



# Designing Great Maps for **Web and Mobile**



Allen Carroll and Larry Orman

# About Allen and Larry



## Allen Carroll, Program Mgr, Storytelling

- Family cartographer and navigator since age 5
- 27 years at National Geographic, 12 of them as Chief Cartographer
- Believer in the power of maps to inform and inspire



## Larry Orman, Exec. Dir. GreenInfo Network:

- Magic marker map maker for years pre-GIS
- 19 years NGO advocacy and 19 geotech world
- Maps are a powerful lens for seeing the world



# Why we're here



# About this workshop series

#1: General Overview

#2: Print/image

#3: Web/mobile

# What we'll cover in **this** **session**

- 1** What's different about maps in the digital age?
- 2** Elements of digital maps
- 3** The process: it's linear...sort of
- 4** CLUES to making great maps
- 5** Some tips on designing digital maps
- 6** What to remember

But first, a **quiz** for you



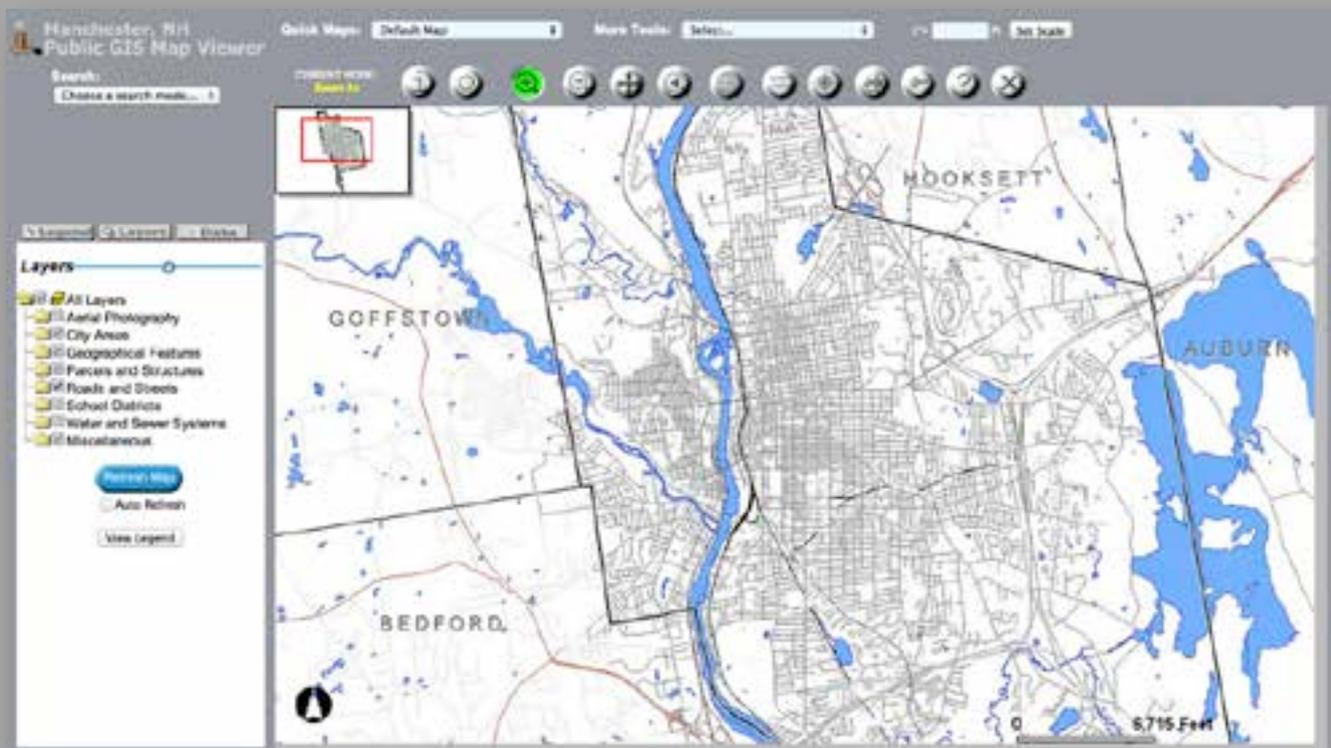


We'll ask . . .

- **What** is this map/site about?
- Is it **appealing** to you?
- Would you **stick around**  
...or move on?



1?





or 2?

Presentación Guía temática Búsqueda

## Momentos de Sevilla

Sevilla, Real Academia de Bellas Artes de San Fernando

SEVILLA [www.sevilla.org](http://www.sevilla.org)



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14

En las calles de Sevilla se puede ver una rica colección de esculturas, fuentes, establos, mosaicos y otras piezas que hacen gala de un gusto refinado. Cuenta otra historia de Sevilla desde el siglo I hasta la edad contemporánea. Importantes autores como Diego de Perugina, Antonio Susillo, Manuel Delgado Descomsburly, Lorenzo Coullaut Valera, Roberto Macía y Eva Forés dejaron su huella.

La guía muestra 54 piezas catalogadas por el Servicio de Proyectos y Obras de la Gerencia de Urbanismo. Son solo una pequeña parte de los 1.385 elementos que contiene el inventario.

[Mostrar lista](#)

Gerencia de Urbanismo  IDE 





1?

The image shows the EPA EnviroAtlas web application interface. At the top, the EPA logo is displayed with the tagline "United States Environmental Protection Agency". Navigation links include "LEARN THE GOALS", "SCIENCE & TECHNOLOGY", "LAWS & REGULATIONS", and "ABOUT EPA". There are also links for "Advanced Search" and "A-Z Index".

The main content area features a map of the United States with several overlays. A "People and Built System" panel is open on the left, showing a list of demographic filters under the heading "National ACS (2008-2012)". The "National Demographics" section is expanded, showing a list of filters with checkboxes:

- Total Population
- Population Density (per square mile)
- Percent Minority
- Percent Below Poverty Line
- Percent Age Less Than 18 Years Old
- Percent Age Less Than 65 Years Old
- Percent Population Age Greater Than 64
- Percent Housing Units Built Before 1950
- Percent 25 Years and Over (2008) Less Than 25
- Percent 25 Years and Over (2008) At Least 25

Below the list is a "Community" section. On the right side of the map, a "Map Legend" panel is open, showing "Boundaries" (States, Counties) and "National Demographics".

At the bottom of the page, there are logos for EPA, LandUse, NRCS, and USGS. The footer contains the text "EPA Home | Privacy and Security Notice | Contact Us" and "Last updated on 5/16/2014". There are also icons for "Track My Mail", "EPA Website", "Blog", "Email Alerts", and "Feedback". A circular logo is visible in the bottom right corner.



or 2?





1?

