esri



# Query NWM data using the ArcGIS REST API



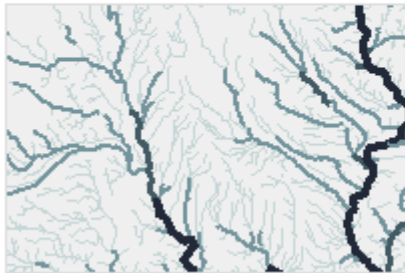
## ArcGIS REST API

# records: 80

```
egdb.dbo.LargeScale_v2.objectid: 61225
egdb.dbo.LargeScale_v2.station_id: 5781915
egdb.dbo.LargeScale_v2.streamorder: 6
egdb.dbo.LargeScale_v2.gnis_name: Colorado River
egdb.dbo.LargeScale_v2.reachcode: 12090205008379
egdb.dbo.medium_term_current.timevalue: 1562317200000
egdb.dbo.medium_term_current.qout: 2271.11
egdb.dbo.medium_term_current.flowrate: 2
egdb.dbo.medium_term_current.qdiff: -539.36
egdb.dbo.medium_term_current.anomaly: 3
egdb.dbo.medium_term_current.velocity: 0
egdb.dbo.medium_term_current.stage: 0
```

# ArcGIS REST API

## National Water Model (10 Day Forecast)





Ten day river forecast from the National Water Model, with streamflow reported in 3 hour time intervals. A product of the National Weather Service, updated once a day.

 Map Image Layer by [esri](#)

Created: Aug 24, 2016   Updated: Jun 13, 2018   View Count: 58,435

 Living Atlas

<https://arcgis.com/home/item.html?id=f43c154ef3b9421bbda14bc17f9e98d2>

URL	 View
<input type="text" value="https://livefeeds2.arcgis.com/arcg"/>	

[https://livefeeds2.arcgis.com/arcgis/rest/services/NFIE/NationalWaterModel\\_Medium/MapServer](https://livefeeds2.arcgis.com/arcgis/rest/services/NFIE/NationalWaterModel_Medium/MapServer)

# ArcGIS REST API query

ArcGIS REST Services Directory

[Home](#) > [services](#) > [NFIE](#) > [NationalWaterModel\\_Medium \(MapServer\)](#) > [Flow Forecast \(cfs\)](#)

[JSON](#)

