



ESRI DEVELOPER SUMMIT 2023

# ArcGIS Maps SDK for JavaScript: Bring in Data from Anywhere

Emily Hu, Jose Banuelos, Lauren Boyd

# Slides available:

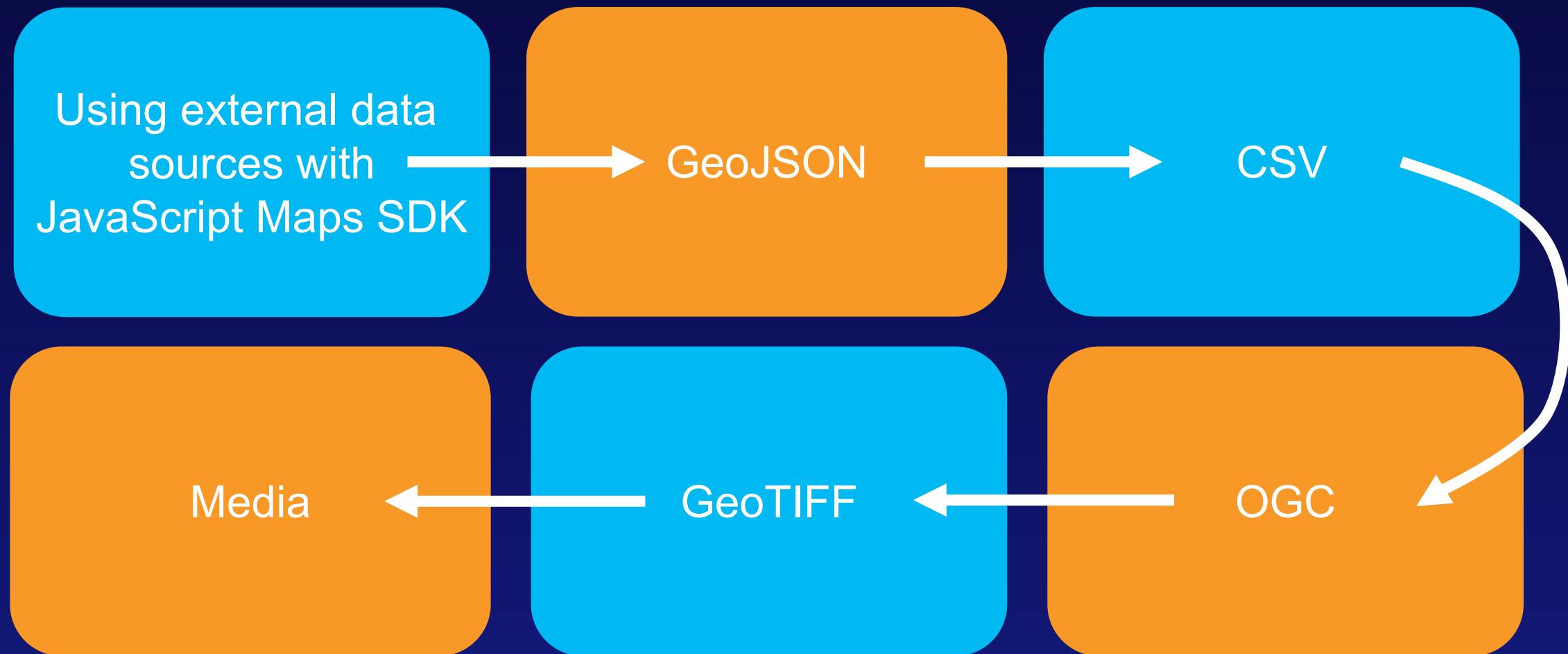
<https://links.esri.com/DS23-data-from-anywhere>

```
const layer = view.map.allLayers.get(0);  
view.whenLayerView(layer)  
.then(layerView => console.log(`  
// if there were problems with  
// the layer, they would appear here`))  
.catch(console.error);
```



```
const view = new MapView({  
  container: "viewContainer",  
  map: map,  
  environment: {  
    lighting: {  
      directShadowsEnabled: true  
    }  
  }  
});
```

# Agenda



# External Data Sources

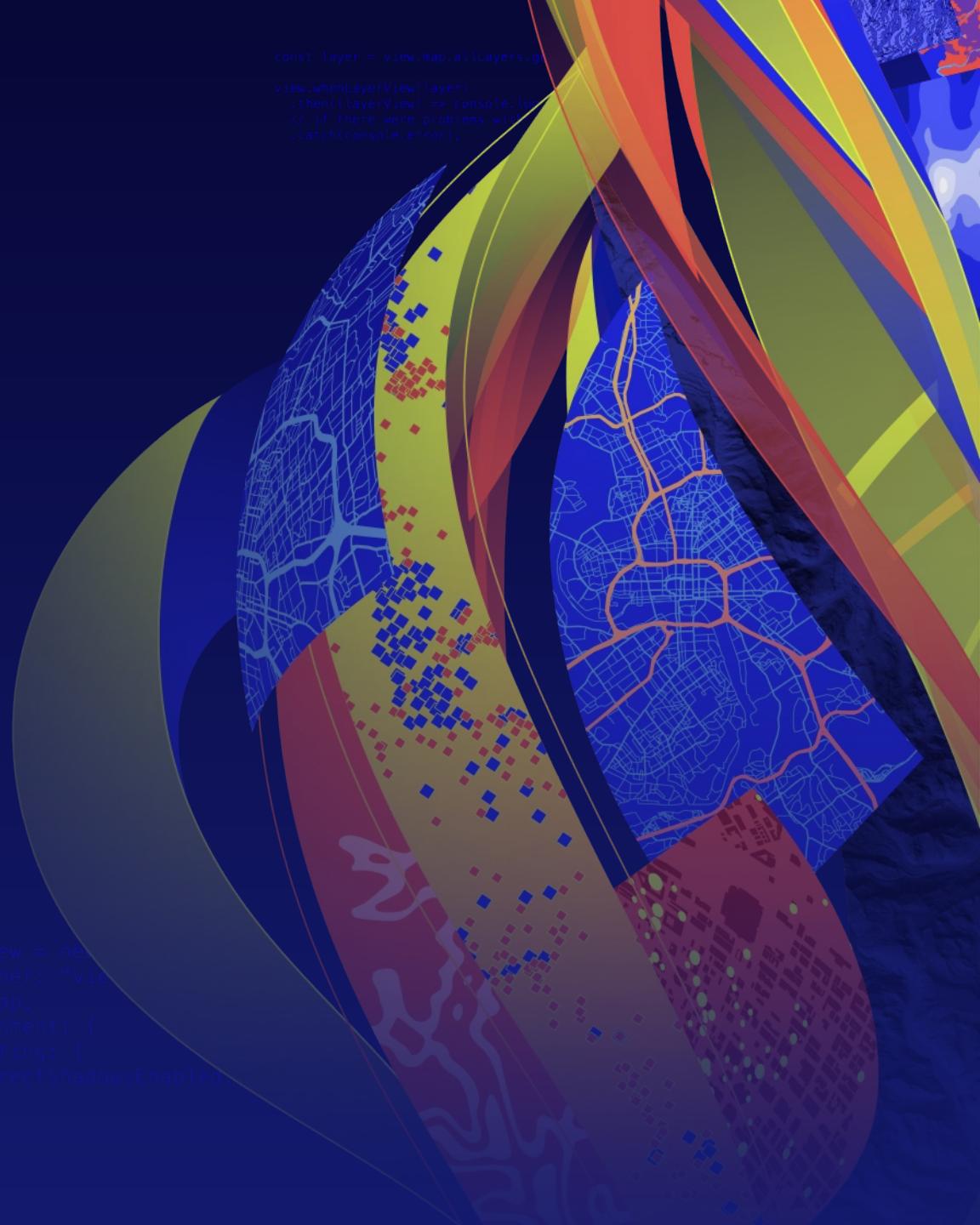
- Different subclasses of Layer based on the data type
- List of external data source layer types

```
// typical programming pattern for working with external data
const layer = new Layer({
  url: "url to your external data",
})
```

Capabilities	GeoJSON	CSV	OGC	GeoTIFF
Faster smart mapping	X	X	X	
Refresh Layer from Data Source	X	X		X
Custom Parameter Support	X	X	X	X
Feature Effect Support	X	X	X	X
Control Feature Drawing Order	X	X	X	
FeatureTable Support	X	X	X (WFSLayer only)	
Editor Feature Snapping	X	X	X (WFSLayer only)	
HitTest Performance Improvements	X	X	X	

# GeoJSON

Lauren Boyd



```
const layer = view.map.allLayers.get(0);
view.whenLayerView(layer)
  .then((layerView) => console.log(`Layer ${layerView.name} loaded`))
  // if there were problems with loading
  .catch(console.error);
```

```
const view = new View({
  container: "view",
  map: map,
  environment: {
    lightings: {
      directShadowsEnabled: true
    }
  }
});
```

