Esri Developer Summit

March 8–11, 2016 | Palm Springs, CA

Drawing Millions of Features in ArcGIS
Advanced Techniques

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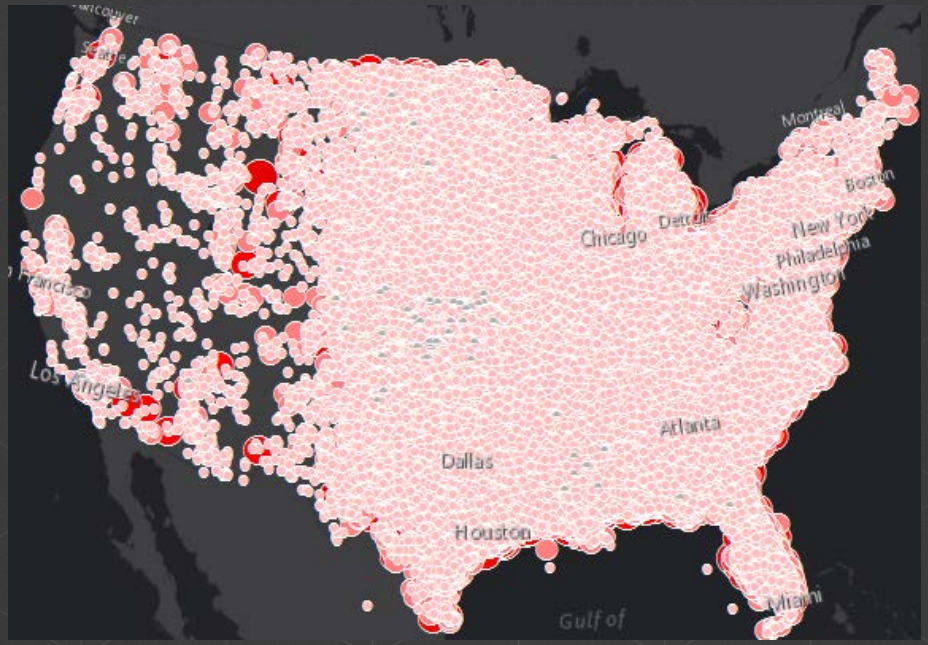
Agenda

- Topics
  - Spatial aggregation with artificial bins
  - Spatial aggregation with standardized geographies
  - Working efficiently with large time-series data

Spatial aggregation with artificial bins

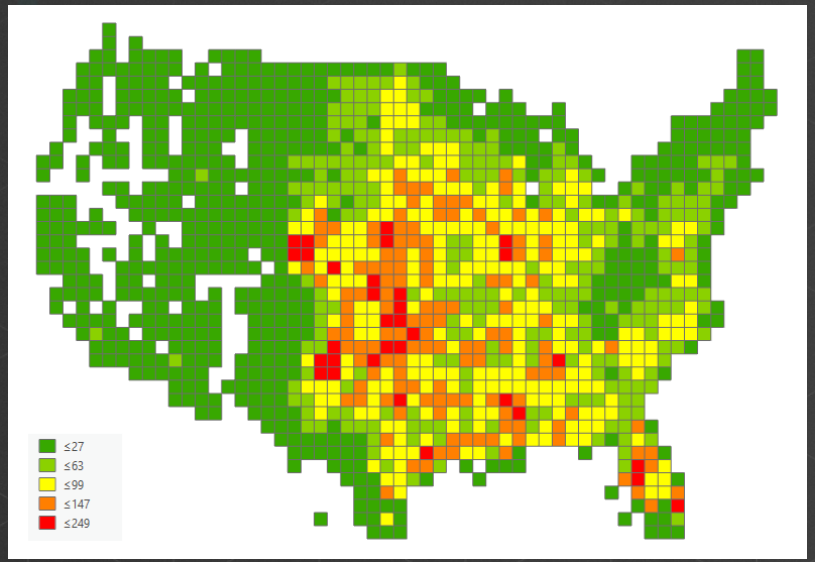
Why spatial aggregation?