**Layer: Flow Forecast (cfs) (ID: 0)**

**Name:** Flow Forecast (cfs)

**Display Field:** egdb.dbo.LargeScale\_v2.gnis\_name

**Type:** Feature Layer

**Result**

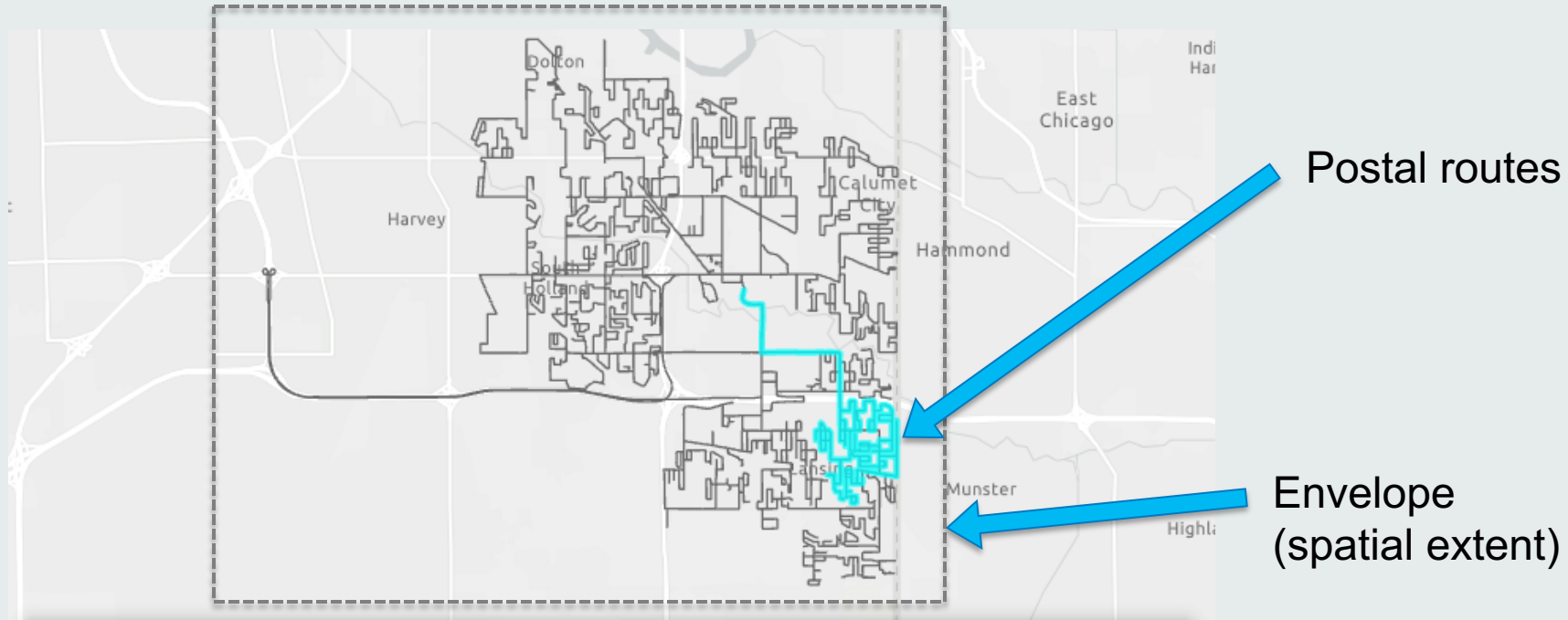
```
egdb.dbo.LargeScale_v2.objectid: 61225
egdb.dbo.LargeScale_v2.station_id: 5781915
egdb.dbo.LargeScale_v2.streamorder: 6
egdb.dbo.LargeScale_v2.gnis_name: Colorado River
egdb.dbo.LargeScale_v2.reachcode: 12090205008379
egdb.dbo.medium_term_current.timevalue: 1562338800000
egdb.dbo.medium_term_current.qout: 2269.7
egdb.dbo.medium_term_current.flowrate: 2
egdb.dbo.medium_term_current.qdiff: -540.77
```

[https://livefeeds2.arcgis.com/arcgis/rest/services/NFIE/NationalWaterModel\\_Medium/MapServer/0/query?where=egdb.dbo.LargeScale\\_v2.station\\_id=5781915&outFields=\\*&f=html](https://livefeeds2.arcgis.com/arcgis/rest/services/NFIE/NationalWaterModel_Medium/MapServer/0/query?where=egdb.dbo.LargeScale_v2.station_id=5781915&outFields=*&f=html)



# **Example: Postal Routes**

# Postal Routes



ArcGIS Pro - PostalService\_project

Routes

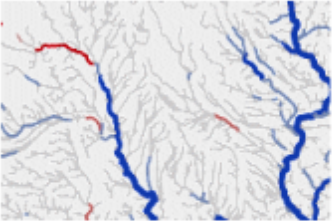
Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete Copy

id	StartTime	EndTime	StartTimeUTC	EndTimeUTC	TotalWaitTime	TotalViolationTime
12	4/9/2019 8:00:00 AM	4/9/2019 3:34:46 PM	4/17/2019 1:00:00 PM	4/17/2019 8:00:00 PM	0	0
18	4/9/2019 8:00:00 AM	4/9/2019 3:58:17 PM	4/17/2019 1:00:00 PM	4/17/2019 8:00:00 PM	0	0
16	4/9/2019 8:00:00 AM	4/9/2019 3:24:23 PM	4/17/2019 1:00:00 PM	4/17/2019 8:00:00 PM	0	0
19	4/9/2019 8:00:00 AM	4/9/2019 3:54:16 PM	4/17/2019 1:00:00 PM	4/17/2019 8:00:00 PM	0	0

Time fields  
(temporal extent)

# Subsetting the National Water Model data

## Dynamic feature service



National Water Model (10 Day Anomaly Forecast)

Map Image Layer By: [esri](#)

Ten day river forecast from the National Water Model, with streamflow reported in 3 hour time intervals. A product of the National Weather Service, updated once a day.