The screenshot displays the 'My Neighborhood' website interface. At the top, there is a search bar with the text '424 N PENNSYLVANIA ST' and a dropdown menu for 'City, County & Neighborhood' set to 'Indianapolis'. Below the search bar is a map of the city grid with a red pin marking the location of 424 N PENNSYLVANIA ST. To the right of the map, the 'Neighborhood Search Results' section is visible. It shows the search criteria and a list of nearby clinics.

**My Neighborhood** *IndyGov*

Search by Address or Name

Enter Your Address Below  
424 N PENNSYLVANIA ST

City, County & Neighborhood  
Indianapolis

Neighborhood Search Results

You searched for (424 N PENNSYLVANIA ST) | Neighborhood - Meridian Kessler

[View Details for 424 N PENNSYLVANIA ST on the Map](#)

**Neighborhood Information**

- Child Care
- Cultural Amenities
- Education
- General Neighborhood
- Health Care

**Clinics**

Search Distance:

[View this information](#)

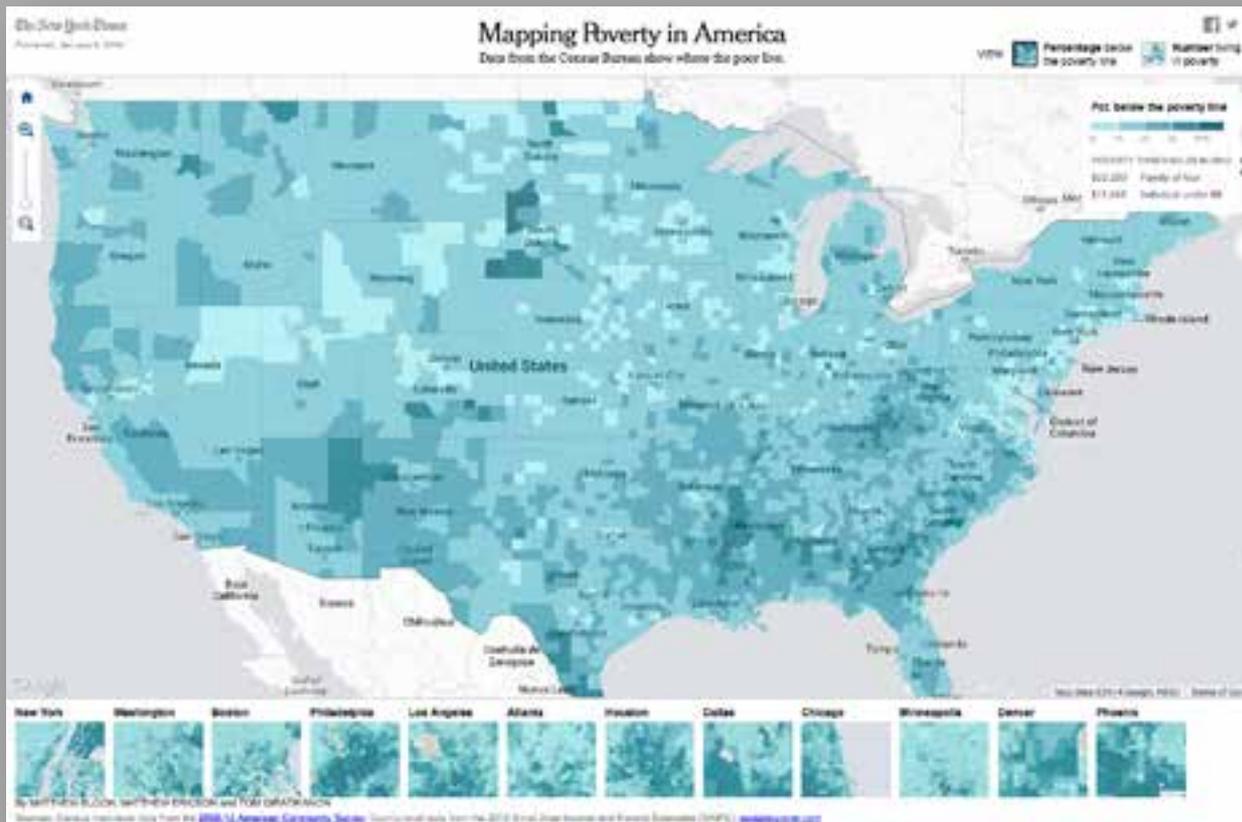
[City Information for 424 N PENNSYLVANIA ST](#)

[View Data Source Information](#)

| Get Directions                 | Service Type                   | Name  | Address                |
|--------------------------------|--------------------------------|---|------------------------|
| <a href="#">Get Directions</a> | Community Clinics for All Ages | Citizens Health Corporation - Health Clinic           | 1352 N COLLEGE AVE     |
| <a href="#">Get Directions</a> | Community Clinics for All Ages | Health & Hospital Corporation of Marion County        | 5711 DR M L KING JR ST |
| <a href="#">Get Directions</a> | Community Clinics for All Ages | Health & Hospital Corporation of Marion County        | 2908 E 38TH ST         |
| <a href="#">Get Directions</a> | Community Clinics for All Ages | Parish Manor Health Center (Disputed Health Services) | 3740 E 38TH ST         |
| <a href="#">Get Directions</a> | Community Clinics for All Ages | Health & Hospital Corporation of Marion County        |                        |



or 2?





# Lessons?

- **First** impressions matter!
- **Attractive** designs, accessible interfaces are key
- **Simplicity** is vital

# How **your brain** perceives



<1 second

**PRE-ATTENTION**



1-3 seconds

**RECOGNITION**



3-20 seconds +

**COGNITION**

1



What's different about  
maps in the **digital age?**

# Cartography in the Digital Age

How have digital media changed cartography?



The good news...



...and the bad news

# Cartography in the Digital Age

How have digital media changed cartography?



Small screens = small maps



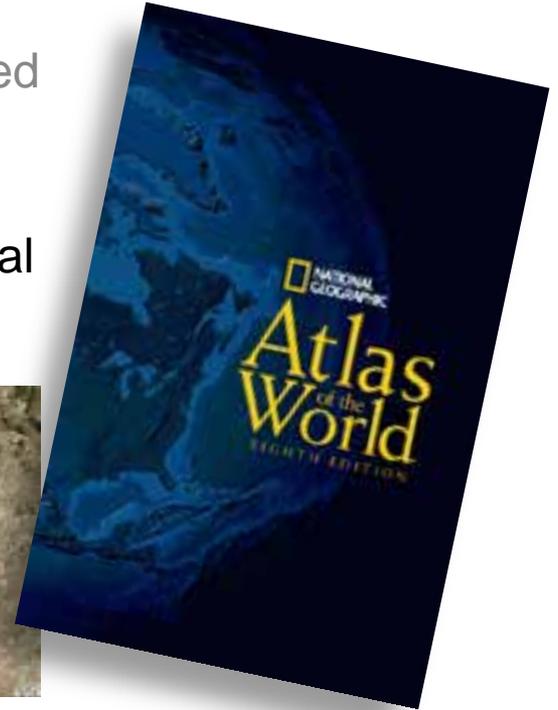
Maps must compete in a blizzard of information...hold their own in an ADD world

# Cartography in the Digital Age



How have digital media changed cartography?