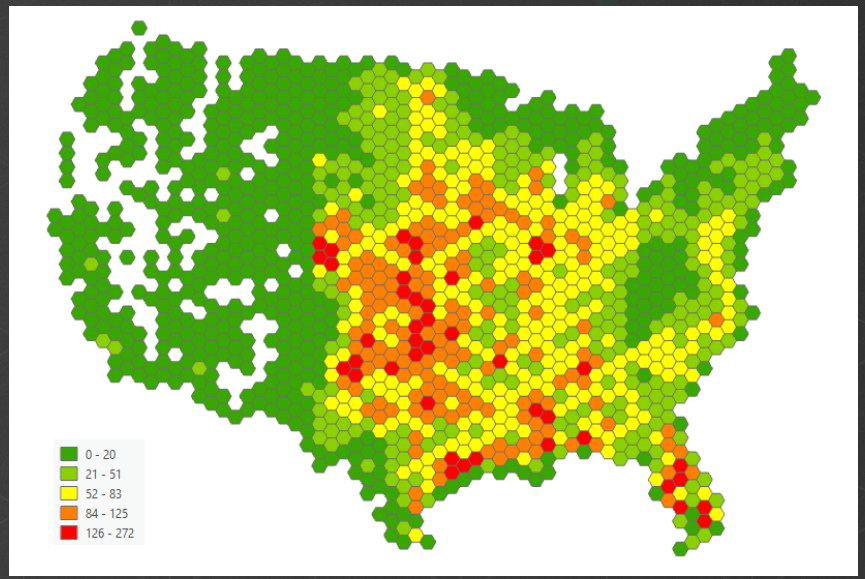
- Sometimes drawing the raw data is overwhelming and doesn’t provide any value



Artificial geography types

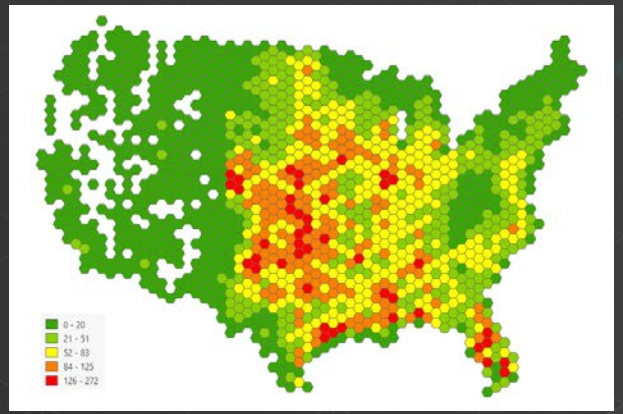
- Rectangular bins
- Hexagons (hexbins)

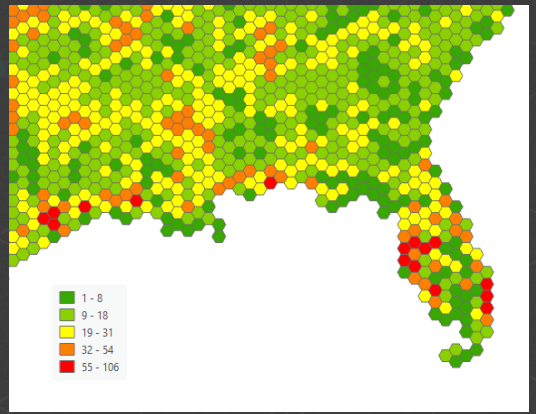


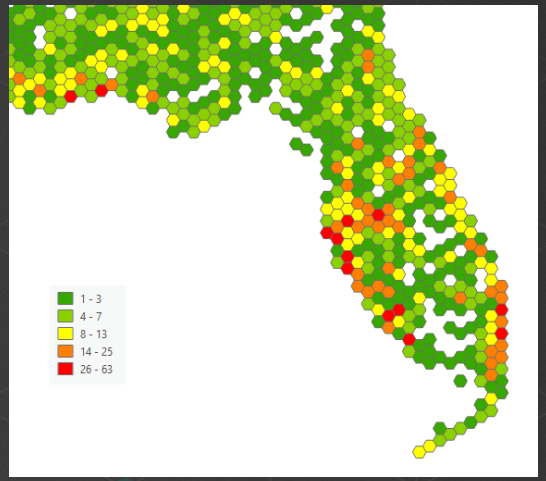


Creating geographies

- Create multiple levels to support aggregation at smaller to larger scales
- Use an equal-area projection