# GeoJSON Data

- Format for encoding geographic data structures
- RFC7964 Specification requires:
  - Geometry, a feature, or a collection of features.
  - World Geodetic System 1984 (WGS84) datum

```
1  {
2    "type": "FeatureCollection",
3    "name": "FH_Perimeter",
4    "crs": {
5      "type": "name",
6      "properties": {
7        "name": "urn:ogc:def:crs:OGC:1.3:CRS84"
8      }
9    },
10   "features": [
11     {
12       "type": "Feature",
13       "properties": {
14         "OBJECTID": 14680,
15         "poly_IncidentName": "Muck Farm",
16         "poly_FeatureCategory": "Wildfire Daily Fire Perimeter",
17         "poly_MapMethod": "Phone/Tablet",
18         "poly_GISAcres": 2.9902640601488399,
19         "poly_CreateDate": "2022-01-06T13:21:06Z",
20         "poly_DateCurrent": "2022-01-06T16:21:06Z",
21         "poly_PolygonDateTime": null,
22         "poly_Acres_AutoCalc": 2.99025142073934,
23         "poly_GlobalID": "{4308A734-2330-49B2-BBDB-6A2274DF76C9}",
24         "poly_Source": "2022 NIFS",
          "irwin ABCDMisc": null
        }
      ]
    }
```

# GeoJSONLayer

- Create layer based on GeoJSON
- Each layer will only accept:
  - One geometry type
  - One schema of the properties

GeoJSON Geometry Object	API Geometry Type
Point	Point
MultiPoint	Multipoint
LineString/MultiLineString	Polyline
Polygon/MultiPolygon	Polygon

# GeoJSONLayer

Load GeoJSON Data

```
1 // points to the states layer in a service storing U.S. census data
2 const geojsonlayer = new GeoJSONLayer({
3     url: "https://earthquake.usgs.gov/earthquakes/feed/v1.0/summary/all_month.geojson",
4     copyright: "USGS Earthquakes"
5 });
```

# GeoJSONLayer

Load GeoJSON Data

```
1 // create a new blob from geojson featurecollection
2 const blob = new Blob([JSON.stringify(geojson)], { type: "application/json" });
3
4 // URL reference to the blob
5 const url = URL.createObjectURL(blob);
6 // create new geojson layer using the blob url
7 const layer = new GeoJSONLayer({ url });
```

# GeoJSONLayer

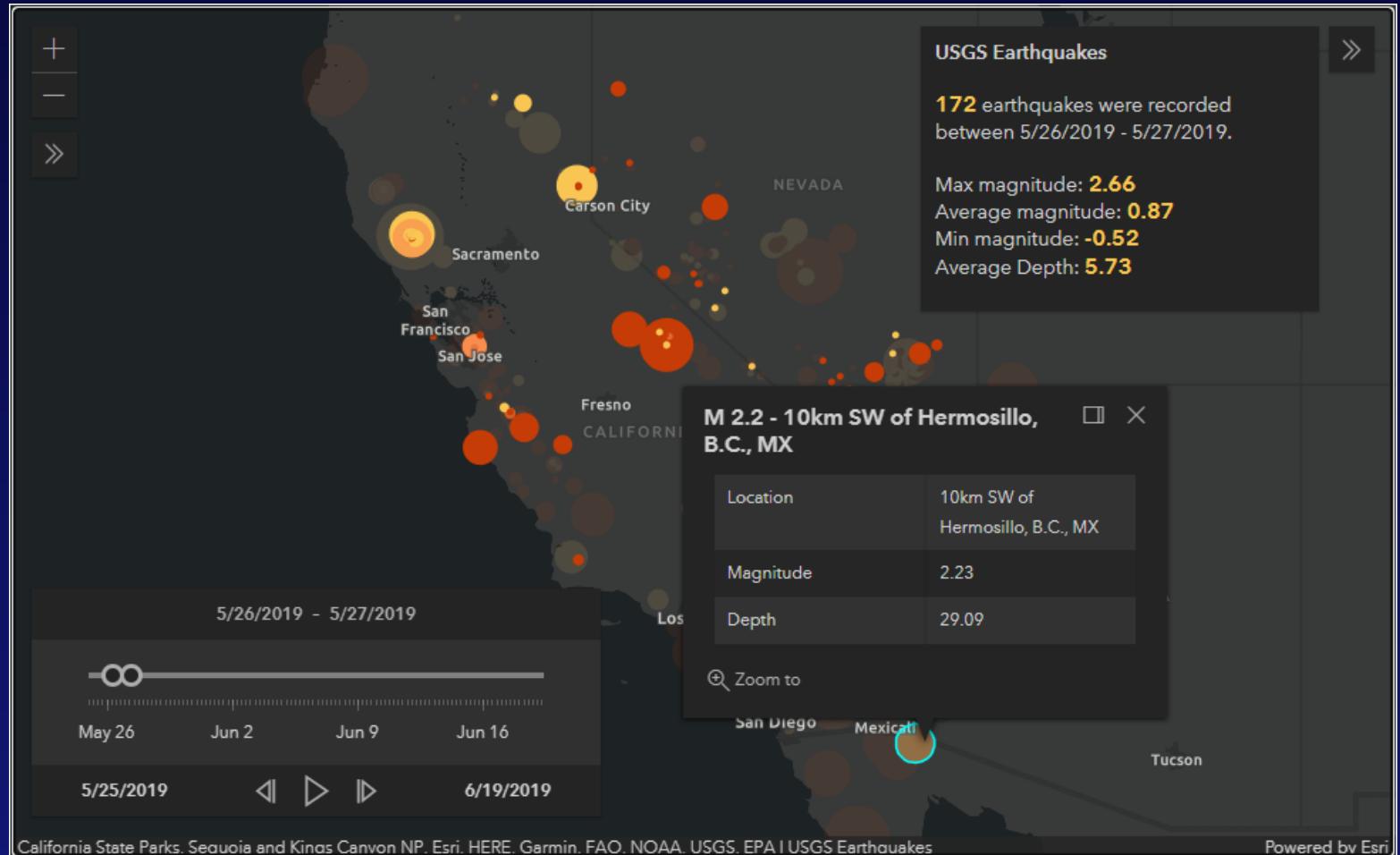
Load GeoJSON Data

```
1 const geoJSONLayer = new GeoJSONLayer({
2   portalItem: {
3     id: "40b6a0b4f1c54acba332567aea7430e4"
4   },
5   copyright: "National Park Service"
6 });
```

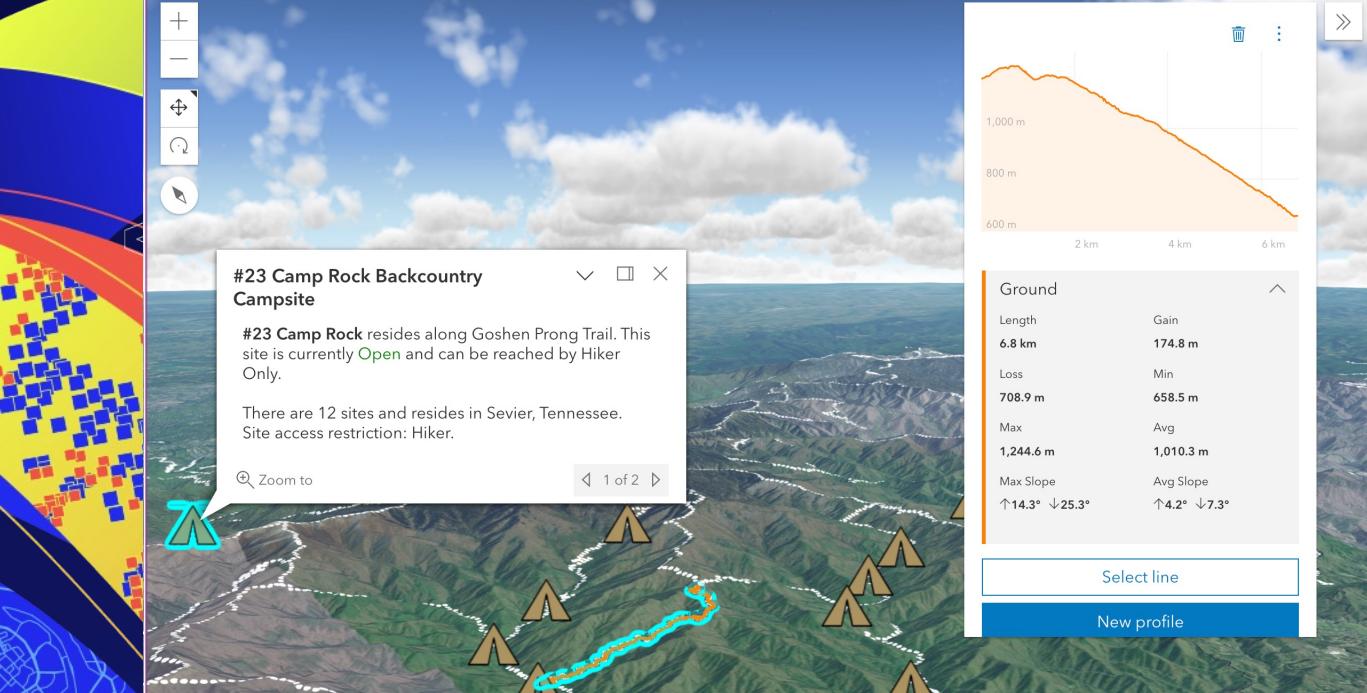
# GeoJSONLayer

## Capabilities

- Supports:
  - Clustering
  - Layer Blending
  - Custom parameters
  - Layer and Feature Effects
  - Widgets
  - Time
  - ... etc!



```
const view = new SceneView({  
  container: "viewDiv",  
  map: map,  
  environment: {  
    lighting: {  
      directShadowsEnabled: true  
    }  
  }  
})
```



# GeoJSONLayer

## Lauren Boyd

```
  layers.getLayer(index)  
  layer  
  console.log(layerView)  
  // If you try to interact with the layerView, you'll get an error here
```