Maps on the web are ephemeral  
(how long will our work last?)



# Cartography in the Digital Age

How have digital media changed cartography?



Cartography now includes a whole range of user experiences

...maps can zoom, change, and move

# Cartography in the Digital Age

How have digital media changed cartography?



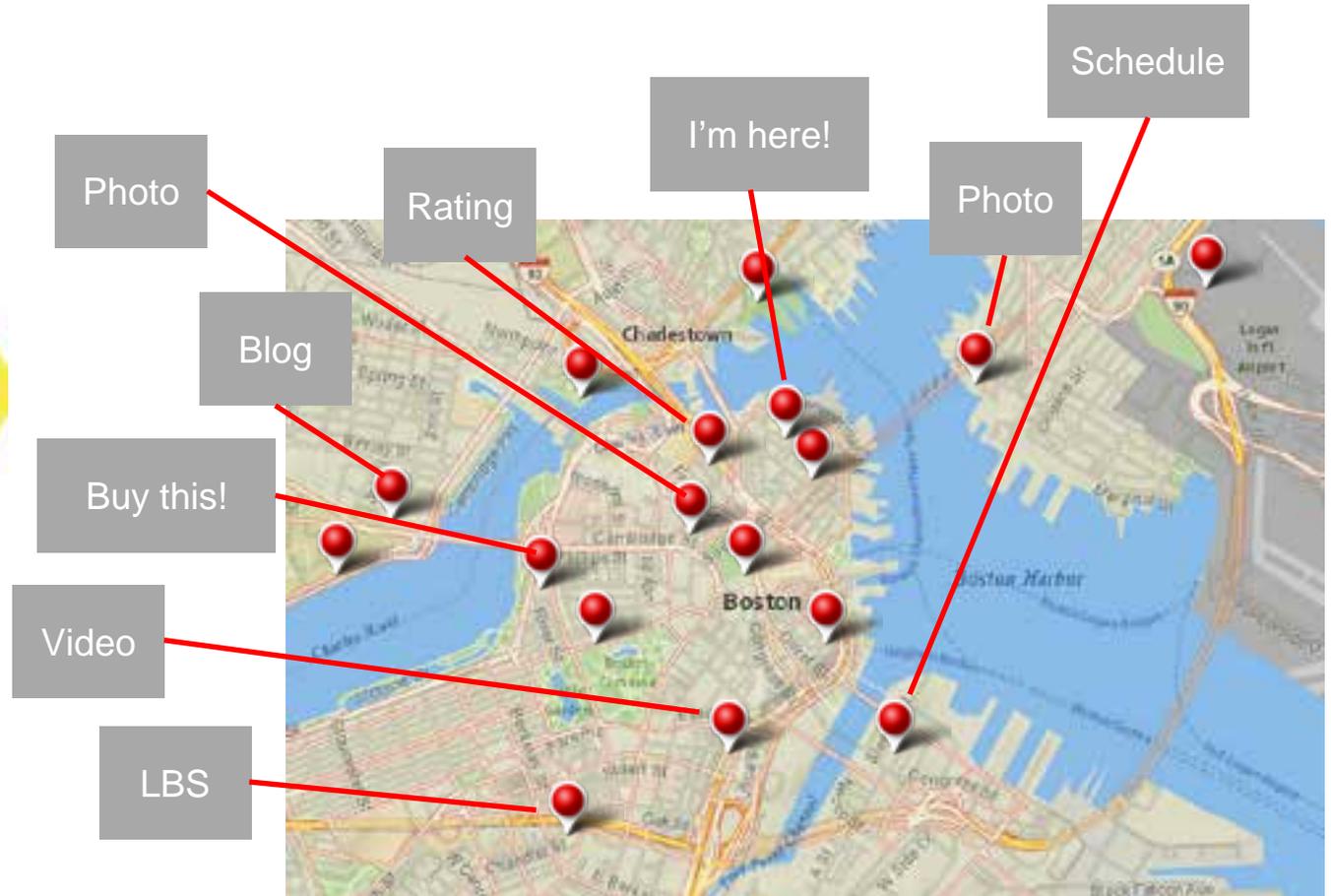
Maps are *deep*

# Cartography in the Digital Age

They're a  
window into  
worlds of  
information



This far  
outweighs any  
shortcoming



**Lesson:**  
**Turn  
challenges  
into assets**



Sistine Chapel ceiling's awkward shapes...



...are the framework for Michelangelo's masterpiece

2



# Elements of web and mobile maps

# Elements of Web and Mobile Maps

App or framework  
(user experience)

The screenshot shows a Story Map interface. At the top, a dark header contains the title "The White House Celebrates the Maker Faire Movement" and the text "A story map" next to the Esri logo. Below the header, a white text area contains the following content:

On June 18, the White House hosts a Maker Faire, bringing together exhibitors, prominent Makers, supporting universities and libraries, and supporting mayors to celebrate a nation of innovators.

**1 White House Maker Faire: Exhibitors and Honored Makers**

America has always been a nation of tinkers, inventors, and entrepreneurs. In recent years, a growing number of Americans have gained access to technologies like 3D printers, laser cutters, easy-to-use design software, and desktop machine tools, democratizing the act of making and enabling citizens to build just about anything. To celebrate this Maker Movement, we are hosting the first-ever White House Maker Faire on June 18th. We'll feature makers, innovators, and entrepreneurs of all ages who are using cutting-edge tools to bring their ideas to life.

In addition to the Makers

# Elements of Web and Mobile Maps

App or framework  
(user experience)

The map



# Elements of Web and Mobile Maps

App or framework  
(user experience)

The map

Popups and map  
actions

The screenshot shows a web-based story map interface. At the top, the title "The White House Celebrates the Maker Faire Movement" is displayed in white text on a dark background. Below the title, a short introductory paragraph reads: "On June 18, the White House hosts a Maker Faire, bringing together exhibitors, prominent Makers, supporting universities and libraries, and supporting mayors to celebrate a nation of innovators." The Esri logo is in the top right corner.