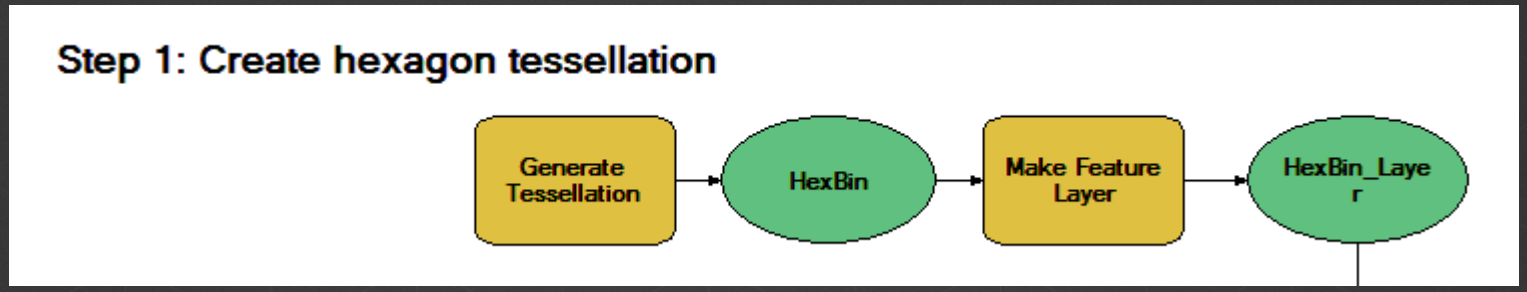


Aggregation approaches

- On-the-fly
  - Provides flexibility
  - Immediately shows updated data
  - Is appropriate for data that changes often
- Pre-calculated
  - Can have faster drawing speed
  - Requires upfront processing time from the author
  - Is appropriate for unchanging data

Pre-calculated aggregation options

- Geoprocessing tools

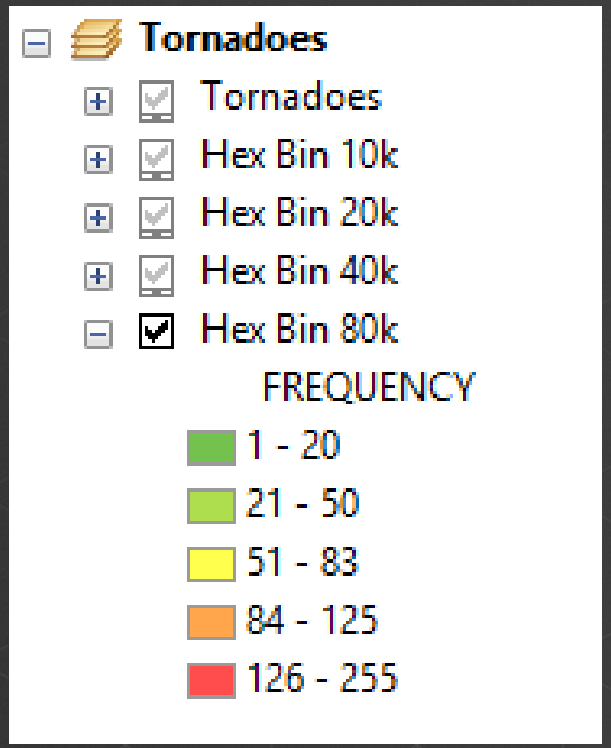


- Native RDBMS SQL

```
SELECT [..] INTO Tornado_Aggregate FROM Tornado t INNER
JOIN Tornado_Bins bins ON bins.geom.STIntersects(t.geom)
= 1 WHERE [..]
```