# CSV

Jose Banuelos

```
const view = new View({  
  container: "view",  
  map: map,  
  environment: {  
    lighting: {  
      directShadowsEnabled: true  
    }  
  }  
})
```

```
const layer = view.map.allLayers.get(0);  
view.whenLayerView(layer)  
.then((layerView) => console.log(layerView))  
// if there were problems with the layer  
.catch(console.error);
```

# CSV Data

The screenshot shows a Microsoft Excel spreadsheet titled "NUFORC\_UFO\_SIGHTINGS\_CA". The data is presented in a table with the following columns:

	Date / Time	City	State	Country	Shape	Duration	Summary	Posted	Images	CITY	X	Y
1	11/7/2015 18:15	29 Palms	CA	USA	Egg	20 minutes	Blue, cloud-shaped light hovering in the sky.	11/19/2015	29 Palms	-82.7698	43.61361	
2	8/7/2012 0:00	29 Palms	CA	USA	Changing	All night	Small UFOs in southern California	9/24/2012	29 Palms	-82.7698	43.61361	
3	6/30/1978 2:30	29 Palms	CA	USA	Egg	15 minutes	while in the marine corp. I seen two ufo's tha	8/5/2009	29 Palms	-82.7698	43.61361	
4	8/8/1977 23:00	29 Palms	CA	USA	Unknown	15 minutes	I was in the Marines and stationed at Marine	9/2/2005	29 Palms	-82.7698	43.61361	
5	7/4/1987 12:00	Abiline (Dyess AFB)	CA	USA	Oval	10	An oval, silver obj. was observed by many inc	3/24/2016	Abiline	-99.7414	32.44917	
6	9/25/1998 20:00	Acampo	CA	USA	Teardrop	2-3 sec	An orange colored, teardrop shaped object tr	11/19/1998	Acampo	-121.274	38.17472	
7	8/21/2020 20:05	Acton	CA	USA	Flash	10-20 seconds	Bluish/greenish light flashing on a white obje	8/27/2020	Acton	0.761003	52.07072	
8	7/26/2013 0:53	Acton	CA	USA	Flash	10 minutes	5 consecutive flashes of light.	8/30/2013	Acton	0.761003	52.07072	
9	4/24/2008 16:45	Acton	CA	USA	Unknown	15 sec	Bad weather and overcast skies make a great	7/28/2010	Acton	0.761003	52.07072	
10	12/5/2005 19:40	Acton	CA	USA	Fireball	1 minute	Driving north on 14 Freeway, 5 miles south of	12/16/2005	Acton	0.761003	52.07072	
11	9/11/1999 22:16	Acton	CA	USA	Fireball	3 seconds	While driving westbound on I14 from Acton I	10/2/1999	Acton	0.761003	52.07072	
12	1/15/1994 23:00	Acton	CA	USA	Unknown	30 mins	it was like they knew i was watching them.	1/31/2011	Acton	0.761003	52.07072	
13	8/15/1997 0:00	Acton (approx.)	CA	USA	Oval	20-25 seconds	Oblong, orange light in sky traveling at slow s	8/10/1999	Acton	0.761003	52.07072	
14	9/19/2008 23:20	Acton or Palmdale	CA	USA	Triangle	still out there	Bright object released 3 Red Triangle Shapes	10/31/2008	Acton	0.761003	52.07072	
15	10/12/2003 0:00	Acton/Aqua Dulce	CA	USA	Circle	8-10seconds	BRIGHT RED OBJECT DECENDS/THEN TURN BR	10/31/2003	Acton	0.761003	52.07072	
16	11/1/2022 20:15	Adelanto	CA	USA	Light	4-5 minutes	We were just looking at the start and then...	12/22/2022	Adelanto	-117.41	34.57922	
17	8/30/2011 21:00	Adelanto	CA	USA	Light	1 minute	Bright light moving fast but not a shooting sta	10/10/2011	Adelanto	-117.41	34.57922	
18	1/17/2008 18:30	Adelanto	CA	USA	Triangle	30 min	very strange and it looked very like a UFO.	1/21/2008	Adelanto	-117.41	34.57922	
19	3/14/2007 10:08	Adelanto	CA	USA	Unknown	ONGOING	JUST STATIONAIRY UP IN THE SKY FLASHING C	4/27/2007	Adelanto	-117.41	34.57922	
20	11/8/2003 7:00	Adelanto	CA	USA	Other	1 minute	something drew my eyes to it, as I do not alw	11/26/2003	Adelanto	-117.41	34.57922	
21	6/30/1984 6:40	Adelanto	CA	USA	Sphere	10 min	Saw a flashing light that turned out to be som	10/31/2008	Adelanto	-117.41	34.57922	
22	12/22/2017 17:35	Agoura Hills	CA	USA	Sphere	minutes	Two white orbs traveling SW over Santa Mon	1/12/2018	Agoura Hi	-118.778	34.14611	
23	11/18/2017 1:50	Agoura Hills	CA	USA	Light	3 minutes	Bright shooting star shot across sky then froze	5/9/2019	Agoura Hi	-118.778	34.14611	
24	6/10/2016 18:10	Agoura Hills	CA	USA	Oval	10 seconds	I've spoken with you before. Wife shooting a	6/16/2016	Agoura Hi	-118.778	34.14611	

# CSVLayer

- Lat / Long automatic detection
  - CSVLayer.latitudeField
  - CSVLayer.longitudeField



```
const csvLayer = new CSVLayer({  
  url: "https://jbanuelos1.esri.com/data/csv/NUFORC_UFO_SIGHTINGS_CA.csv",  
  copyright: "nuforc.org"  
});
```

# CSVLayer

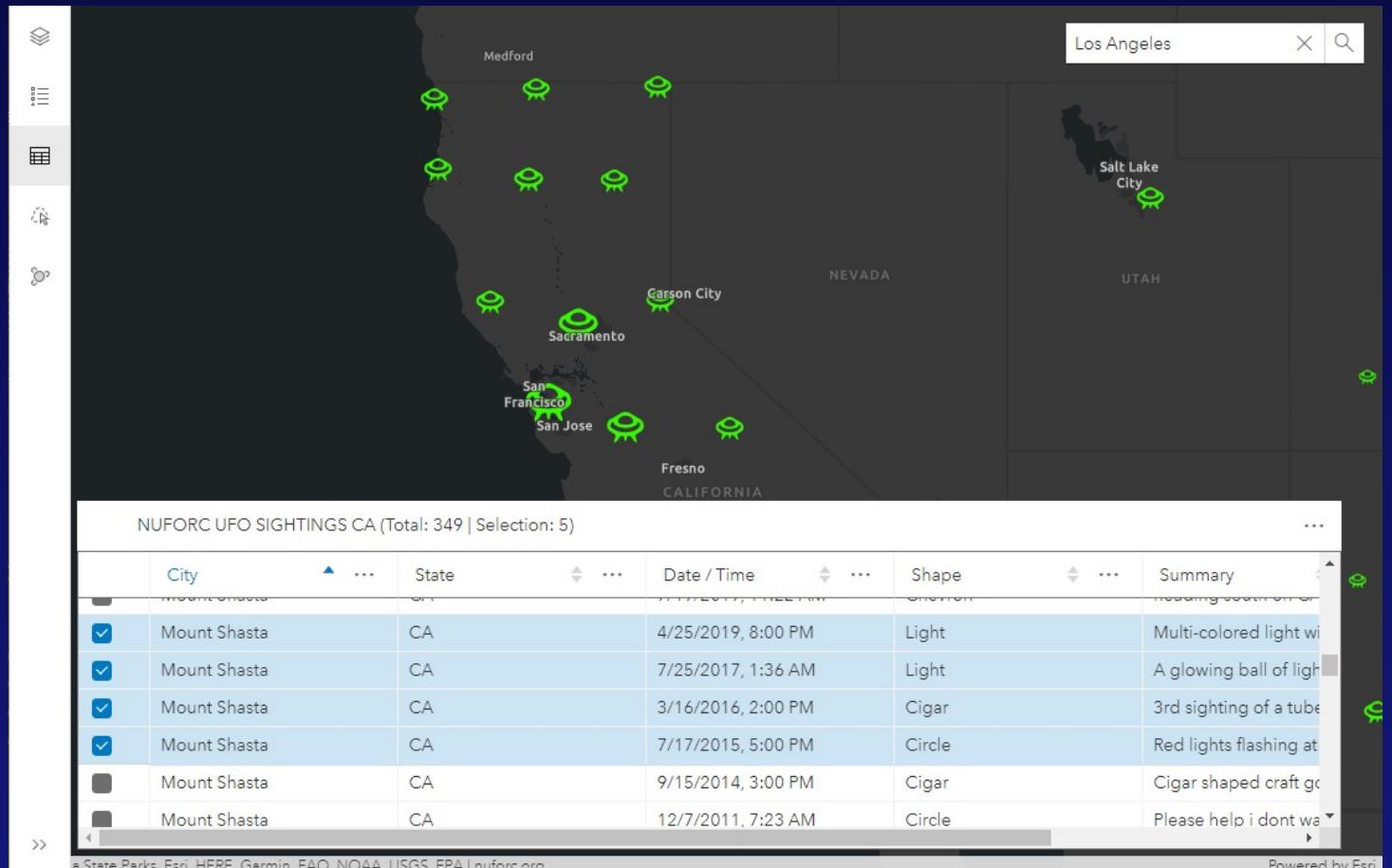
- Lat / Long automatic detection
  - CSVLayer.latitudeField
  - CSVLayer.longitudeField

```
const csvLayer = new CSVLayer({  
  portalItem: {  
    id: "2e603ade23164fe6838c638ff7ee083b"  
  },  
  copyright: "nuforc.org"  
});
```

