# Designing and Using Basemaps

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# Agenda

- **The ArcGIS System**

- **Basemaps are a key component of your system**

- **Cartographic design considerations**

- **Using basemap layers in ArcMap**

- **Best practices for designing basemaps for the web**

- **Design considerations for mobile applications**

# ArcGIS 10 — A Complete System

**Easier**
**More Powerful**
**and Everywhere**

Web

Mobile

Desktop

- Discover
- Create
- Manage
- Visualize
- Analyze
- Collaborate

Cloud

Enterprise

Local

# How do basemaps benefit my organization?

- **Reusable maps that can accessed as part of the ArcGIS system**

- **Provide common cartography**

- **Deliver fast performing geographic context for applications**

- **Are part of a pattern for using GIS information**

  - **Operation layer(s)**

  - **Basemap layer(s)**

# Operational layers

- **Show a focused item of interest**
- **Support functionality of the application**
- **Displayed on top of basemap**

**Crime Data**



**Service Requests**

# Basemap layers

- **Provide geographic reference**
  - **Serve as a background for operational layers**

- **Communicate clearly and effectively**
  - **Text**
  - **Symbols**
  - **Colors**

- **Simple in design**
  - **Limited to task-specific layers**

- **Perform well**

# Designing versus acquiring basemaps

- **Acquire**
  - Many basemap resources
    - ArcGIS Online
    - Microsoft Bing Maps
    - And more…
- **Design**
  - Use your authoritative data
  - Incorporate end user needs
  - Use a map template to get started

# Demo

## Design and technical considerations

- **What size will it be?**

- **What geographic extent will I show?**

- **What map scale will that make it?**

- **What map projection will I use?**

- **Will it be in color?**

- **What print resolution can I use?**

# Types of basemaps

- **Aerial**
  - **Imagery only**

- **Traditional**
  - **Streets, parcels, municipal boundaries**

- **Hybrid**
  - **Combines aerial and traditional layers**
  - **Designed as two map services or one**

# Common design principles

- **End-user requirements**
  - **Provide only relevant data**

- **Combining with other services or data**
  - **Utilize subtle symbology and text**

- **Optimize your basemaps performance**
  - **Caching**
  - **Desktop**

# Suggested basemap data

- **Contours**
- **County Boundary**
- **Hillshade**
- **Landmark**
- **Municipal Boundary**
- **National Park**
- **Park**

- **Railroad**
- **Road Centerline**
- **State Boundary**
- **State Park**
- **Waterbody**
- **Waterline**

# ArcGIS Desktop - basemap layer

- **New in ArcGIS 10**

- **Is a user-defined group of static layers that draws continuously during navigation**

- **Provides optimal drawing performance**

- **Use a high-performance drawing engine**
  - **Improves the display speed and response time of the map**
  - **Provide a continuous visual context for data that you're viewing, editing, or analyzing.**