The main content area is split into two columns. The left column has a large number "1" and the heading "White House Maker Faire: Exhibitors and Honored Makers". Below this, a paragraph of text describes the Maker Movement and the event. The right column features a map of the United States with red location pins. A popup window is open over a pin in California, showing a photo of two men working on a project and the text: "Underwater Robot Born in Garage Explores World's Oceans" followed by the names "David Lang, 29, and Eric Stockpole, 28, Berkeley California".

At the bottom right of the map, there is a legend and the Esri logo. The map also includes standard navigation controls like a zoom in (+) and zoom out (-) button, and a home button.

# Elements of Web and Mobile Maps

App or framework  
(user experience)

The map

Popups and map  
actions

Legends and other  
ancillary items

## Cartography: Map details?



# Elements of Web and Mobile Maps

App or framework  
(user experience)

The map

Popups and map  
actions

Legends and other  
ancillary items

Cartography: All elements of design and communication



**Elements**  
of Web and  
Mobile Maps

**User Experience Vs. Cartography**

**Elements**  
of Web and  
Mobile Maps

**User Experience = Cartography**

**They're inseparable**

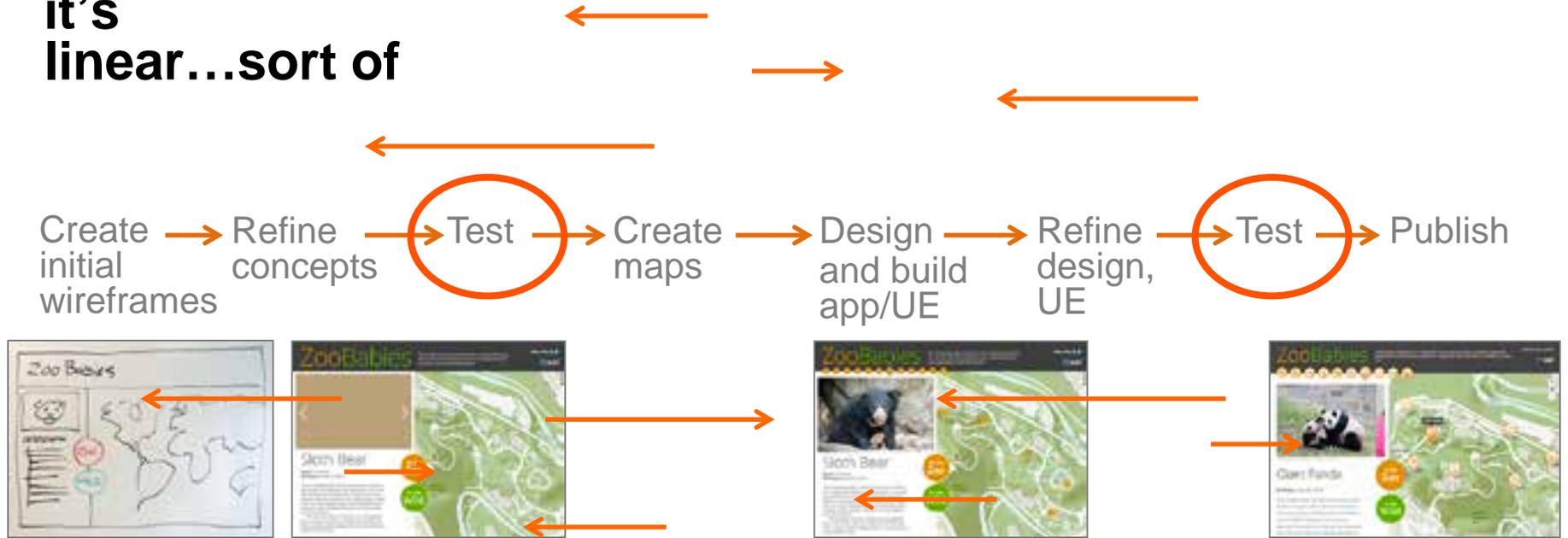
3



## The process

It's linear...sort of

# The process it's linear...sort of

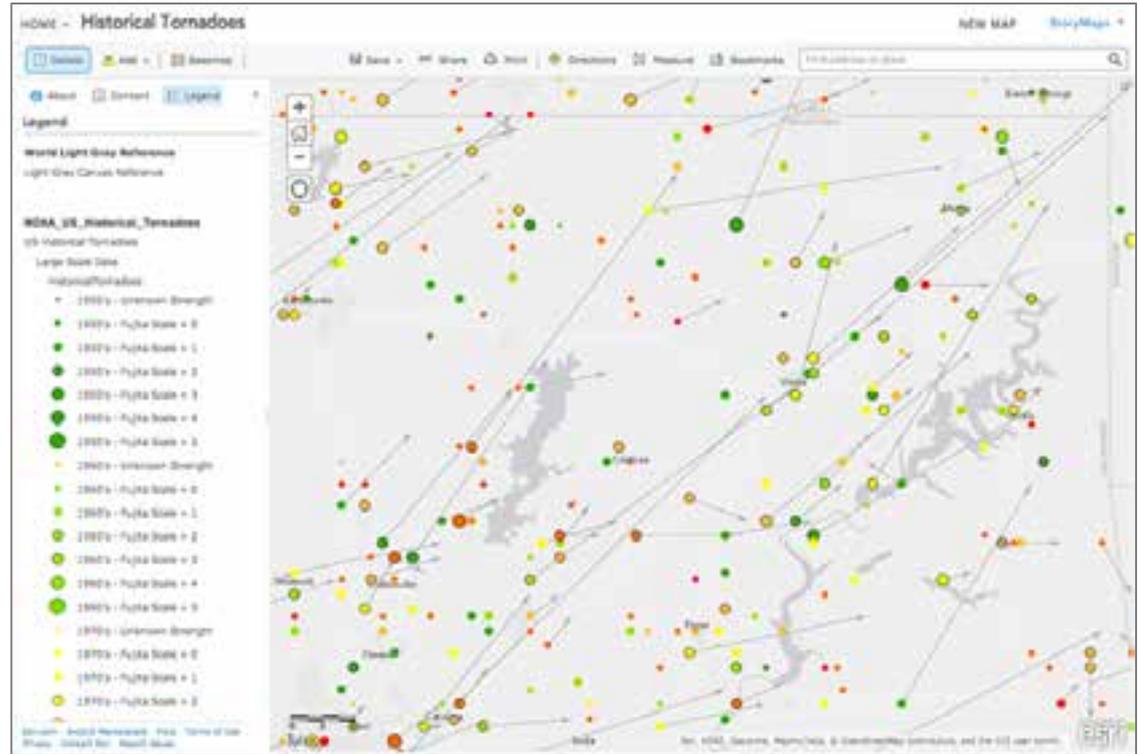


Iteration, experimentation, trial and error is part of the process

**Testing is vital!**

# Case Study: Tornado Dashboard

**Idea:**  
Show tornadoes  
through space and  
time



# Case Study: Tornado Dashboard

## Initial sketch

Concept:

- Summarize tornado totals by state
- Facts and figures for each twister



# Case Study: Tornado Dashboard

## Mockups: First round

- First tab: State totals
- Second tab: Stats for individual tornadoes



# Case Study: Tornado Dashboard

Second round

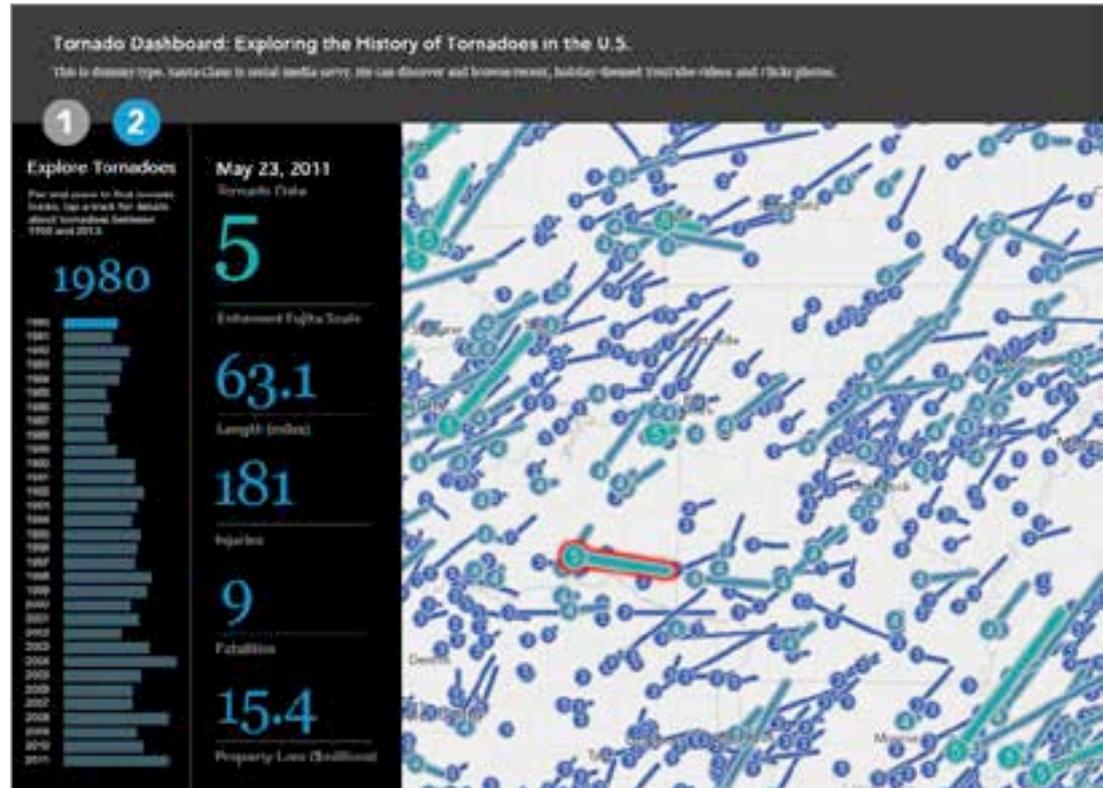
- Numbers instead of tabs
- Slide-out stat panels after click



# Case Study: Tornado Dashboard

Third round

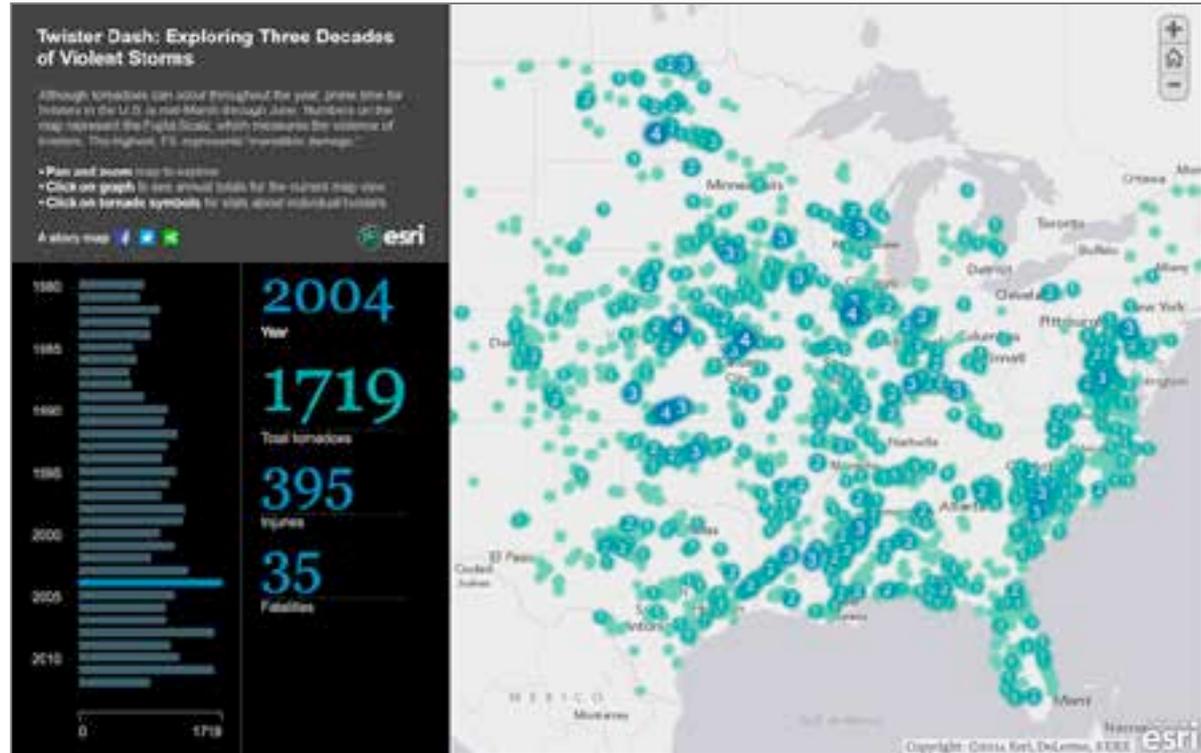
- Dynamic graph shows total twisters by map extent
- Click on tornado for individual twister stats



# Case Study: Tornado Dashboard

Fourth round

- Eliminate state summaries
- Remove top banner
- Refine cartography



# Case Study: Tornado Dashboard

## Published app

- Removed Fujita numbers from map

Moral:  
iteration,  
modification,  
experimentation  
improved the  
map



4



Some **CLUES** to making  
great digital maps

Some  
**CLUES** to  
making  
great maps  
in the  
digital age

1. **C**onnects with its audience
2. **L**imits user options
3. **U**ser experience supports the story
4. **E**asy-to-read maps
5. **S**trives for simplicity

**C L U E S**  
**Connect  
with your  
audience**



**Think of your mom**

Step back and explain things

Avoid being technical

Be informal but respectful

# CLUES

## Connect with your audience

Think about your **primary** audience

Lots of people may see your map, but who do you really want to convince?



