Telling Stories with Maps
A White Paper

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Introduction

Maps tell many kinds of stories. They can summarize a situation, trace a route, and show change over time. They can examine causes and effects and reveal interrelationships. They can show patterns of movement and compare and contrast places. They can help people make plans, predict or model the future, and support decisions. They can explain, reveal, and propagandize.

A story map can also do all of these things. Story maps combine maps with other elements that facilitate and emphasize the message the creator seeks to convey. Title, text, legend, popups, and other visuals—graphs, charts, photographs, video, audio—help interpret the map or maps that form the centerpiece of the story. Story maps include a user experience—a set of functions presented within a user interface—that also facilitate the story. For the most part, story maps are intended for non-technical audiences. They present geographic information with the goal of informing, educating, entertaining, and involving their audiences.

Some stories are relatively simple, such as "You are here" or "Here is how to get from point A to point B." Some are more complex, such as the portraying causes and effects of drought, or the relationship between unemployment and income patterns.

Maps and Technology

Maps have been telling stories for centuries. In the past few decades, however, maps have been integrated with data analysis and supercharged with digital technologies, including geographic information systems, the Web, mobile communications, and the cloud. Thanks to these technologies, maps can be used and interacted with in a myriad of ways. Countless maps are generated and used every day—to help millions of people know where they are, to guide them to where they want to go, to locate services, to support decision-making, and to serve a multitude of other functions.

Similarly, maps can now tell stories in new ways. Maps can take you from globe to street corner in seconds; they can dynamically show change over time; they can organize and present charts, graphs, photos, and video. With the sweep of a fingertip across a tablet, map users can compare one theme with another, ask questions of maps, add their own information to maps, cast votes on maps. But these exciting new capabilities don't automatically lead to good storytelling.

Why is Esri Producing Story Maps?

As with any new medium, there is a time lag between the availability of new tools and their full and effective use. The Esri story maps team is exploring ways to use the new capabilities of digitally-enabled maps to educate, entertain, and inform in ways that are uniquely suited to this rapidly evolving medium.

Esri is developing story maps in pursuit of three goals:

- To demonstrate the power ArcGIS as a communication platform
- To showcase useful and important geographic information
- To enable thousands of people to create and publish their own stories

For the story maps team, the final goal is by far the most important and most exciting. If thousands of people make and share story maps, society will benefit. People will become more geographically aware; they will better understand the interconnectedness that makes the world work; and they will become better world citizens.

Esri is working to enable map-based storytelling by developing templates and applications, by establishing and promoting best practices, and by providing instructions on how to make story maps.
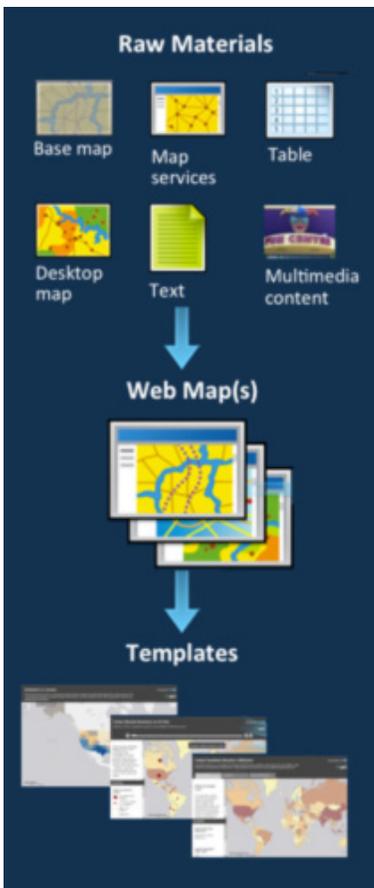
Story Maps and ArcGIS

For four decades Esri has been enabling professionals to combine geographic thinking with analytical capabilities to perform many tasks, including spatial analysis, planning, management, decision support, and situational awareness. As GIS software has evolved, and as ArcGIS has embraced Web servers and the cloud, many new opportunities have arisen for non-specialists to benefit from, and to actually utilize, the capabilities of GIS. Story maps use these capabilities to show that ArcGIS can be an effective communications platform.