# Adding a basemap layer in ArcMap

- **Create a new basemap layer by right-clicking on the Dataframe**
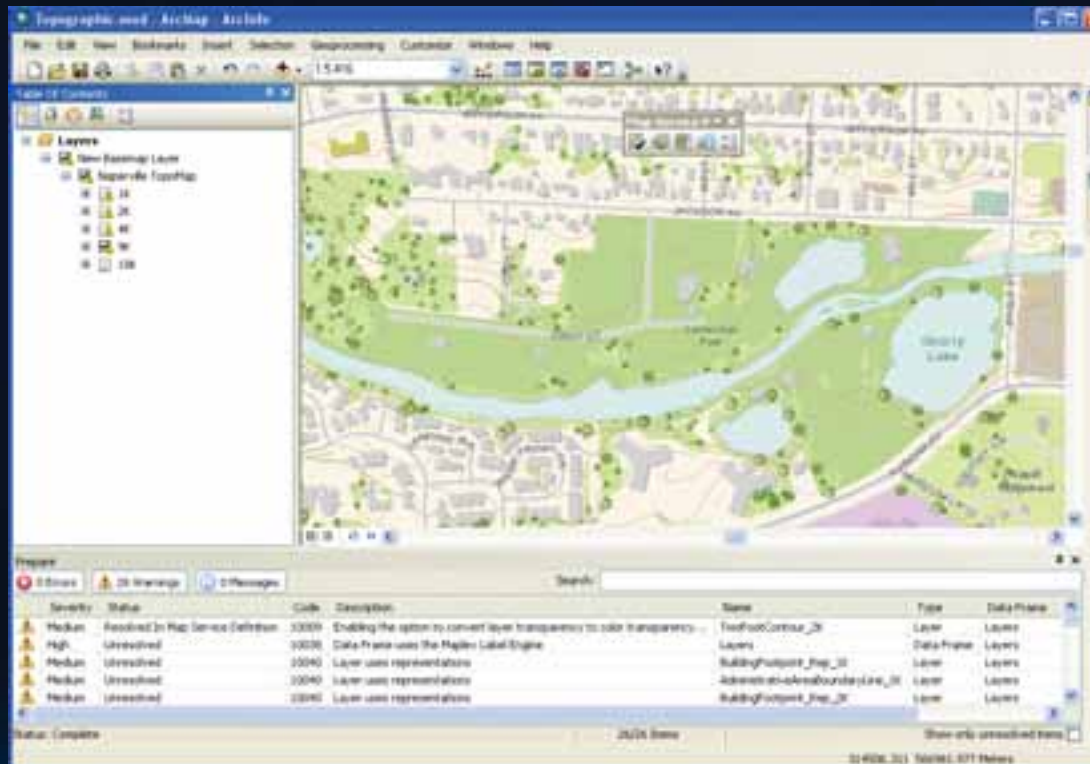  - **Add your layers to the basemap layer**
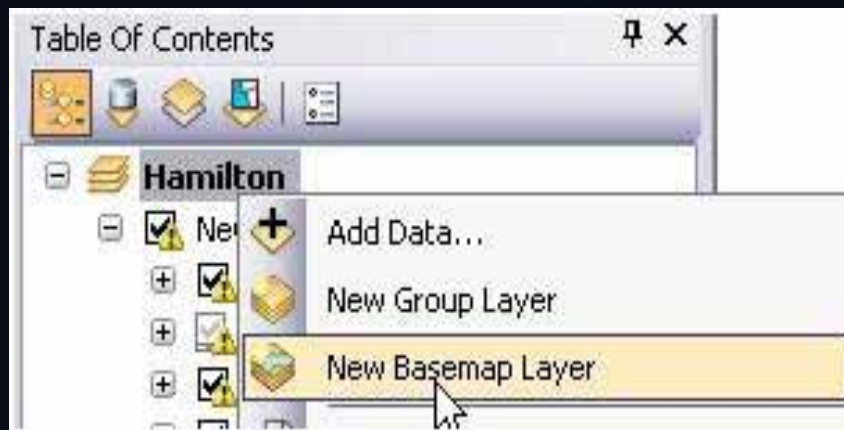
# Adding data

- **Basemap layer appear like a group layer**

- **Add your data layers to the basemap layer**

- **Add relevant data layers based on the basemaps purpose**
  - **Topographic map layer example**
    - **contours, hillshade, elevation points, physiographic feature names**

# Optimizing performance

- **Analyze your basemap layer**
  - **Determine performance problems and recommendation on how to improve**

# Sharing your basemap layers

- **Save as a layer file**
    - **User needs to have access to the data**

- **Save a layer package**
    - **Data is zipped up with the layer file**
    - **Share data and the basemap layer online**

# Demo

# Delivering basemap services using ArcGIS Server

- **Cached Map Service**
  - **Images pre-created for faster application performance**

- **Image Service**
  - **ArcGIS Server Image Extension**
  - **Image service provides dynamic access to imagery**

# Cached map services properties

- **Precomputed map image tiles**
  - **Stored on server for a range of levels of detail**

- **Full access to attribute data**
  - **Identify, Query, etc.**

- **Provides best performance and scalability**

- **Decision whether to cache basemap affects its design**
  - **Cached map accessible at specific levels of detail only**

**Level 0**

**Level 1**

# Cached map design considerations

- **Determine projection of your cached map**
  - **All cached services in Web map must have the same projection**