Authoring your map

- Set scale dependencies for each level of geography

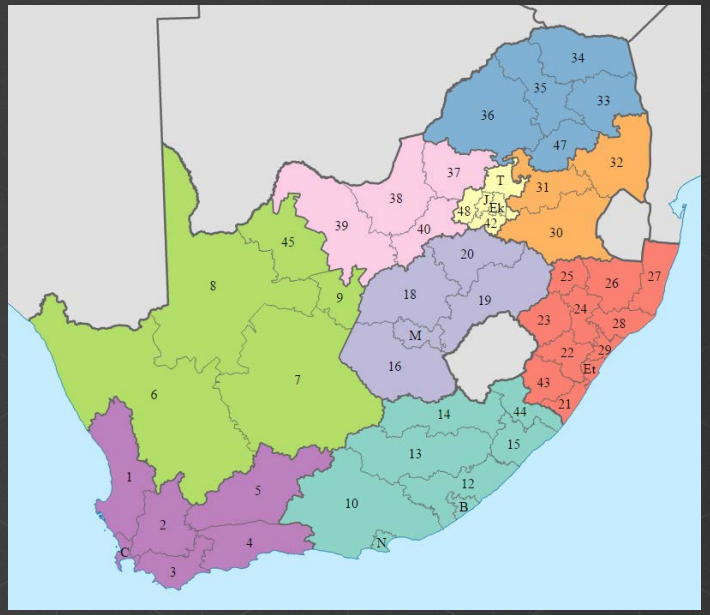


Demo: Aggregating to artificial bins

Spatial aggregation with standardized geographies

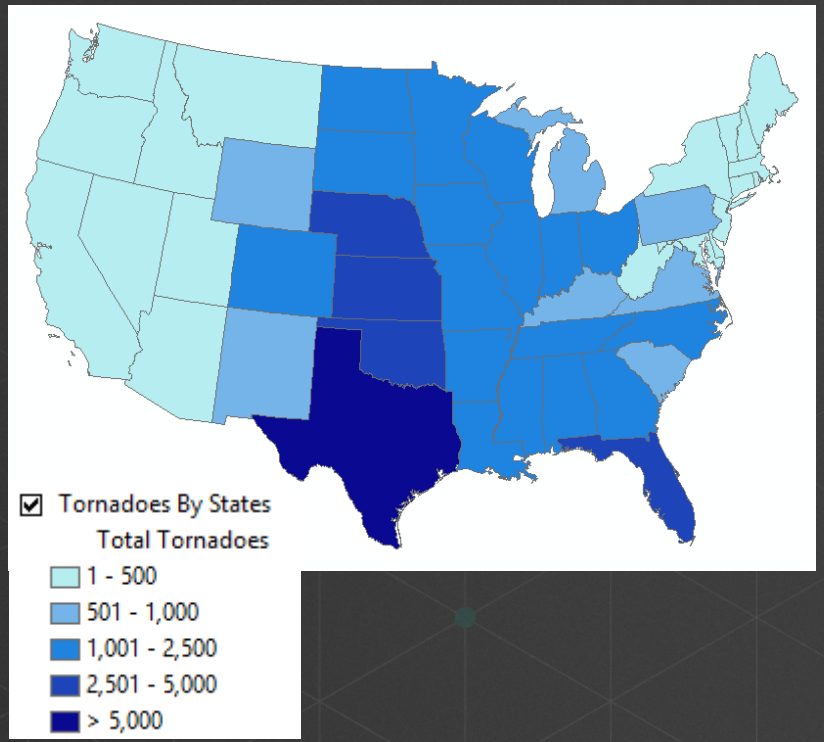
Using standardized geographies

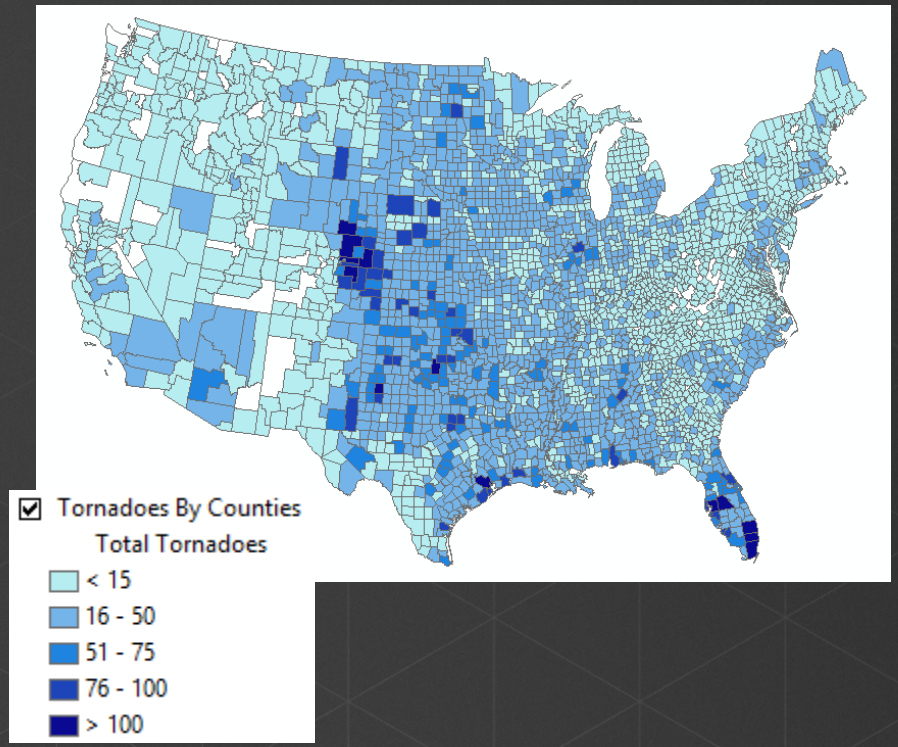
- Select the appropriate level of geography
  - South Africa example:
    - Nation
    - Province
    - District
- Do not necessarily use the most detailed geographies