In particular, story maps tap the content resources and functionalities of ArcGIS Online. Most story maps incorporate Web maps, which combine base maps, thematic maps, tabular data, popups, and other functionalities into intelligent maps that can be shared and viewed on multiple devices.

The primary means by which Esri enables people to make their own story maps is this combination of **web maps** or **intelligent maps**—built, refined, and shared on ArcGIS Online—that can then be placed into **storytelling apps** or **templates** that provide key components, including narrative elements and a consistent and intuitive user experience.

Section I of this paper describes some of the **general principles and elements** that story maps share:

1. Story
2. Text
3. Spatial data
4. Cartography
5. Supporting content
6. User experience

Raw Materials

Base map

Map services

Table

Desktop map

Text

Multimedia content

Web Map(s)

Templates

Section II itemizes and discusses the various **kinds of story maps.**

1. Locating something
2. Providing directions
3. Describing a place
4. Explaining a geography-related topic
5. Summarizing a status or situation
6. Comparing two or more themes
7. Comparing two or more places
8. Showing change over time
8. Forecasting the future
10. Providing a narrative
11. Presenting a briefing
12. Enabling participation

Section I. Elements of Story Maps

Nearly all story maps share these common elements: the story or narrative component itself, text, spatial data, cartography, supporting content, and user experience.

1. Story

"Story" in this context is not a traditional text-based narrative; rather, it's the concept or message that a story map is intended to communicate. Text is an essential component of most story maps, but it plays a supporting role, with the map or series of maps taking center stage.

The best story maps deliver a clear message to a well-defined audience, and are useful to that audience by providing a service, presenting interesting and useful information, or providing entertainment. Their content and user experience should be appropriate to the audience's level of knowledge and ability. Other elements of a successful story:
- Clear and simple presentation
- A manageable number of elements that
- Ease and clarity of navigation

If your story is complex, it's possible that it should be made into several story maps. A complex story map may be acceptable in some contexts, but only if your audience is highly motivated. That may be true within some workplace environments, but it's not true even of most professional audiences.

2. Text

Text for stories published in digital media should be as brief as possible. In most cases, Internet and mobile users aren't willing to read very much. Your maps should tell most of your story; the text is like a narrator or guide, to help the user interpret the map.

Your story should have a title that's engaging and descriptive. The user should

have a good notion, from the title alone, what he/she should expect. Supporting text for the story should be as brief as possible. Text within popups and graphics should be confined to a phrase or a single sentence. Other best practices:

- Use active verbs, even in the title (especially in the title, if possible)
- Cut to the chase: Put key information in the first sentence or two of each item of text; supporting material should come later. That way, someone skimming the text will understand the essential concepts.
- Avoid technical or scientific jargon

3. Spatial data
Story maps are derived from a variety of sources. These include:

- Existing maps
- Aerial or satellite images
- GIS data published as a map service
- Tabular data with location information
- Mash-ups, or combinations of various maps

Regardless of the data type, only content that directly supports the story should be collected and included; if it doesn't, it should most likely be deleted. It should come from a credible source, and the source or sources should be cited within the story.

4. Cartography
Good cartography—that is, attractive and understandable representation of spatial information—is essential to a good story map.

A shortcoming of many maps, especially GIS-derived maps, is that their creators too often are preoccupied with the data or subject matter itself, and give short shrift to the representation of the data. Just as a brilliant scholar may fail to reach an audience because his or her language is dense and technical, a map may fail to communicate because its data is poorly represented. Maps are information products. They're expressions of data, but they also inform an audience: they tell the story of the data.

So it's likely that you'll need to modify, simplify, and enhance the map you're using (unless it has already been optimized for web use—and perhaps even then) in order to effectively tell your story.

Here, briefly, are some guidelines that will help you create a map that successfully tells its story. Esri's Mapping Center provides rich resources—including articles, blogs, and tutorials—that give useful guidance on cartographic design. Here, briefly, are some basic principles:

- Strive for a design that is clear, simple, pleasing to look at
- Map elements should reflect and support the story
    - The main subject(s) of the story should also be its most prominent visual elements
    - Eliminate non-essential items
- Scale: it's usually desirable to limit the range of scales at which users can view

your stories. Most data isn't equally valuable or understandable at all scales.