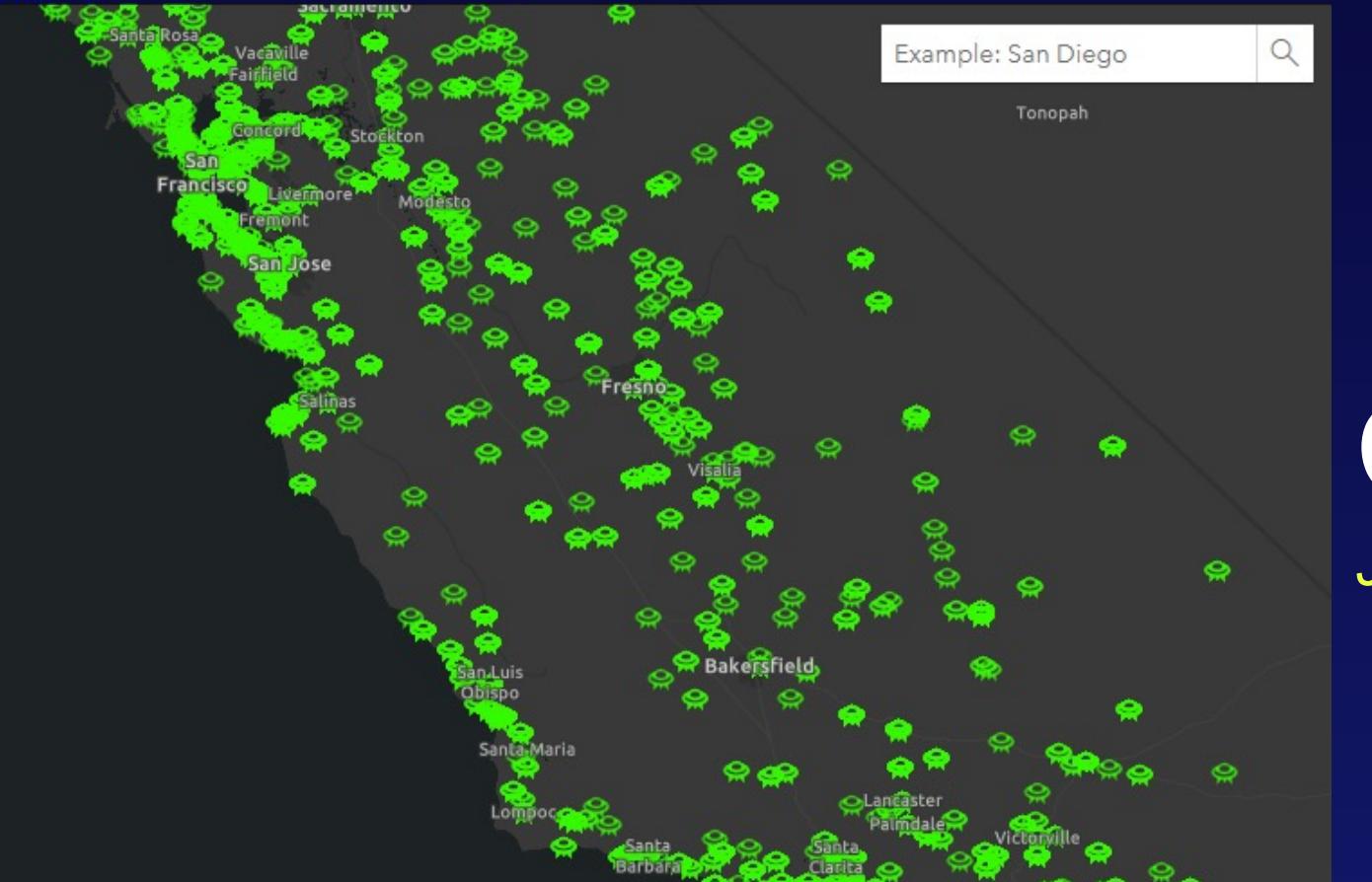
# CSVLayer

Capabilities (same as geojson)

- Supports:
  - RefreshInterval
  - Clustering
  - Layer Blending
  - Custom parameters
  - Layer and Feature Effects
  - Widgets
  - Time
  - ... etc!



```
const view = new SceneView({  
  container: "viewDiv",  
  map: map,  
  environment: {  
    lighting: {  
      di  
    }  
  }  
})
```

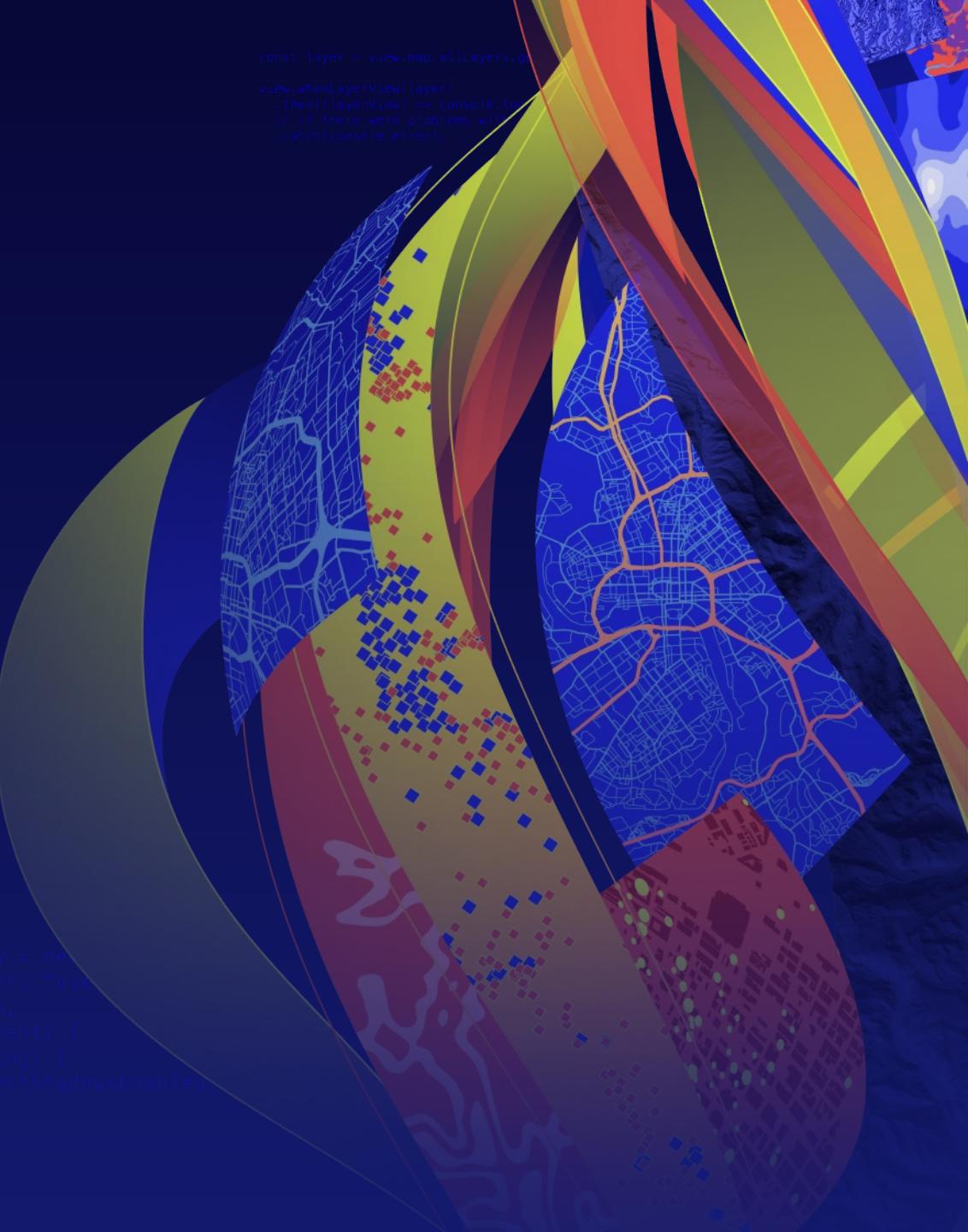


# CSVLayer

Jose Banuelos

# OGC

Jose Banuelos and Emily Hu



```
const layer = view.map.allLayers.get(0);
view.whenLayerView(layer)
  .then(layerView => console.log("Layer loaded"))
  // if there were problems with the layer
  .catch(console.error);
```

```
const view = new View({
  container: "view",
  map: map,
  environment: {
    lighting: {
      directShadowsEnabled: true
    }
  }
});
```

# OGC Services and OGC Layer Types

- JS API supports the following services:

Service Type	API Layer Type
OGC API Features	<a href="#"><u>OGCFeatureLayer</u></a>
WFS (Web Feature Service)	<a href="#"><u>WFSLayer</u></a>
WMS (Web Map Service)	<a href="#"><u>WMSLayer</u></a>
WMTS (Web Map Tile Service)	<a href="#"><u>WMTSLayer</u></a>
WCS (Web Coverage Service)	<a href="#"><u>WCSLayer</u></a>

# WFSLayer

Load WFS service data

- Create layer based on OGC Web Feature Service (WFS)