South African provinces and districts

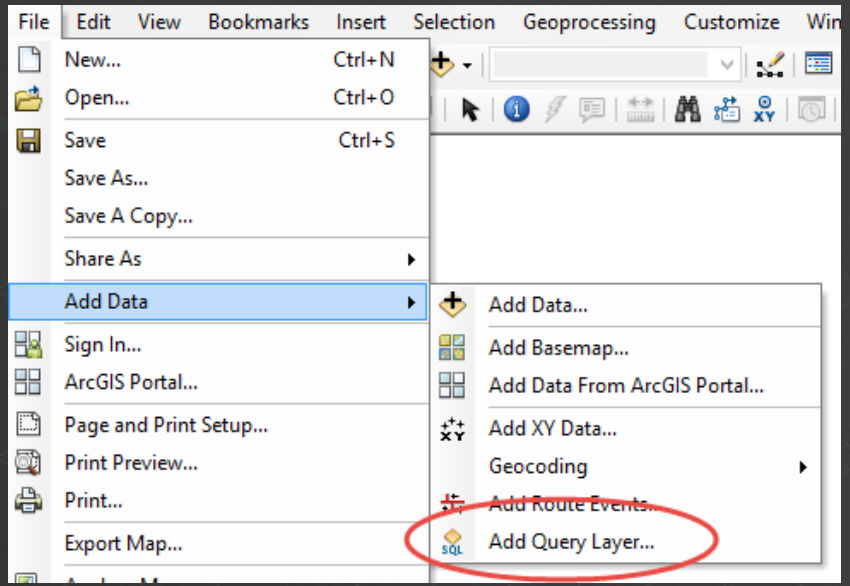
Tornado example

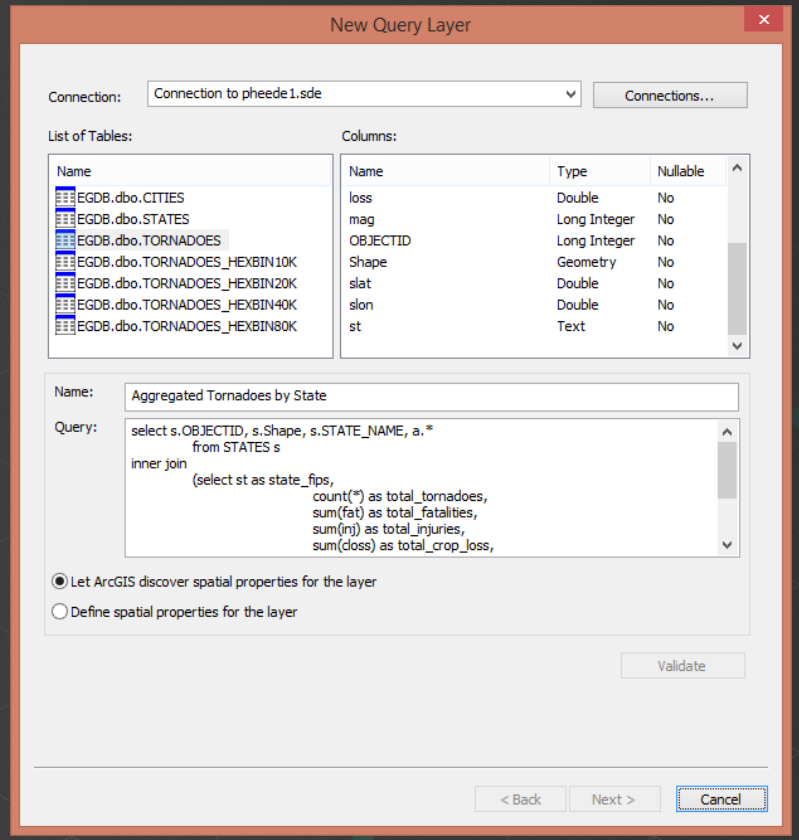




On-the-fly aggregation in ArcMap

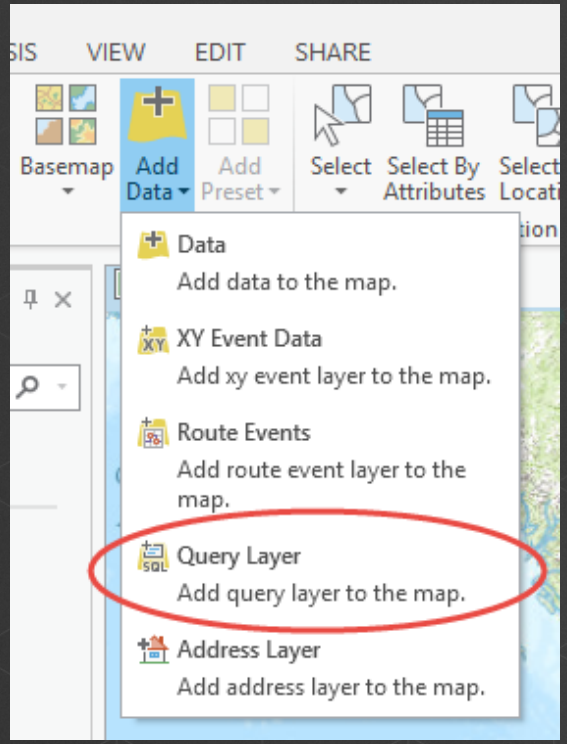
- Query layer with custom SQL

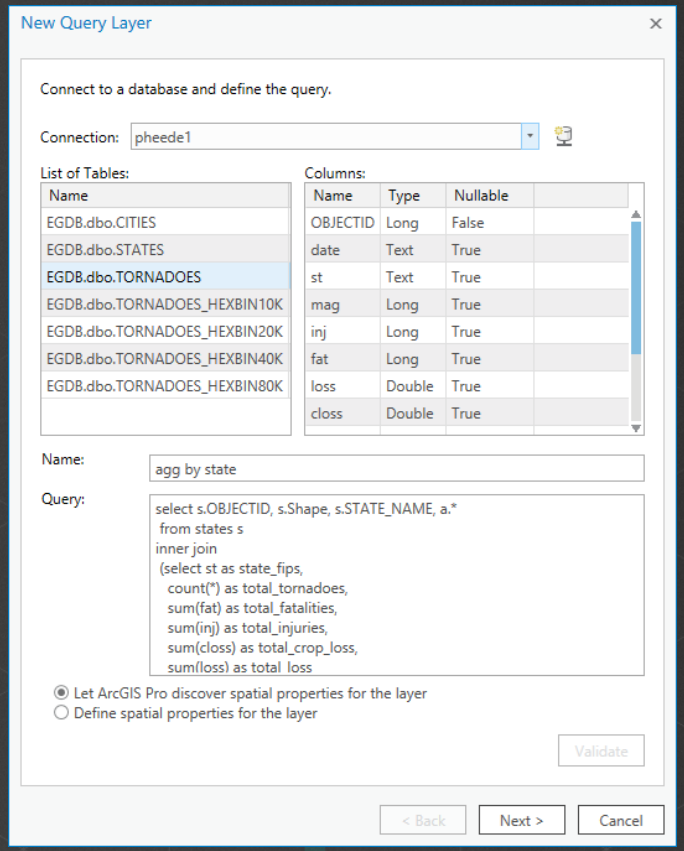




On-the-fly aggregation in ArcGIS Pro

- Query layer with custom SQL





Demo: Aggregating to standardized geographies

Working efficiently with large time-series data

Large time-series data—Example 1

- Rainfall data
  - Static geography: Point
  - Attribute data changing over time: Measurement
  - A thousand weather stations reporting once per day for 10 years would create more than 3.5 million records