   • Visual hierarchy: The information that's most important for your story should also be the most prominent element of your map.

   • Include a legend with easy-to-understand labels for data categories, but strive to make map as self-explanatory as possible.

   • Use color judiciously:

      • Use brighter colors for main subject, and subtler colors for the background

      • Think about, and take advantage of, the subliminal messages and associations we all make with color (green, for instance, isn't associated with demographic data).

      • Avoid using every color of the rainbow. Limited color palettes are often the most pleasing and successful.

   • Symbology: Make map symbols and icons simple and graphically strong; avoid icons with lots of detail and several colors.

   • For most stories, keep type and labeling to a minimum.

5. Supporting content

Popups, graphs and charts, and multimedia content can make your story a rich and satisfying experience. However, too many elements can clutter your story and obscure its message.

- Popups spawned by clicking or mousing over map elements are a great way for users to explore your map and understand its details.
- Graphs and charts can expand on the data represented on a story's maps. Charts should be simple and clear, with titles and labels to interpret them.
- Multimedia content, including photos, video, and audio can bring locations to life and add character and interest to stories. If they're poorly used, they can also distract and clutter a story.

6. User experience

The user experience, or the design and presentation of interactive functionalities, should be as intuitive and unobtrusive as possible.

- Don't let the controls and functionalities steal the spotlight; avoid gratuitous or unnecessary animations or other bells and whistles
- Limit interactive elements so that users don't have to figure out several functions
- Keep interactive elements simple. If you have to explain to users how to navigate your story map, it's likely too complicated
- When possible, test your story on some users before publishing it

Section II. Kinds of Story Maps

Everyone seems to interpret the term "story map" differently. One might argue that some of the maps listed below aren't storytelling maps. For the sake of this essay, we're using a liberal definition, on the assumption that every map tells at least a basic story of some sort.

Students of cartography and GIS learn early on that information is portrayed on maps in three different forms: Points, lines, and polygons. Story maps use all three forms in various combinations, but certain kinds of maps tend to use one of these features more often than others. The use of points, lines, and polygons in different types of storytelling maps are summarized below, using these symbols:

- • Points, signifying locations
- — Lines, signifying routes and linear features
- Δ Polygons, signifying areas or region.

Storytelling maps often defy easy categorization. The list below summarizes the most common map types, but storytelling maps often combine elements of two or more of these types.

### 1. Locating something (most often •, with — and Δ In supporting roles)

Perhaps the simplest story a map tells is to locate or orient the user. The map provides reference points familiar to users so that the subject location can be placed relative to familiar features and landmarks. Locators tell you that you are here, or that the thing you're reading or learning about is here. Locators are rarely interactive, because the most effective locators are usually the simplest, and don't require sophisticated functionality.

2. Providing directions (— between • with O sometimes in supporting role)

Millions of web and smart phone users are served by applications that provide directions from one location to another, or among a series of locations. Route maps can be simple and static, and they can be highly interactive, providing sequential instructions to users, and enabling users to explore alternate routes.

3. Describing a place (• — Δ)

Many maps depict a location or region in order to give the user a sense of its character. Street maps, highway maps, and reference map provide the basic services of locating points of interest and depicting roads, trails, buildings, and other features. Many places have special stories associated with them; maps of Gettysburg, Disney World, and Grand Canyon will likely emphasize very different features. Interactivity, especially popups associated with icons or other map elements, can greatly enrich these maps.
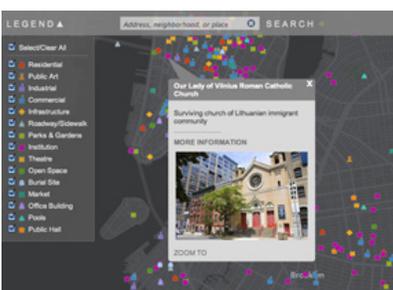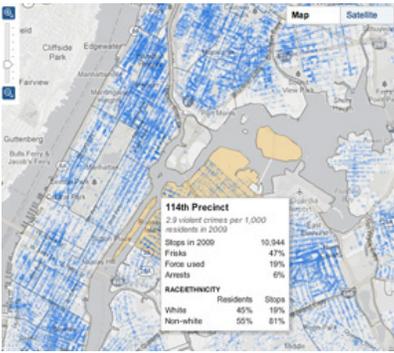
- • User interfaces
  - • Icons and popups for points of interest. Example: New York City Place Matters (left)
- • Tips and best practices
  - • Emphasize features of most interest to users, or that best tell your story
  - • Present basic geographic features as a background or context; emphasize the special features that tell the unique story of the place