✚ ☆ ...

## ArcGIS REST API

ArcGIS REST Services Directory

[Home](#) > [services](#) > [NFIE](#) > [NationalWaterModel\\_Medium\\_Anomaly\\_\(MapServer\)](#)

[JSON](#)

**Layer: Flow Forecast (cfs) (ID: 0)**

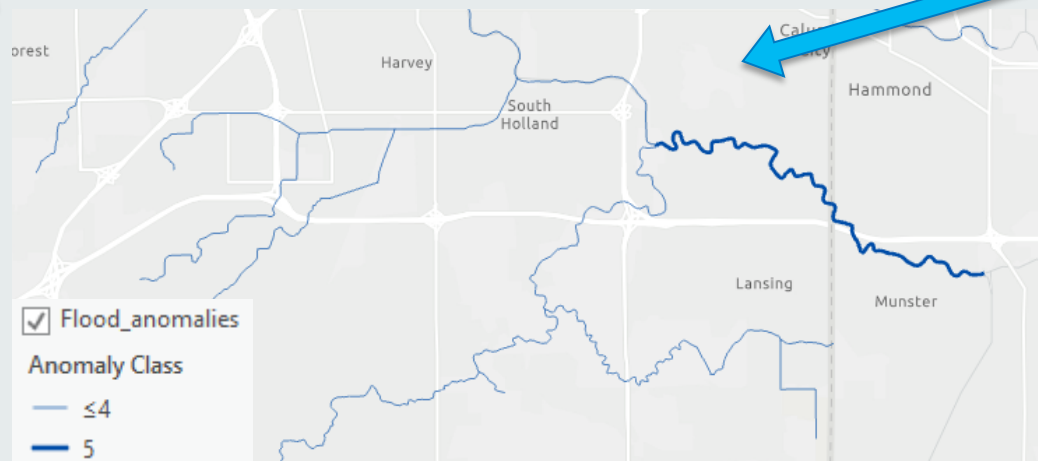
**Name:** Flow Forecast (cfs)