Large time-series data—Example 2

- Stream data
  - Static geography: Polyline
  - Attribute data changing over time: Prediction
  - About 67,000 stream polyline segments predicted at four-hour intervals over a 10-day period creates more than 4 million records

Table

FLOW_MAP

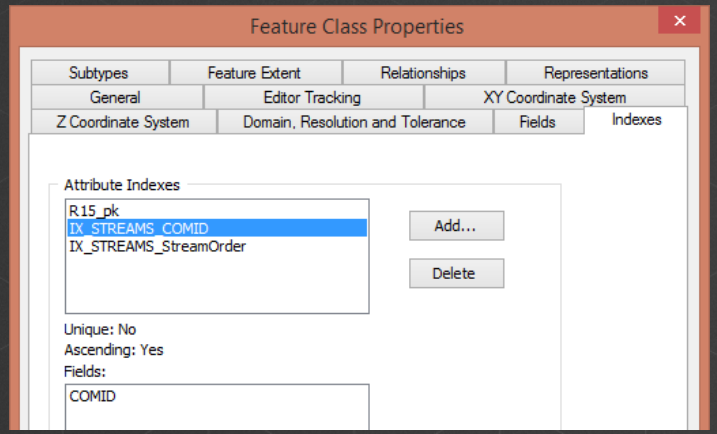
OBJECTID *	Time	COMID *	Qout	TimeValue
4037159	60	1109679	0.1213	2/10/2015 18:00:0
4037160	60	1078897	0.0908	2/10/2015 18:00:0
4037161	60	1078881	0	2/10/2015 18:00:0
4037162	60	1109689	0	2/10/2015 18:00:0
4037163	60	1109687	0	2/10/2015 18:00:0
4037164	60	1109681	0.1302	2/10/2015 18:00:0
4037165	60	1109677	0	2/10/2015 18:00:0