http://storymaps.esri.com/placematters/

4. Explaining a geography-related topic (• — Δ)

Many maps are created to explain something: the extent of damage from an earthquake, the number of registered voters in an area, the pattern of vegetation in a national park. These maps may depict the results of a research project or spatial analysis. Most of these stories involve presenting one or more thematic maps

atop a basemap.

- User interfaces:
    - Mouseovers and popups can provide rich information that reinforces or expands upon map elements.
    - For topics with a number of elements, two or more themes may be made accessible in a variety of ways (see comparing themes, below)
- Examples: The New York Times publishes some of the best storytelling maps in the world. This map examines police behavior in different parts of New York City.

5. Summarizing a status or situation (• — Δ)

Many professionals in fields such as emergency response, utilities, or facilities management use maps to monitor the status of systems or to help keep track of an ongoing issue or crisis. This sort of map can be very informative for general audiences as well. Perhaps the most familiar status map shows the track, location, and projected impact of a hurricane (which makes it both a change-over-time map—see below—and a status map).

- User interfaces for summarizing a situation
    - Many situation maps combine the ability to toggle among thematic maps with clickable icons representing locations of facilities and events
- Examples: Esri's Horn of Africa Drought Crisis map

6. Comparing two or more themes (mostly Δ but also often • —)

Story maps often compare and draw parallels between two or more phenomena or themes. This story, for instance, relates patterns of health insurance coverage to the distribution of Hispanics and to median household income. Comparison maps can take many forms and serve many purposes. They frequently seek to explain a phenomenon or trend by comparing it to other themes that may be causes or influences on the subject being explored.

- User interfaces for comparing themes
    - Toggle back and forth between themes
    - Overlay one on another
    - Display two or more themes side by side. Example: Appalachian Trio story map (left)
    - Display two themes and enable users to swipe back and forth for easy comparison. Example: Swipe tool template
- Tips and best practices
    - Scale and extent should be consistent among the themes being compared
    - Text should help interpret the themes and explain how they relate
    - Popups can be used to summarize key data points in the themes being compared

7. Comparing two or more places (• — Δ)

Maps can compare and contrast different locations. To some extent, a reference atlas enables users to compare locations by presenting a series of maps using consistent styles and symbologies. But places can be more specifically compared to show, for instance, how similar land uses have different patterns in cities around the world.

- User interfaces for comparing places are similar to comparing themes:
    - Toggle back and forth
    - Overlay one on another
    - Display side by side
    - Side by side with a slider
    - A series of similarly styled maps (namely, an atlas)
- Tips and best practices
    - Use consistent scale and symbology; don't require user to compare apples and oranges

8. Showing change over time (mostly Δ but can be arrays of • and —)

Most maps represent the earth's three-dimensional surface on a two-dimensional sheet or screen. Some maps also seek to represent the fourth dimension of time. Just as maps compress space through scale, temporal maps compress time by a variety of techniques.