- **Determine scale levels based on:**
  - **Scales at which users need to view the map**
  - **Other cached services that are part of the Web map**
    - **Only those services that exist at particular scale will display**

# Choosing output image type

| | Transparency | # of colors | Storage | Best for |
|---|---|---|---|---|
| **JPEG** | No | 16 million | Lossy (1%-100% compression) | Raster /Vector* |
| **PNG8** | Yes | 256 | Lossless | Simple vector |
| **PNG24** | Yes (No in IE 6) | 16 million | Lossless | Raster / Vector |
| **PNG32** | Yes | 16 million | Lossless | Raster / Vector |

*JPEG format with quality ratio of 90 is utilized in ArcGIS Online
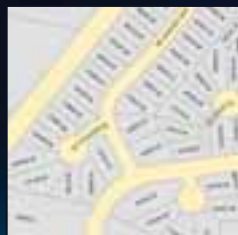
*Raster and Vector Data*
*512 X 512 pixels*
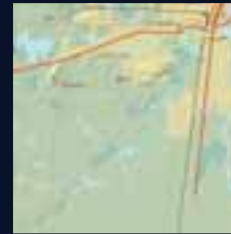
JPEG = 40 KB    PNG8= 92 KB    PNG24 = 178 KB    PNG32 = 189 KB
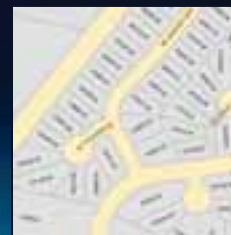
*Vector Only Data*
*512 X 512 pixels*
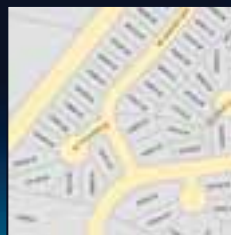
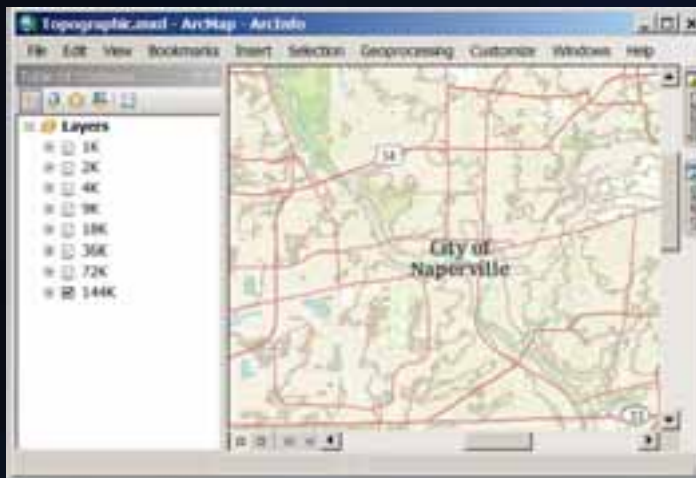JPEG = 43 KB    PNG8= 14 KB    PNG24 = 21 KB    PNG32 =  22 KB

# Map Templates

- **Contain best practices for publishing your data**

- **Are used in ArcGIS Online maps**

- **Are well designed for Web and mobile applications**

- **Are downloadable, ready to use, plug-in your data**

- **Include documents, sample data, and styles**

**Local Government Topographic**



**World Topographic Map**

# Labels vs Annotation

- **Two dynamic placement options**
  - **Standard label engine or Maplex**

- **Maplex is recommended for cached maps**
  - **Sophisticated label placement rules**
  - **Supported with MXD**

- **Geodatabase annotation**
  - **Fixed for a particular scale**
  - **Additional workflows may be required**
  - **More data to manage in geodatabase**

# Traditional basemap design considerations

- **Design layers for the cache scales**
    - Utilize group layers to set up symbology for each cache scale
    - If layer properties are consistent (e.g., symbol size), reuse layer for multiple scales

1:18,000

1:9,000

# Hybrid basemap design considerations

- **Map designed to overlay on top of imagery**
  - **E.g., avoid polygon fills on layers**

- **Choose effective font properties for text**
  - **Visible over dark backgrounds**