4037166	60	1109683	0	2/10/2015 18:00:0
4037167	60	1109755	0	2/10/2015 18:00:0
4037168	60	1109643	0	2/10/2015 18:00:0
4037169	60	1109675	0.1358	2/10/2015 18:00:0
4037170	60	1109669	0.1407	2/10/2015 18:00:0
4037171	60	1109667	0	2/10/2015 18:00:0
4037172	60	1109697	0	2/10/2015 18:00:0
4037173	60	1109657	0.3253	2/10/2015 18:00:0
4037174	60	1109641	0	2/10/2015 18:00:0
4037175	60	1109695	0	2/10/2015 18:00:0
4037176	60	1109653	0.2505	2/10/2015 18:00:0
4037177	60	1109753	0	2/10/2015 18:00:0
4037178	60	1109635	0.3094	2/10/2015 18:00:0
4037179	60	1109691	0	2/10/2015 18:00:0
4037180	60	1109665	0.1633	2/10/2015 18:00:0

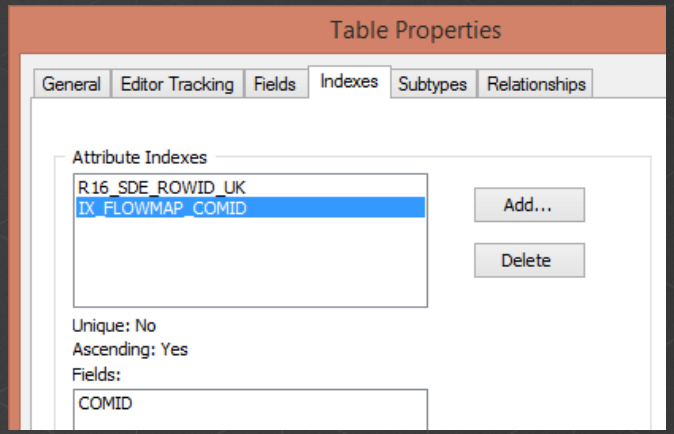
4038780 (0 out of 4038780 Selected)