# CLUES

## Limit user options

The best maps and apps do one thing really well

An all-purpose map viewer may make sense once in a while...



But a focused, single-purpose app will better serve a specific audience

# CLUES

## User experience supports the story

There are lots of ways to interact with maps

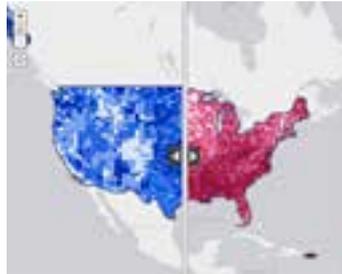
Locate



Navigate



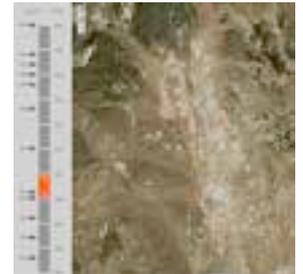
Compare



Narrate



Show change



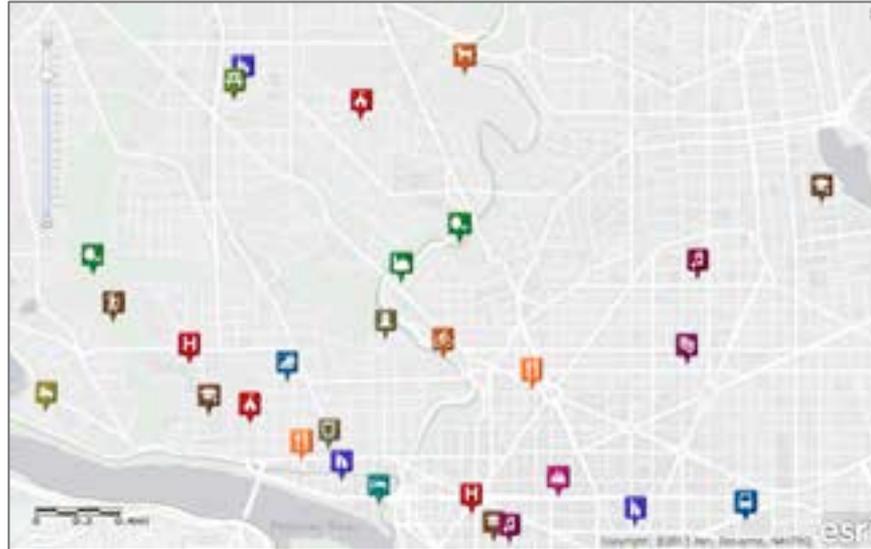
Think about the job your map is doing, and choose the means by which users will experience your story