**Display Field:** egdb.dbo.LargeScale\_v2.gnis\_name

**Type:** Feature Layer

**Geometry Type:** esriGeometryPolyline

## Forecast subset

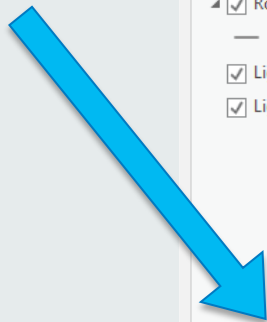


# Postal Service Routes Potential Disruptions



ArcGIS Pro

Intersection

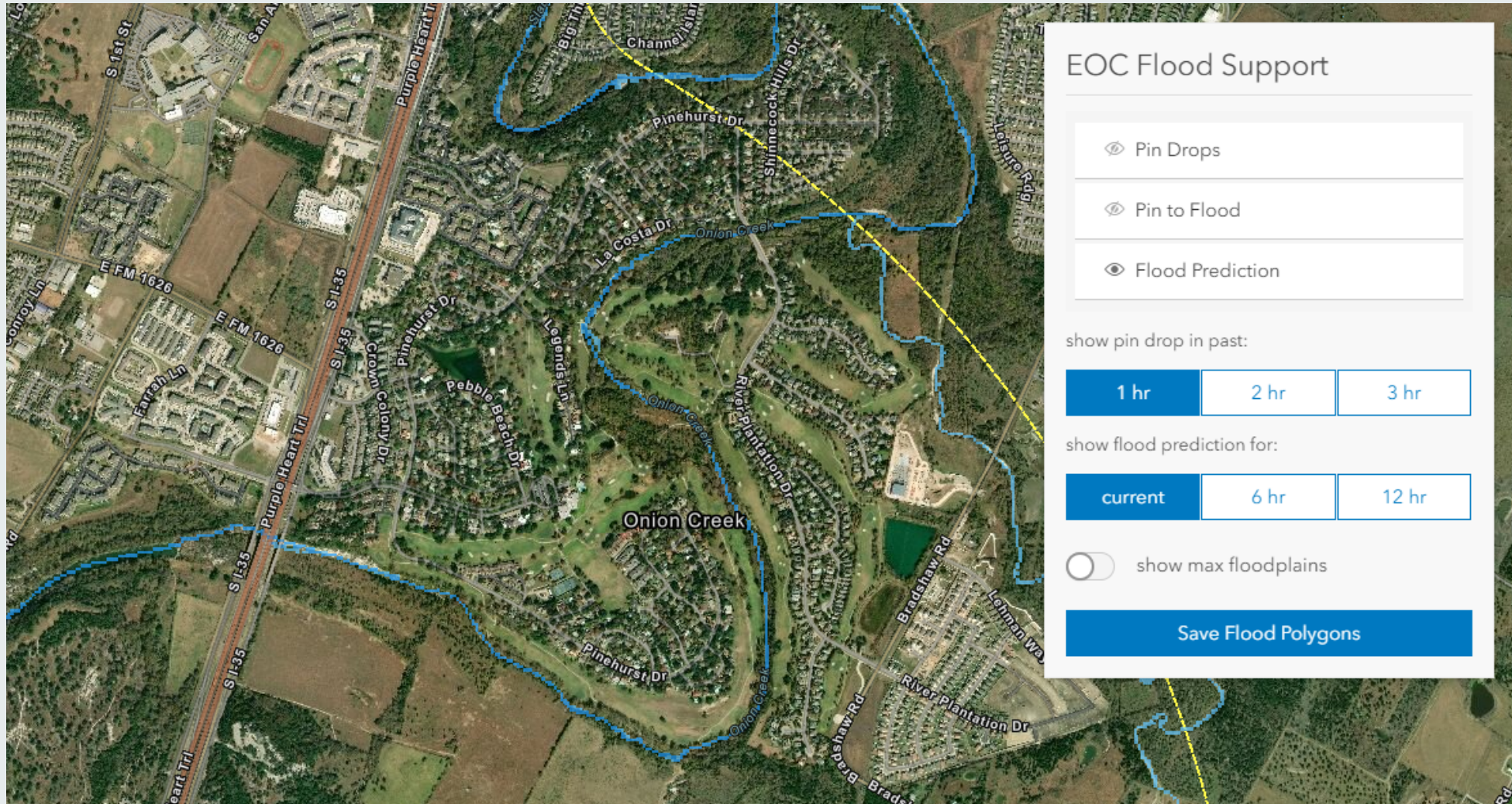


The screenshot displays the ArcGIS Pro interface. On the left, the Contents pane shows a list of layers: 'Route\_disruptions' (highlighted), 'Flood\_anomalies', 'Routes', 'Light Gray Reference', and 'Light Gray Base'. The 'Route\_disruptions' layer is currently selected. The map view shows a network of red lines representing postal routes overlaid on a light gray base map. A specific intersection is highlighted in cyan. Below the map, a data table for the 'Route\_disruptions' layer is visible, showing various attributes for each route segment.