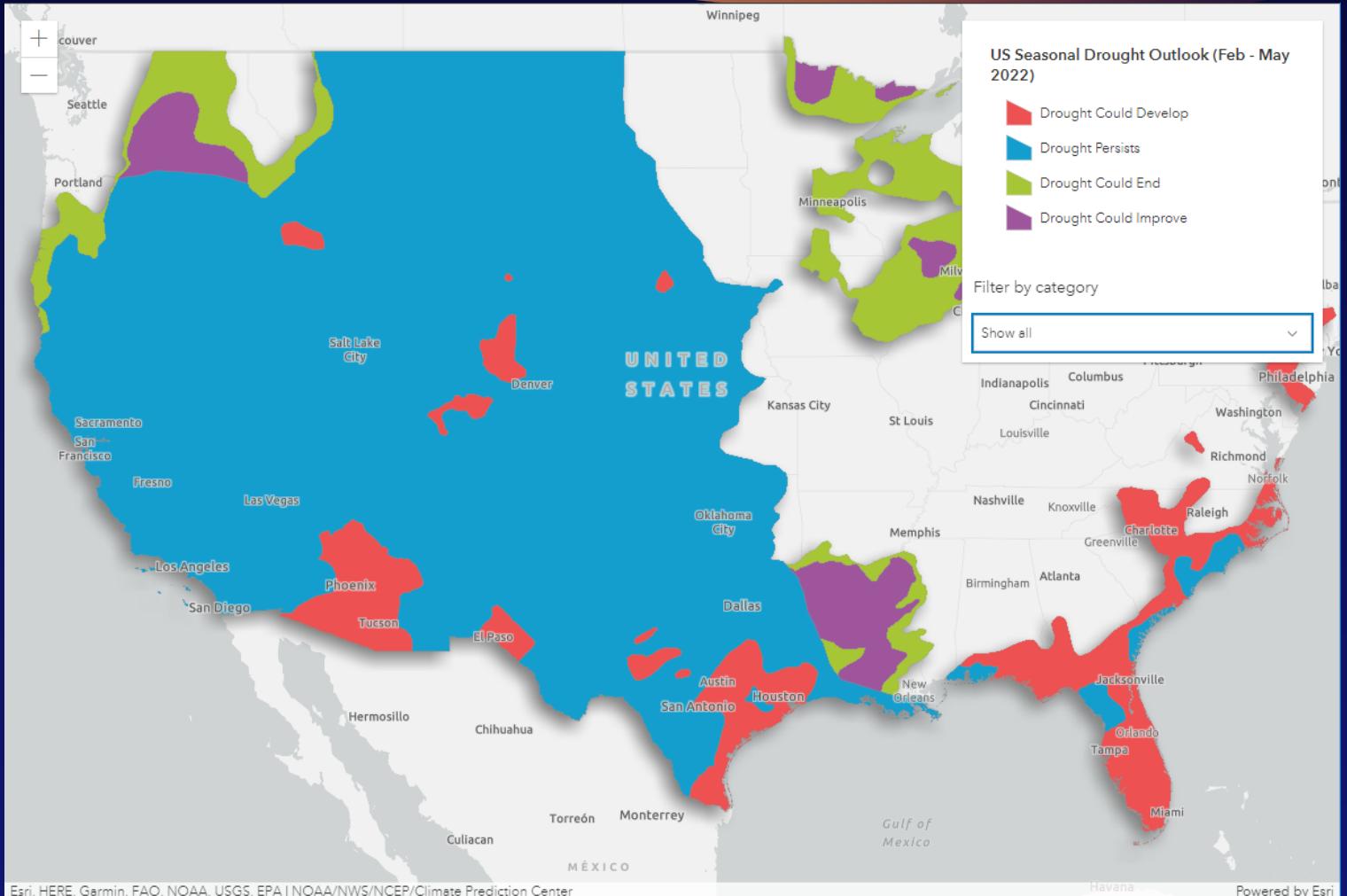
```
1 // Create a layer with features from Massachusetts 1990 census
2 const censusData = new WFSLayer({
3   url: "https://giswebservices.massgis.state.ma.us/geoserver/wfs",
4   name: "GISDATA.CENSUS1990BLOCKGROUPS_POLY"
5 });
```

Properties Specified	Layer Load Behavior
None	First layer in the service
name	First layer with the name
name and namespaceUri	Layer with the name and namespace specified

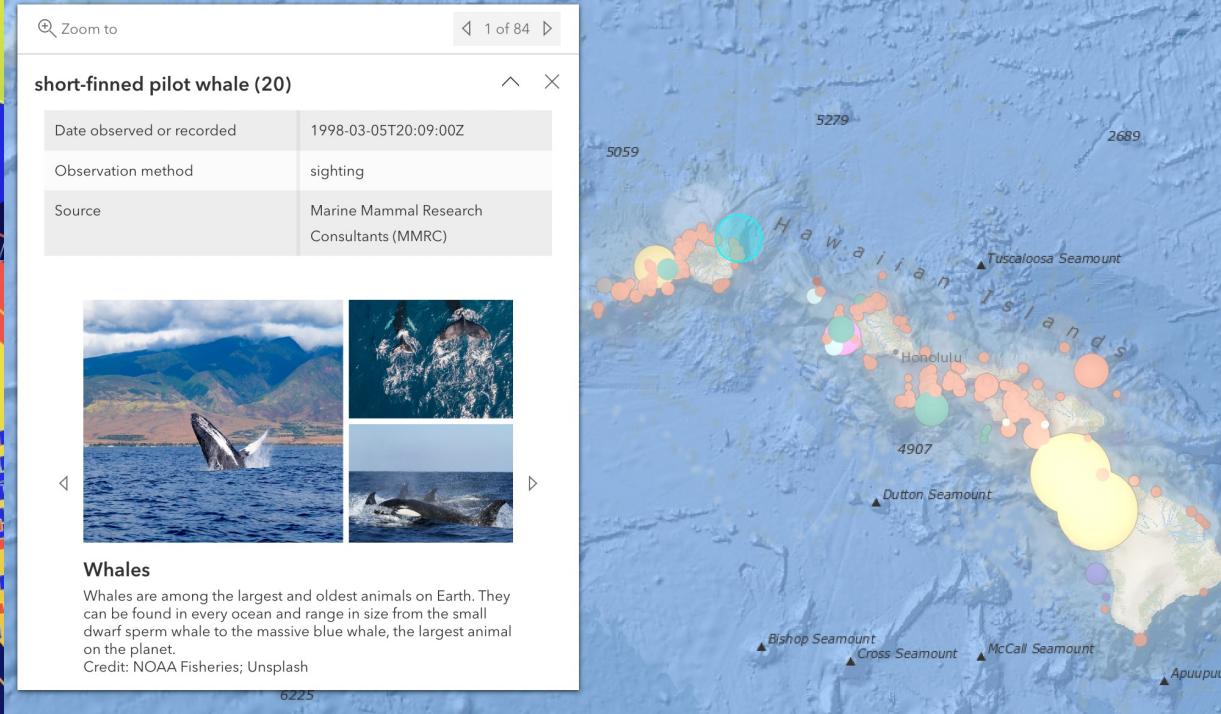
# WFSLayer

## Capabilities

- Supports:
  - Clustering
  - Layer Blending
  - Custom parameters
  - Layer and Feature Effects
  - Smart mapping
  - Widgets
  - ... etc!



```
const view = new SceneView({  
  container: "viewDiv",  
  map: map,  
  environment: {  
    lighting: {  
      directShadowsEnabled: true  
    }  
  }  
})
```



# WFSLayer

## Emily Hu

# GeoTIFF

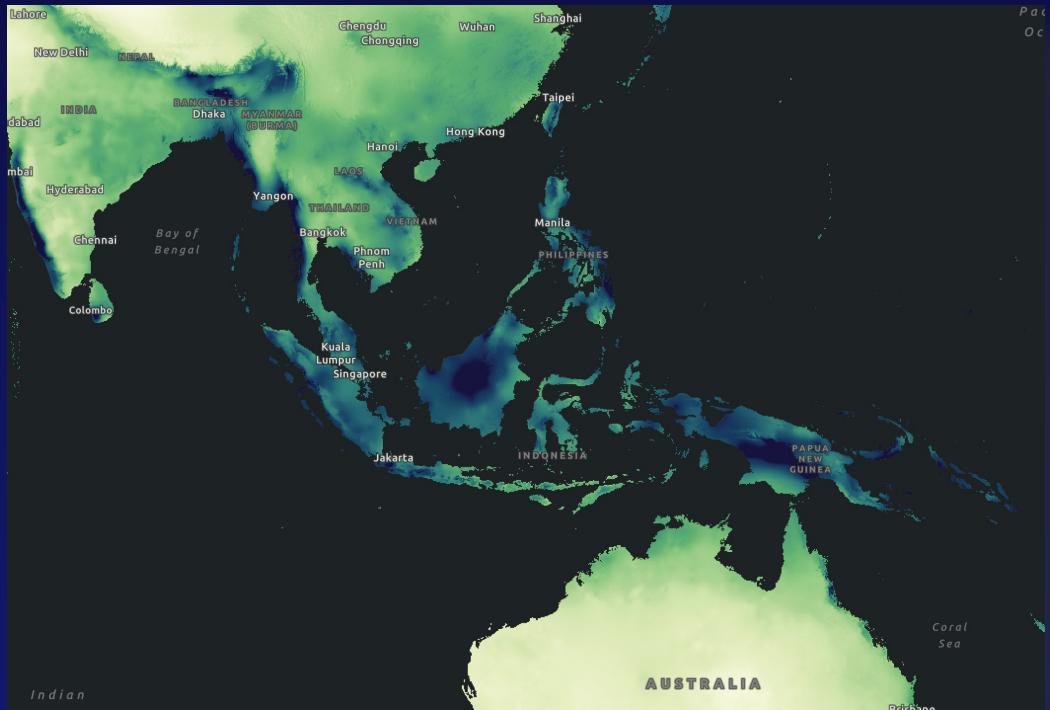
Emily Hu

```
const view = new View({  
  container: "view",  
  map: map,  
  environment: {  
    lighting: {  
      directShadowsEnabled: true  
    }  
  }  
})
```

```
const layer = view.map.allLayers.get(0);  
view.whenLayerView(layer)  
.then((layerView) => console.log(layerView))  
// if there were problems with the layer  
.catch(console.error);
```