# CLUES

## Easy-to-read maps

A map for storytelling is very different from a map for analysis

Base map as context—not competition



# CLUES

## Easy-to-read maps

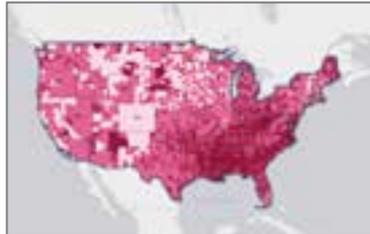
Simple,  
accessible  
thematic maps



Strip off non-essential information



Use limited color palettes



# CLUES

## Easy-to-read maps

Avoid  
visually  
complex  
symbols and  
icons

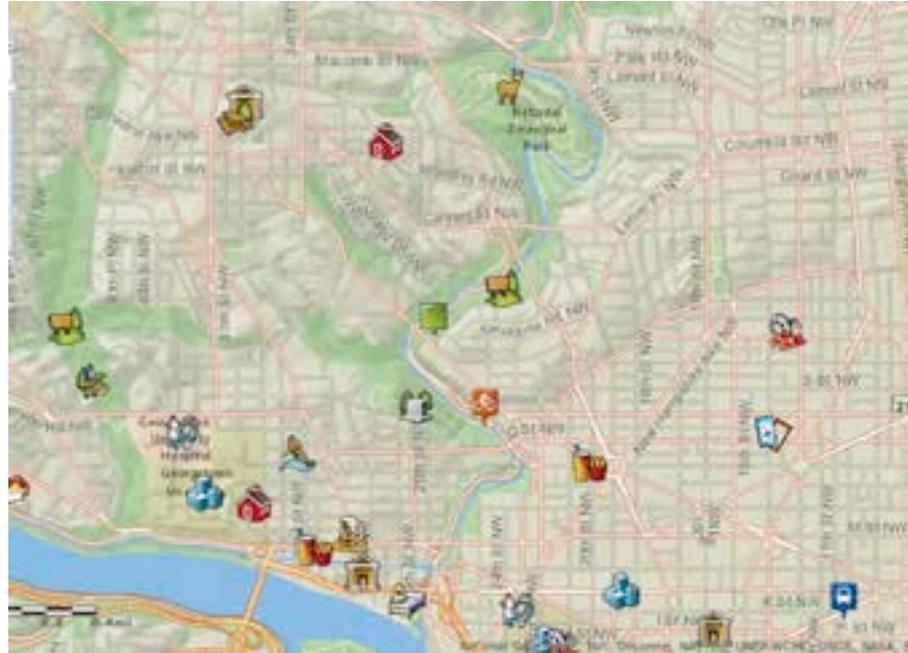


Simple  
shapes are  
usually  
better than  
pictographs

# CLUES

## Easy-to-read maps

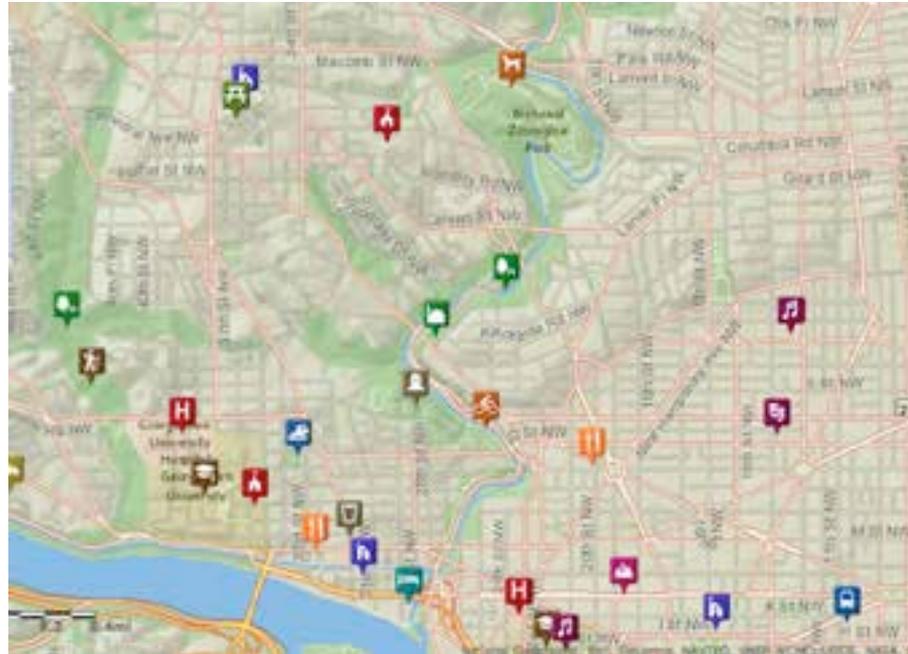
Avoid visually complex symbols and icons



# CLUES

## Easy-to-read maps

Avoid visually complex symbols and icons



# CLUES

## Easy-to-read maps

Several simple maps are much better than one complex one



Crop yields

Yield gaps

Water use

Crop use

User experience can parse a complex story into simpler components

# CLUES

## Strive for Simplicity

Eliminate unnecessary options

USER EXPERIENCE



Avoid “GIS-y” functions:  
No arrays of little icons



# CLUES

## Strive for Simplicity

Eliminate unnecessary options

The image shows a digital interface for 'GOOD WANDERLUST'. At the top left, the 'GOOD' logo is displayed in a bold, black, sans-serif font. To its right, the word 'WANDERLUST' is written in a smaller, all-caps, sans-serif font. Below this, a subtitle reads 'GOOD maps out history's greatest journeys, from Hippokrat to Kinnear'. In the top right corner, there is a small, light-colored link that says 'Back to article'. The main content area features a dark grey rectangular box. On the left side of this box, the title 'Cook's Endeavour Voyage 1768-1777' is followed by a paragraph of text: 'Captain James Cook was commissioned in 1768 by the British Royal Society to travel to the Pacific and observe Venus passing in front of the sun to help determine the distance between Earth and the sun (Cook's measurements—and those of the 75 other observers around the world—were accurate enough to make the calculation). After completing the assignment, Cook and the crew of his ship, the Endeavour, undertook the first complete mapping of the coast of New Zealand, Tasmania and the eastern coast of Australia.' To the right of the text is a small, square portrait of Captain James Cook. Below the text and portrait, there is a small, dark button with the text 'EXPLORE' and a right-pointing arrow. In the top right corner of the dark box, there is another button that says 'RETURN TO TRAVEL LIFE'. The background of the interface is a light grey world map with a blue line tracing the path of Captain Cook's voyage. The continents are labeled in a large, light grey, sans-serif font: 'NORTH AMERICA', 'SOUTH AMERICA', 'AFRICA', 'ASIA', and 'AUSTRALIA'. At the bottom right of the map, there is a small caption that reads 'A collaboration between GOOD and Overseas Roberts'.

[awesome.good.is/features/011/Wanderlust/index.html](https://awesome.good.is/features/011/Wanderlust/index.html)

# CLUES

## Strive for Simplicity

### Eliminate

Edit! Shorten! Reduce! Distill!

Simplify!

Digital media =

**ADHD** media



“Not that the story need be long, but it will  
take a long while to make it short.”

— Henry David Thoreau, *Letters to Various Persons*

# CLUES

1. **C**onnect with your audience
2. **L**imit user options
3. **U**ser experience supports your story
4. **E**asy-to-read maps
5. **S**trive for simplicity