FLOW_MAP

Setting up the data

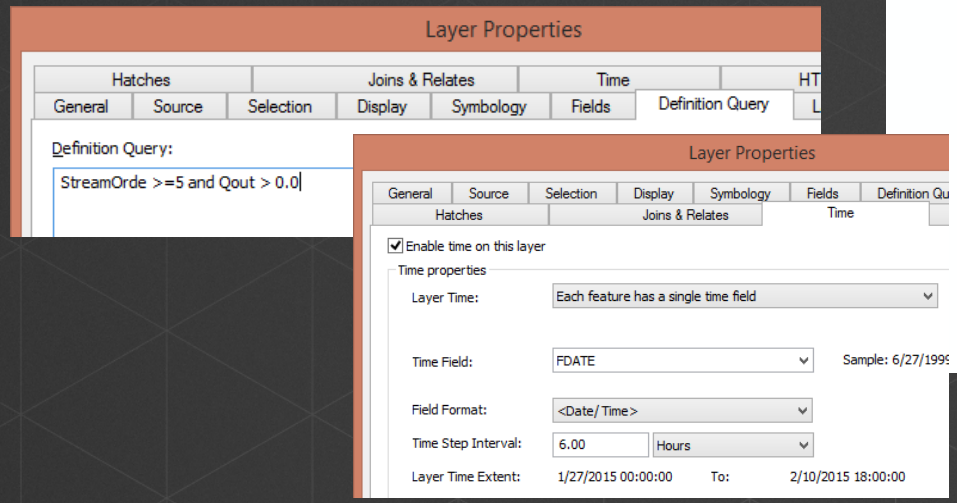
- One-to-many (1:M) join between the spatial data and the temporal records
  - All data should come from the same database
  - Database indices are required for the attributes you join against

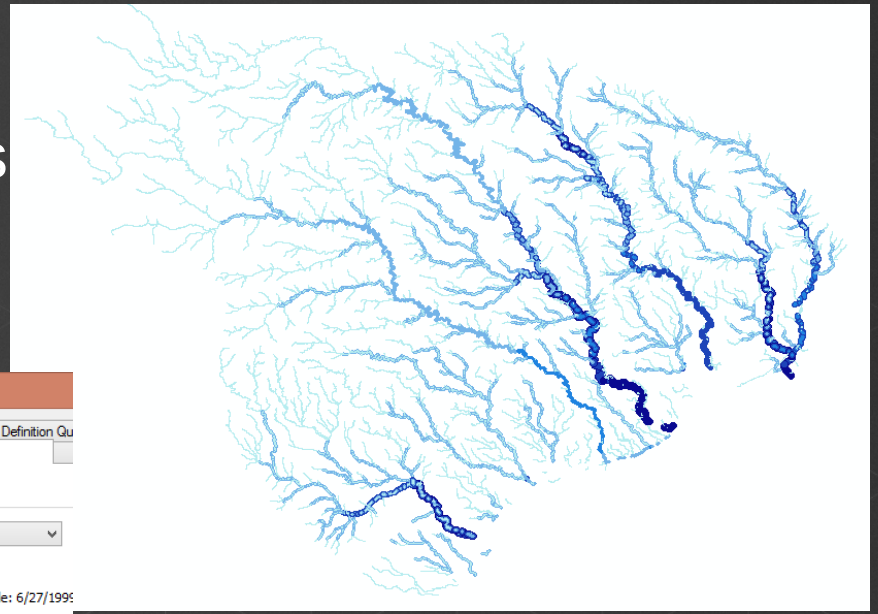




Visualizing the data

- Set up time-aware properties on the layer
- Set scale dependencies
- Create definition expressions





Software demonstration:
Working with time-series data

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