- **During design, add imagery to ArcMap as a guide**



**Hybrid basemap
service**



**Hybrid basemap on
top of imagery**

# Demo

# Mobile basemaps

- **Are added as a basemap layer to the application**

- **Provide geographic reference, but do not require synchronization of data**

- **Can use services from ArcGIS Server and ArcGIS Online, or using a mobile cache**
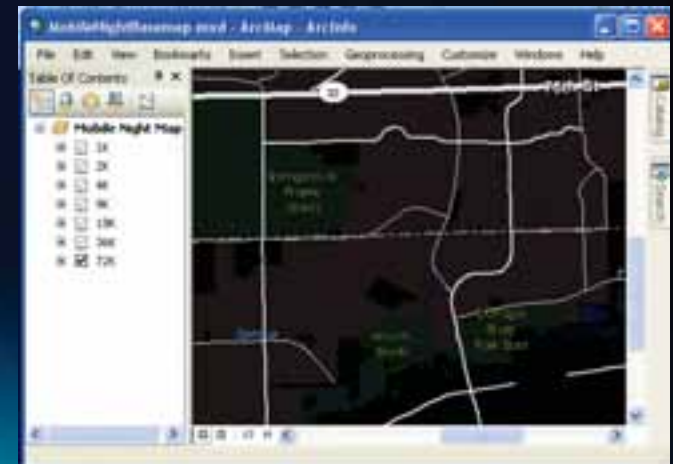
# Design considerations for mobile basemaps

- **Environmental conditions play an important part in the design**

- **Chose colors and symbols that can be easily read under different lighting**

- **Contrast of colors and simplicity is the key to the design**

- **Limit the amount of text in the map**

- **Test the maps under different lighting**

**Day**
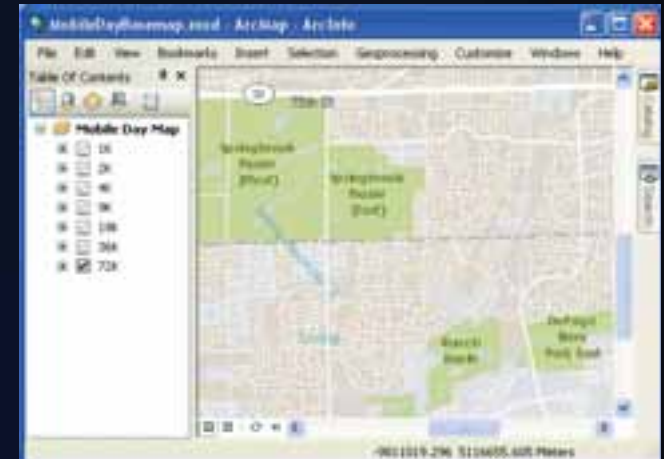


**Night**

# What device are you deploying your maps on?

- **What is the size of the screen**
- **Create scale dependency**
- **Limit the amount of data**
- **Test performance**
- **Choose simple symbols**
- **Avoid fill colors**

# Mobile basemap deployment

- **Create Mobile Map**
  - Use the Create Mobile Map tool in ArcGIS Desktop
  - Creates a mobile project file (.amp), and a mobile cache
  - Does not use ArcGIS Server services
  - Synchronize using the Synchronize Mobile Cache tool

- **Publish as a service**
  - Create a map service using ArcGIS Server
  - Build an out-of-the-box application using the ArcGIS Mobile Project Center
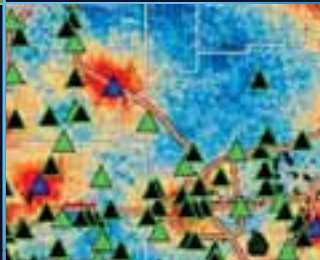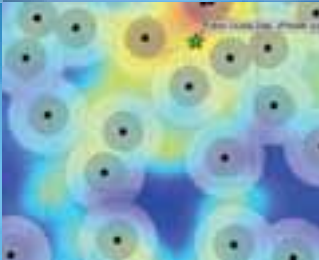
# Demo

# Conclusions

- **Basemaps underpin a new web map paradigm**
  - Simplify mapping for non-GIS users
  - Simplify mapping for GIS users

- **Basemaps contextualize in several ways to help create new maps when combined with other content**

**Questions**