# GeoTIFF Data

- Georeferenced TIFF (Tag Image File Format) files
- Raster Data
- Widely used in geospatial and earth science communities
- Cloud Optimized GeoTIFF
  - beta starting at v4.25



# ImageryTileLayer

## Load GeoTIFF Data

- Local Files - via hosted Tile Service

- Best performance. Add local GeoTIFF file to ArcMap or ArcGIS Pro, create a tile service, and publish to ArcGIS Online

```
1 // Set the url property to the hosted tile service
2 const layer = new ImageryTileLayer({
3   url: "https://tiledimageservices.arcgis.com/P3ePLMYs2RVChkJx/arcgis/rest/services/10m_Tree_Canopy_Height/ImageServer"
4 })
```

```
1 // Set the portalItem property to the hosted tile service
2 const layer = new ImageryTileLayer({
3   portalItem: {
4     id: "2a3dfb00c2c6425f85bd70da420d58eb"
5   }
6 })
```

# ImageryTileLayer

## Load GeoTIFF Data

- External Online Source - via Cloud Optimized GeoTIFF (COG):

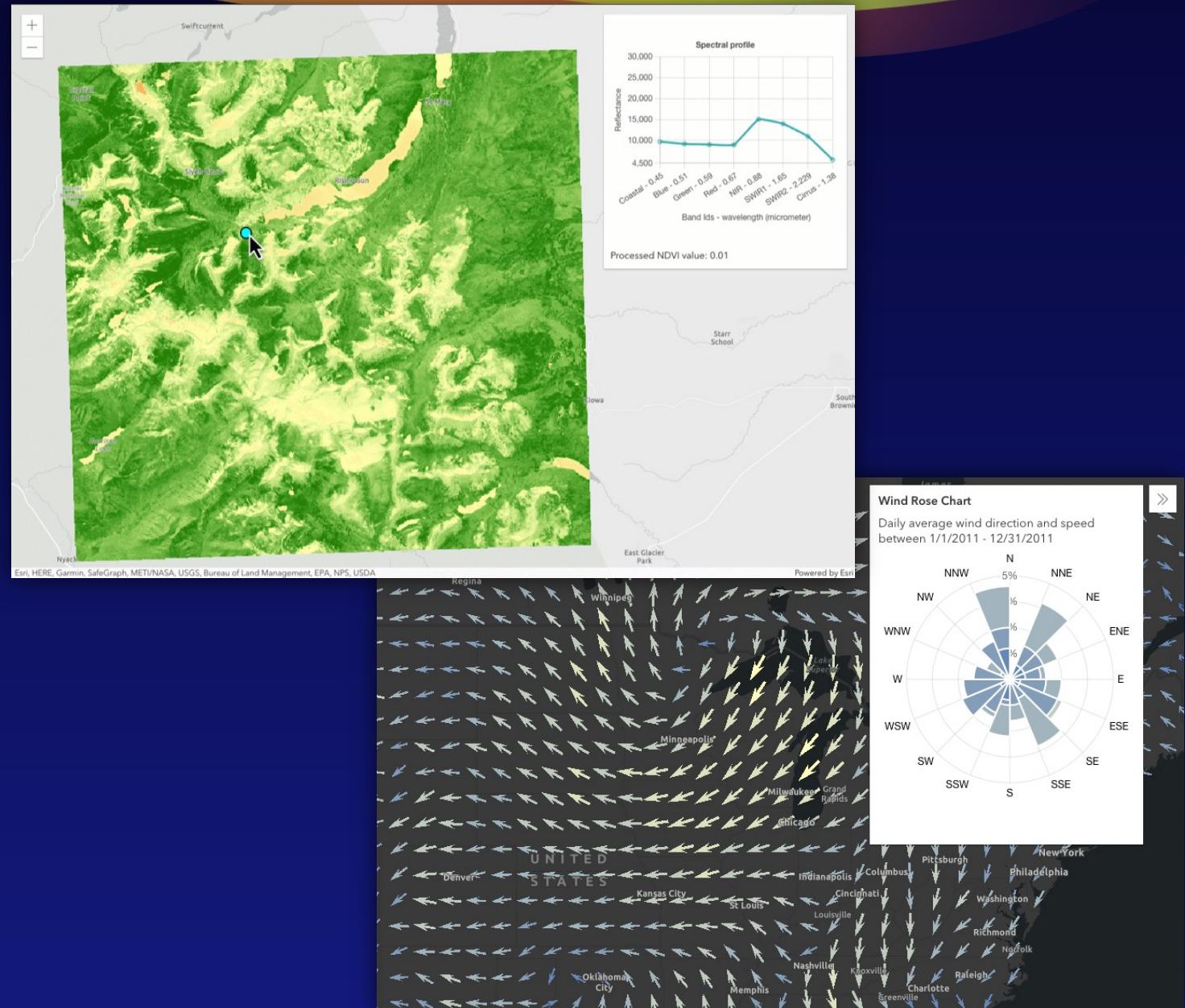
- Host on a HTTP file server; a useful option when imagery workflow generates a temporary image or read from an external source

```
1 // Set the url property of the ImageryTileLayer to point to the url of the COG file
2 const layer = new ImageryTileLayer({
3   url: "https://oin-hotosm.s3.amazonaws.com/58efcb2acfbcc90010aca475/1/5c1397c1-c93b-47e3-8d51-003a22c241f3.tif"
4 });
```

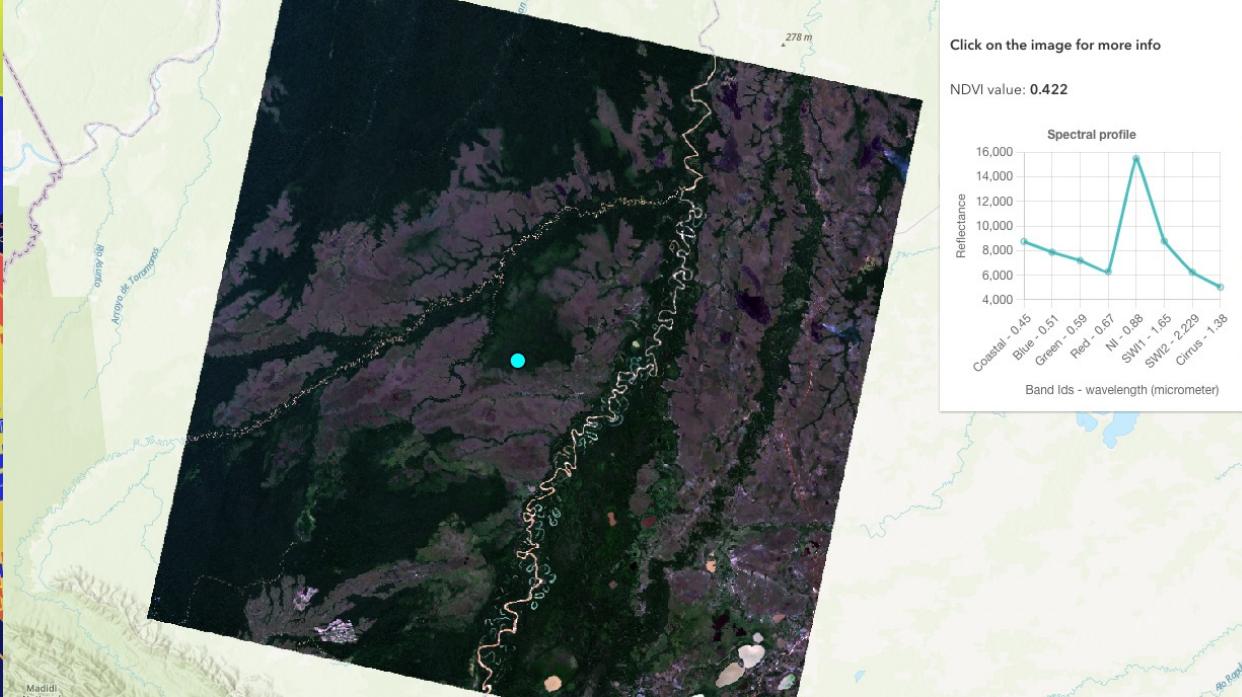
# ImageryTileLayer

## Capabilities

- Supports:
  - Multidimensional variables
    - Only for tile services
  - Process pixels with client-side raster functions
    - New 4.26
  - Popup
  - Layer blending
  - Layer effects
  - Time extent
  - ...and more!



```
const view = new SceneView({  
  container: "viewDiv",  
  map: map,  
  environment: {  
    lighting: {  
      directShadowsEnabled: true  
    }  
  }  
})
```