Field:	Add	Delete	Calculate	Selection:	Zoom To	Switch	Clear	Delete	Copy	
IS Name	Reach Code	Timevalue	Flowrate (cfs)	Flow Class	Anomaly (cfs)	Anomaly Class	Water Velocity (fps)	Stage Height (ft)	Shape_Length	Shape_Length
Arm Little Calu...	07120003000016	4/17/2019	252.15	1	44.43	5	0.2	0	15747.267176	47330.70773
Arm Little Calu...	07120003000016	4/17/2019	252.15	1	44.43	5	0.2	0	15747.267176	45841.060889
Arm Little Calu...	07120003000016	4/17/2019	252.15	1	44.43	5	0.2	0	15747.267176	49778.982299
Arm Little Calu...	07120003000016	4/17/2019	252.15	1	44.43	5	0.2	0	15747.267176	52918.174278
Arm Little Calu...	07120003000016	4/17/2019	252.15	1	44.43	5	0.2	0	15747.267176	59537.239642
Arm Little Calu...	07120003000016	4/17/2019	252.15	1	44.43	5	0.2	0	15747.267176	39717.453942
Arm Little Calu...	07120003000016	4/17/2019	252.15	1	44.43	5	0.2	0	15747.267176	50619.563453
Arm Little Calu...	07120003000016	4/17/2019	252.15	1	44.43	5	0.2	0	15747.267176	61280.508368

# Web Apps

# EOC Flood Support



EOC Flood Support

- Pin Drops
- Pin to Flood
- Flood Prediction

show pin drop in past:

1 hr	2 hr	3 hr
------	------	------

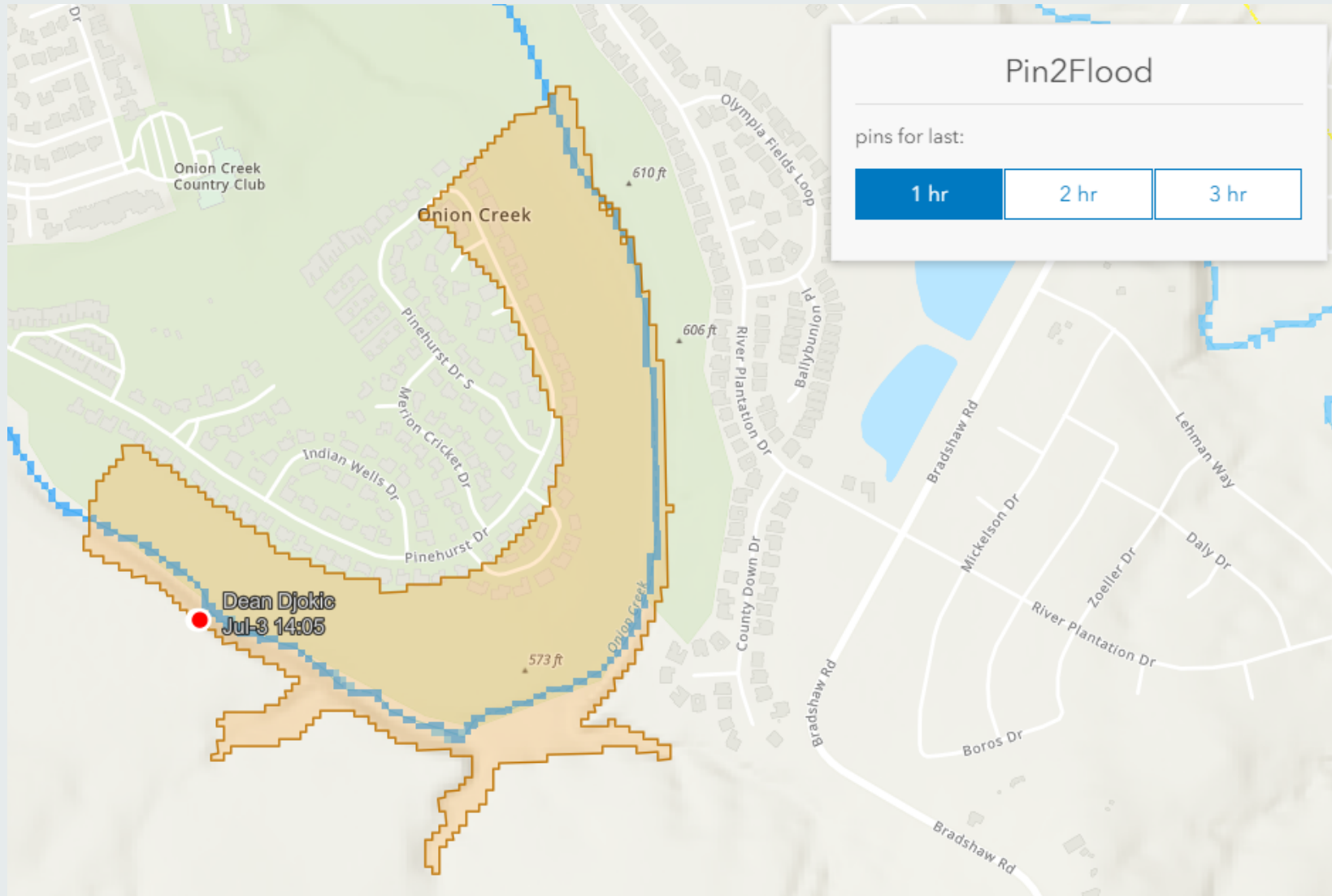
show flood prediction for:

current	6 hr	12 hr
---------	------	-------

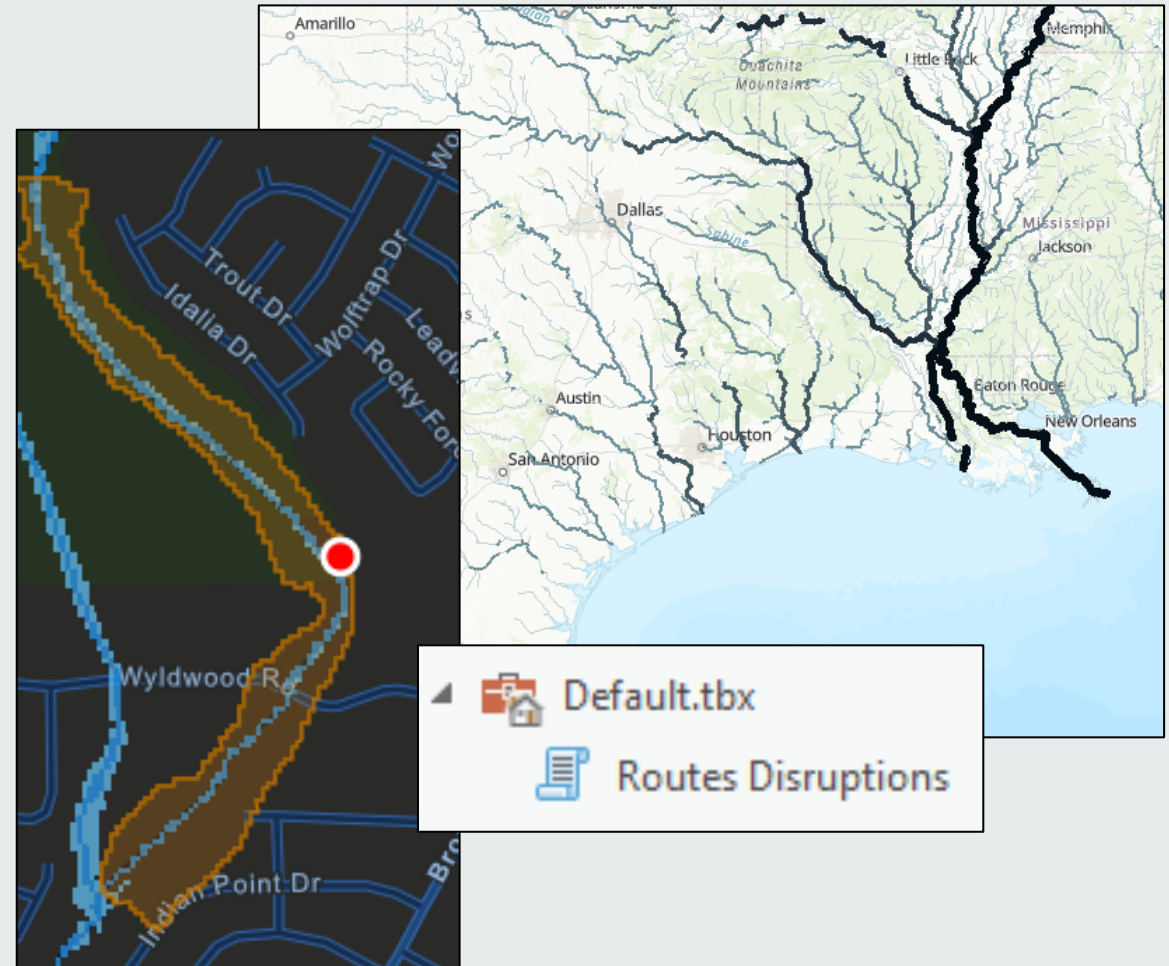
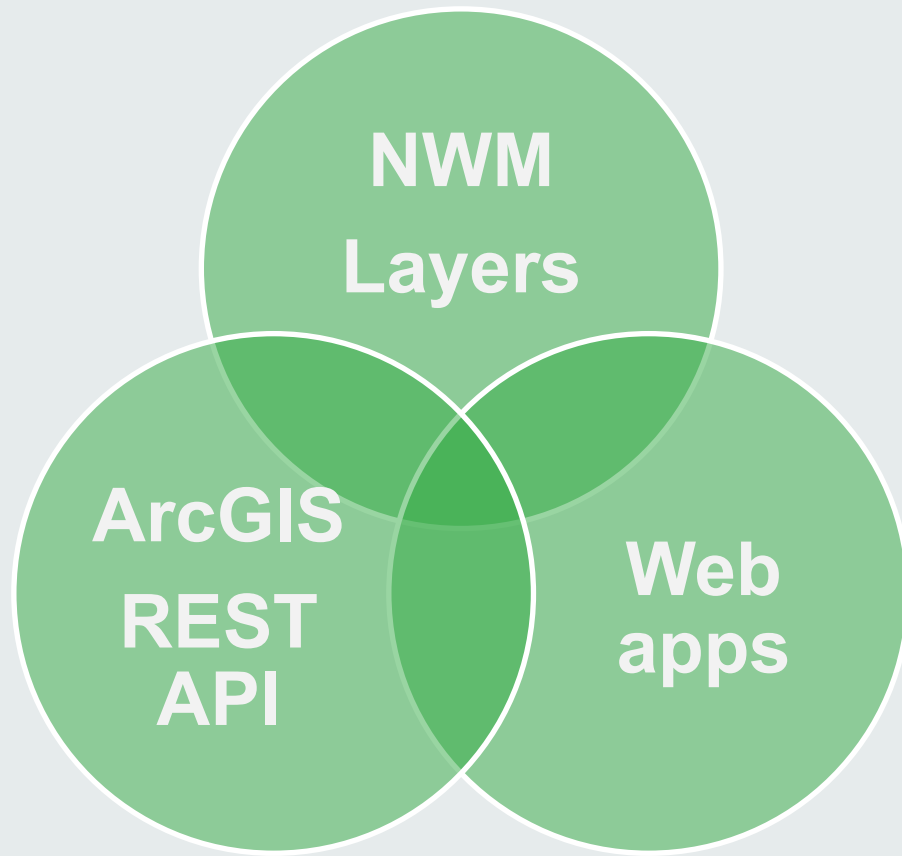
show max floodplains

[Save Flood Polygons](#)

# Pin2Flood



# NWM data in your own web apps & toolboxes







**esri**

**THE  
SCIENCE  
OF  
WHERE**