- Designs and user interfaces for representing change
    - A pair of maps: Before/after; then/now; now/future
- Side-by-side; slider; toggle
    - A series of maps shown together in an array
    - A series of maps shown in sequence and linked to a timeline or time slider. Well-designed timeline tools can enable users to view maps in rapid sequence, simulating an animation, and to pause to more closely study individual maps. Example: The Cellular Explosion story map (left)
    - An animation. Animations can show temporal change in dramatic fashion. Access to detail in individual maps is usually sacrificed to emphasize dynamism. The Cornell Lab of Ornithology has produced animations that combine thousands of bird observations to depict migration patterns (left).
- Tips and best practices
    - The human eye is very sensitive to change and movement, so showing maps in sequence makes it easier for users to detect changes than showing change side-by-side.
    - Timeline performance can be compromised if individual maps need to be downloaded to the user's device.


http://storymaps.esri.com/mobilephones/
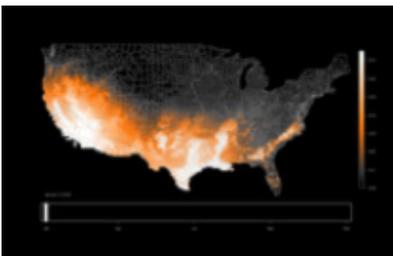
9. Forecasting the future (mostly O but also • —)

These story maps are similar in form to maps that show change over time, but their emphasis is on the future. These maps often use the same devices as temporal maps, but they may need to also explain the model or analysis on which the prediction is made.

- User interfaces for showing forecasts
    - Single map of predicted future state
    - Series of sequential maps: flow, model, etc.
    - Animation
    - Series of thematic maps.
- Example: The Nature Conservancy's Climate Wizard (left) enables users to choose geographies, time parameters, and themes (temperature and precipitation) to explore the potential impacts of climate change.

http://www.climatewizard.org/

10. Providing a narrative (• and — with Δ In supporting role)

In some sense, all story maps are narratives. We're defining narrative here as a separate form for those cases in which the primary organizing principle for a story is its sequential nature. Narratives can move users across space, through time, among a sequence of themes, or a combination of all three.
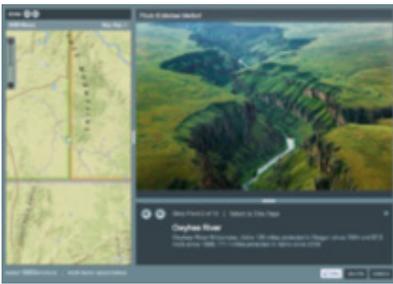
- User interfaces for narratives
    - A series of pages, with one map per page
    - A route on a map with a series of labels or popups
    - A series of icons and popups that are clearly numbered or linked together in a sequence
- Example: National Geographic's GeoStory player effectively combines maps, text, and multimedia content into a three-panel viewer. A gallery of GeoStories is at geostories.org.
- Example: ArcGIS Explorer Online enables users to create PowerPoint-style narratives and presentations incorporating web maps and other map services (left).

http://www.geostories.org

http://www.arcgis.com/explorer/?present=41d2d84b410e4e1db3e2c8c29f013a5d

11. Presenting a briefing (• — Δ)

Story maps can assist managers and policy-makers in understanding issues and making decisions. Traditionally, briefing documents have been static documents, with maps playing a supporting role to text. Briefing documents can now do much more, with intelligent web maps providing interactivity, continual updating, and the ability of users to sketch and comment on maps. For the most part, these opportunities have not yet been fulfilled.

- User interfaces could include: web and mobile experiences; links between text and dynamic maps; integration of photos and videos; ability of users to draw on maps and make comments.
- Example: ArcGIS Explorer Online (above)

12. Enabling participation (primarily • with — Δ in secondary role)

Web and mobile applications enable users to actively participate in mapping. Volunteered Geographic Information (VGI) has empowered thousands of enthusiasts to help compile and update street maps and other base maps; examples include Open Street Map and the "authoritative crowdsourcing" of Esri's World Topographic Basemap by scores of local, provincial, and national agencies. VGI is also a key component of more specialized maps and apps that enable users to add their own content or express their own opinions.

- User interfaces for VGI: Interfaces need to provide ease of use, and to reduce or eliminate barriers to participation such as registration requirements.
- Well-designed interfaces and user experiences can encourage appropriate content by defining the kinds of contributions being sought. For instance, "Places I Love" provides categories of outdoor recreation to help focus user contributions.

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