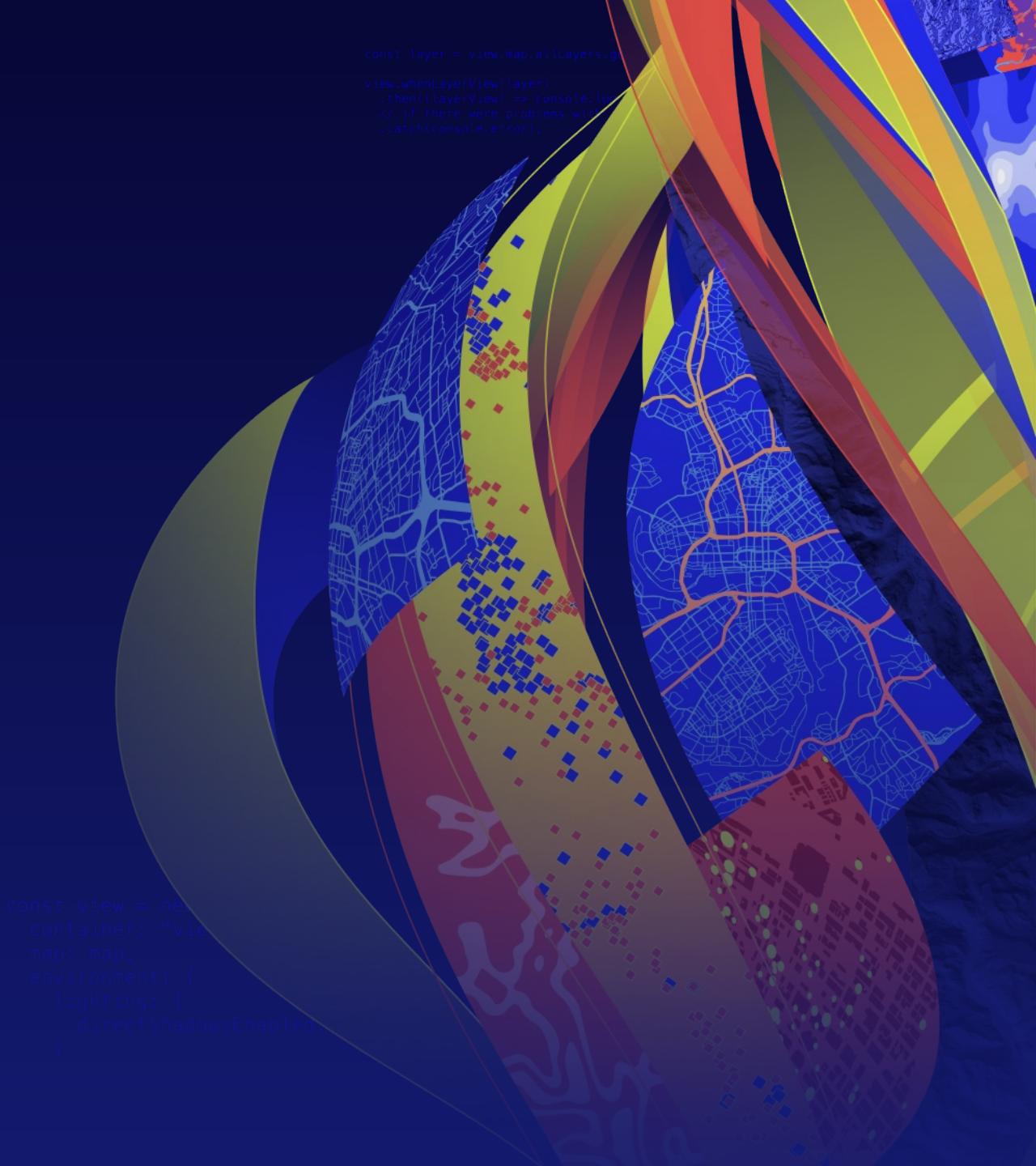
# GeoTIFF

## Emily Hu

```
var layers = view.layers;  
var layerView = layers.getLayerView();  
var layerIndex = 0;  
var layer; // layerView is undefined here  
layerView = layerView || layer;  
if (layerView) {  
  console.log(layerView);  
}  
// If you try to do something with the layerView, you'll get an error here
```

# Media

Jose Banuelos



# Media Data

- Images

- PNG, JPEG, WebP, etc.
- (Limitation: GIF, APNG)

- Video

- MP4, MPEG, 3GP, etc.



# MediaLayer



```
const element = new VideoElement({
  video: "https://arcgis.github.io/arcgis-samples-javascript/sample-data/media-
layer/videos/hurricanes_aerosol-aug.mp4",
  georeference: new ExtentAndRotationGeoreference({
    extent: new Extent({
      xmin: -150,
      ymin: 1,
      xmax: 20,
      ymax: 80,
      spatialReference: {
        wkid: 4326
      }
    })
  })
});
```

# MediaLayer

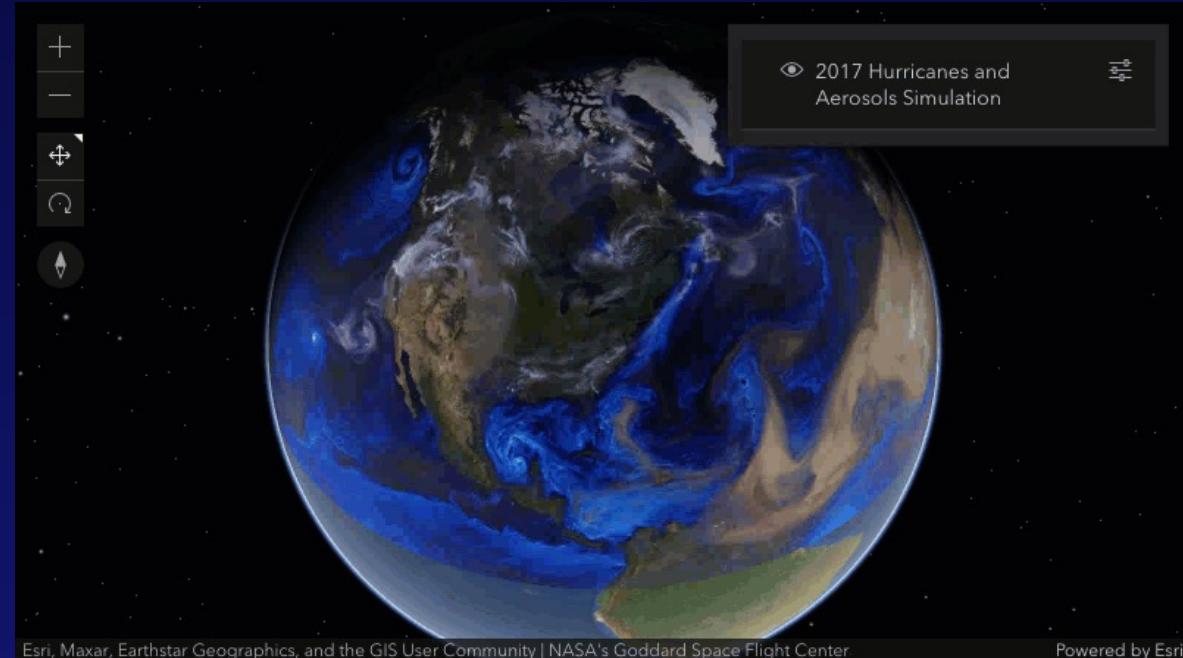


```
const layer = new MediaLayer({  
  source: [element],  
  title: "2017 Hurricanes and Aerosols Simulation",  
  copyright: "NASA's Goddard Space Flight Center"  
});
```

# MediaLayer (beta)

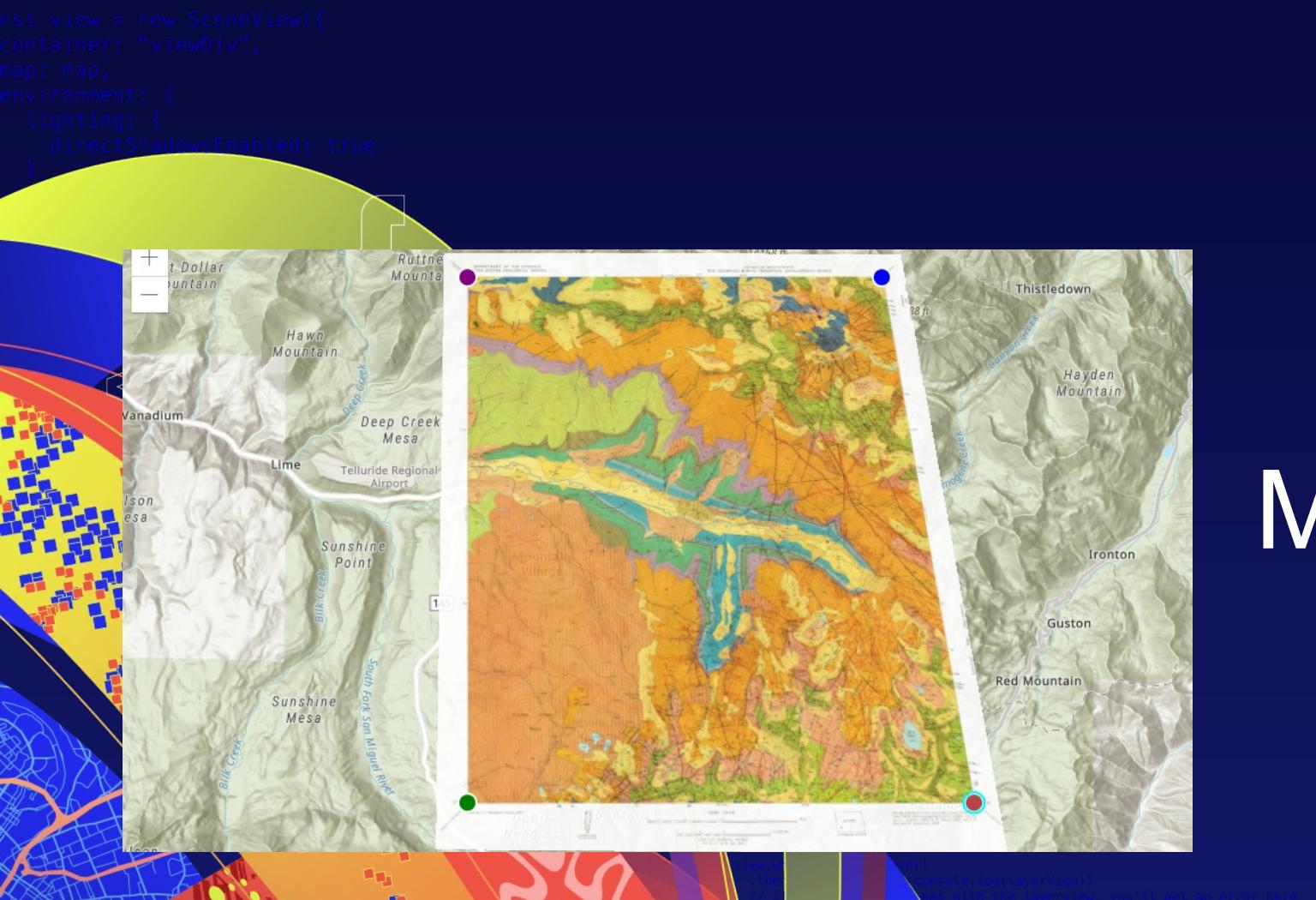
## Capabilities

- Supports:
  - Layer blending (only in 2D)
  - Layer effects (only in 2D)
  - Images
  - Video
  - WebMap persistence



Esri, Maxar, Earthstar Geographics, and the GIS User Community | NASA's Goddard Space Flight Center

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# MediaLayer

layerView  
console.log(layerView);  
// If you try to interact with the layerView, you'll get an error here.

Slides available:  
<https://links.esri.com/DS23-data-from-anywhere>

```
const layer = view.map.allLayers.get(0);  
view.whenLayerView(layer)  
.then(layerView => console.log(`  
// if there were problems with  
// the layer, they would appear here`))  
.catch(console.error);
```

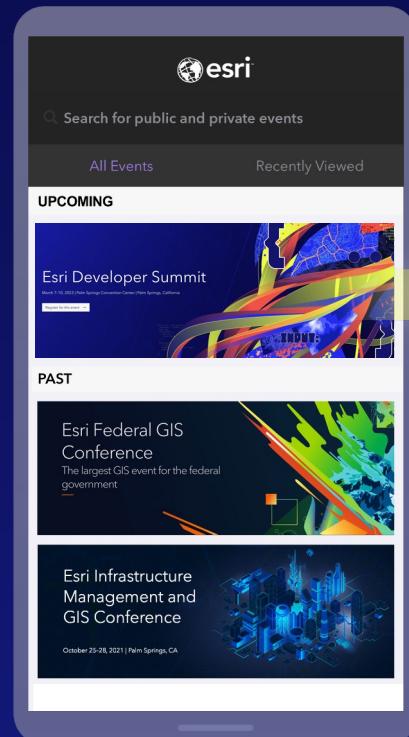
```
const view = new ArcGISView({  
  container: "viewContainer",  
  map: map,  
  environment: {  
    lighting: {  
      directShadowsEnabled: true  
    }  
  }  
});
```

# Upcoming Sessions

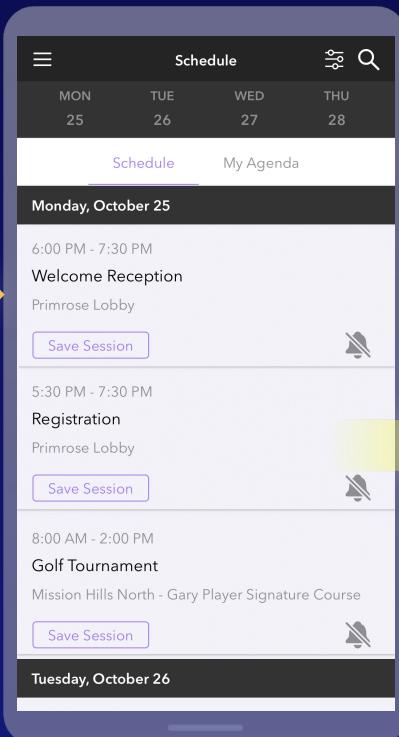
Session	Day/Time	Location
ArcGIS Maps SDK for JavaScript: Tips and Tricks for Developing and Debugging Apps	Thursday, 1:00PM – 1:30PM	Demo Theater 3: Mesquite D-E   PSCC
ArcGIS Maps SDK for JavaScript: Visualizing Change Over Time	Thursday, 1:00PM – 2:00PM	Smoketree A-E   PSCC
ArcGIS Maps SDK for JavaScript: Web Editing	Thursday, 2:30PM – 3:30PM	Primrose B   PSCC
ArcGIS Maps SDK for JavaScript: Using Arcade with Your Apps	Thursday, 2:30PM – 3:30PM	Smoketree A-E   PSCC
Building Web Apps with ArcGIS Maps SDK for JavaScript and Calcite Design System	Thursday, 4:00PM – 5:00PM	Smoketree A-E   PSCC
ArcGIS Maps SDK for JavaScript: Using Arcade with Your Apps	Thursday, 5:30PM – 6:30PM	Primrose A   PSCC
Q&A with the ArcGIS Maps SDK for JavaScript Team	Friday, 8:30AM – 9:30AM	Pasadena/Sierra/Ventura
ArcGIS Maps SDK for JavaScript: the Road Ahead	Friday, 10:00AM – 11:00AM	Catalina/Madera

# Please Share Your Feedback in the App

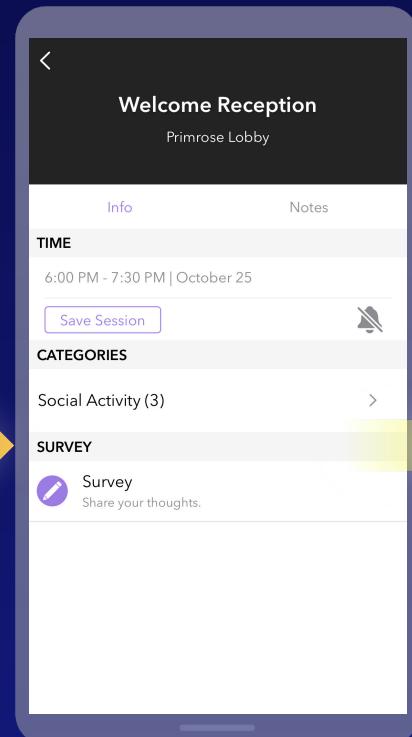
Download the Esri Events app and find your event



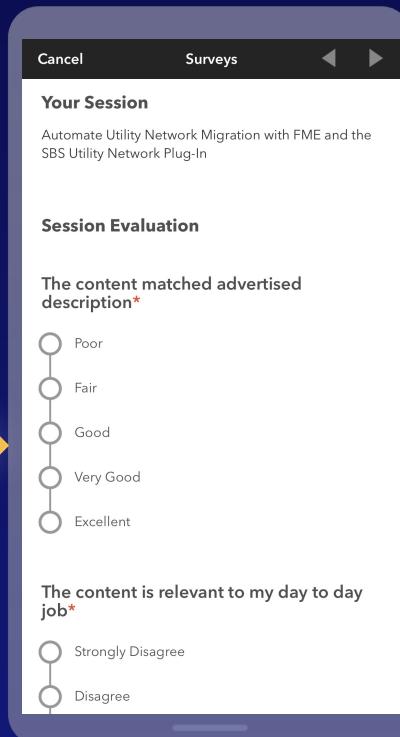
Select the session you attended



Scroll down to "Survey"



Log in to access the survey



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-  [youtube.com/@EsriDevs](https://youtube.com/@EsriDevs)
-  [links.esri.com/DevVideos](https://links.esri.com/DevVideos)
-  [github.com/Esri](https://github.com/Esri)
-  [github.com/EsriDevEvents](https://github.com/EsriDevEvents)
-  [links.esri.com/EsriDevCommunity](https://links.esri.com/EsriDevCommunity)

```
const layer = view.map.allLayers.get(0);  
view.whenLayerView(layer)  
.then(layerView => console.log(`  
// if there were problems with  
// the layer, they would appear here`))  
.catch(console.error);
```

```
const view = new ArcGISView({  
  container: "viewContainer",  
  map: map,  
  environment: {  
    lightings: {  
      directShadowsEnabled: true  
    }  
  }  
});
```



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```
const layer = view.map.addLayer(  
  view.whenLayerView(layer)   
    .then(layerView => const  
      {  
        if (there were problems)  
          catch(console.error);  
      }  
    );  
  );
```

E/SCRIPT>

```
const view = new SceneView({  
  container: "viewDiv",  
  map: map,  
  environment: {  
    lighting: {  
      directional:  
    },  
  },  
});
```

LIVE  
BY  
THE  
CODE