5



Some **tips** on  
designing digital maps

# PC, tablets, and mobile: the challenge of **screen** **sizes**

Not just size, but context and user interaction

Your maps  
have to work  
within this  
variety of sizes

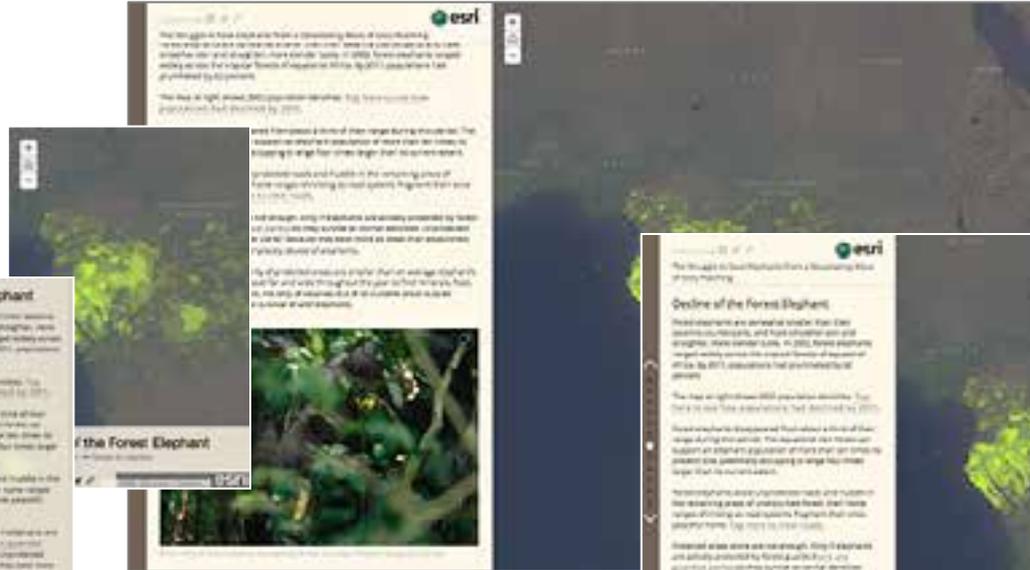


# PC, tablets, and mobile: the challenge of **screen** **sizes**

Responsive design

PC: *Click, scroll*

Mobile:  
*Tap,  
swipe*



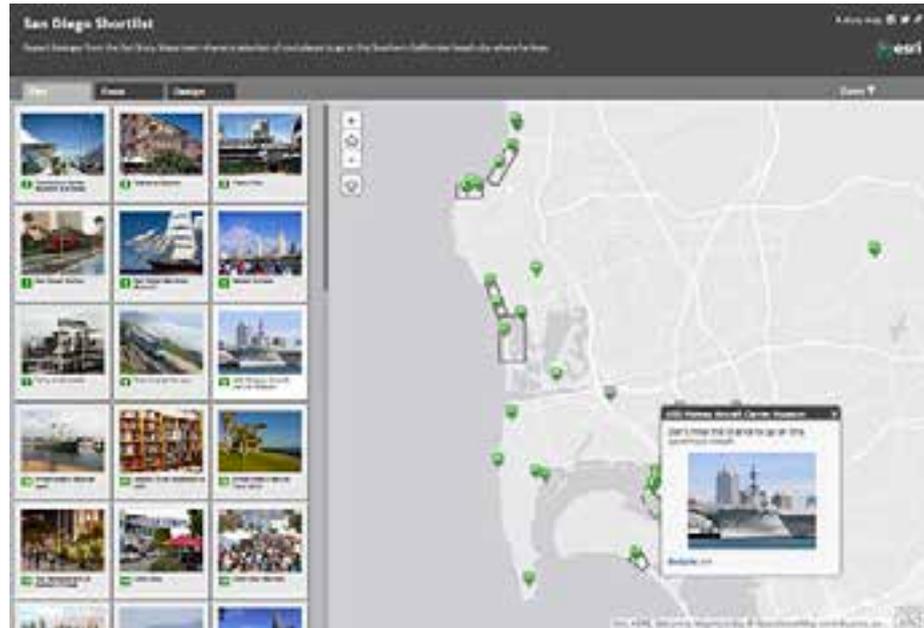
Tablet:  
*Tap,  
swipe*

...and *separate functions*

# PC, tablets, and mobile: the challenge of **screen** **sizes**

Responsive design:  
separating functions

Tabs



Popups

Thumbnails

# PC, tablets, and mobile: the challenge of **screen** **sizes**

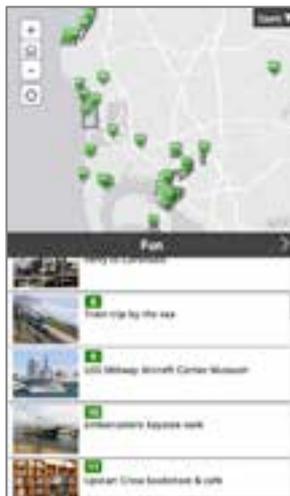
Responsive design:  
separating functions

*Tap*



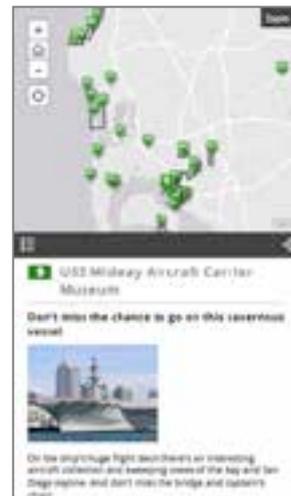
**Tabs**

*Swipe*



**Thumbnails**

*Tap*



**Popups**

# Design tips: Minimalism

Clean, open, modern  
design

Is it here to  
stay?

Yes.

The image is a screenshot of a website with two distinct sections. The top section, on a white background, is titled 'Build mobile and web apps' and includes a green button labeled 'Learn more'. The bottom section, on a light grey background, is titled 'Design beautiful maps' and includes a blue button labeled 'Design maps'. Both sections feature icons: a computer monitor and smartphone for the first section, and a map with a location pin and a pen for the second.

**Build mobile and web apps**

Our open source APIs and SDKs let you quickly style and add custom maps to your application. We make it possible to pin travel spots on [Pinterest](#), find restaurants on [foursquare](#), and visualize data on [GitHub](#).

[Learn more](#)

**Design beautiful maps**

Quickly create beautiful interactive maps and data visualizations using our open source design studio, [TileMill](#), and publish directly to [Mapbox.com](#) to share with the world. For basic customization, create maps with our [online Map Editor](#).

[Design maps](#)

# Design tips: Minimalism

Flat, 2-D design  
(no simulated third  
dimension, no drop  
shadows)

Is it here to  
stay?

Probably not.



Old iPhone



New iPhone

## Design tips: Minimalism

Super, super skinny  
type everywhere

Is it here to  
stay?

Hope not.



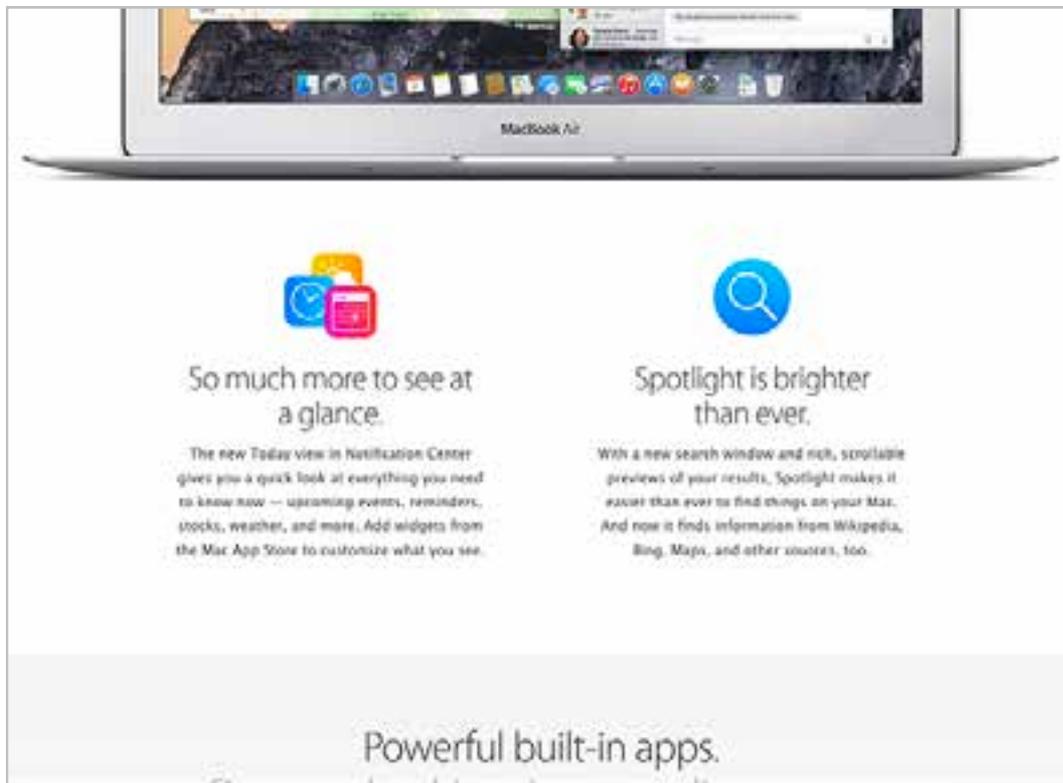
# Design tips:

Think vertical

How do you make room for all that open, clean design?

Scrolling is cool.

(but are we overdoing it?)

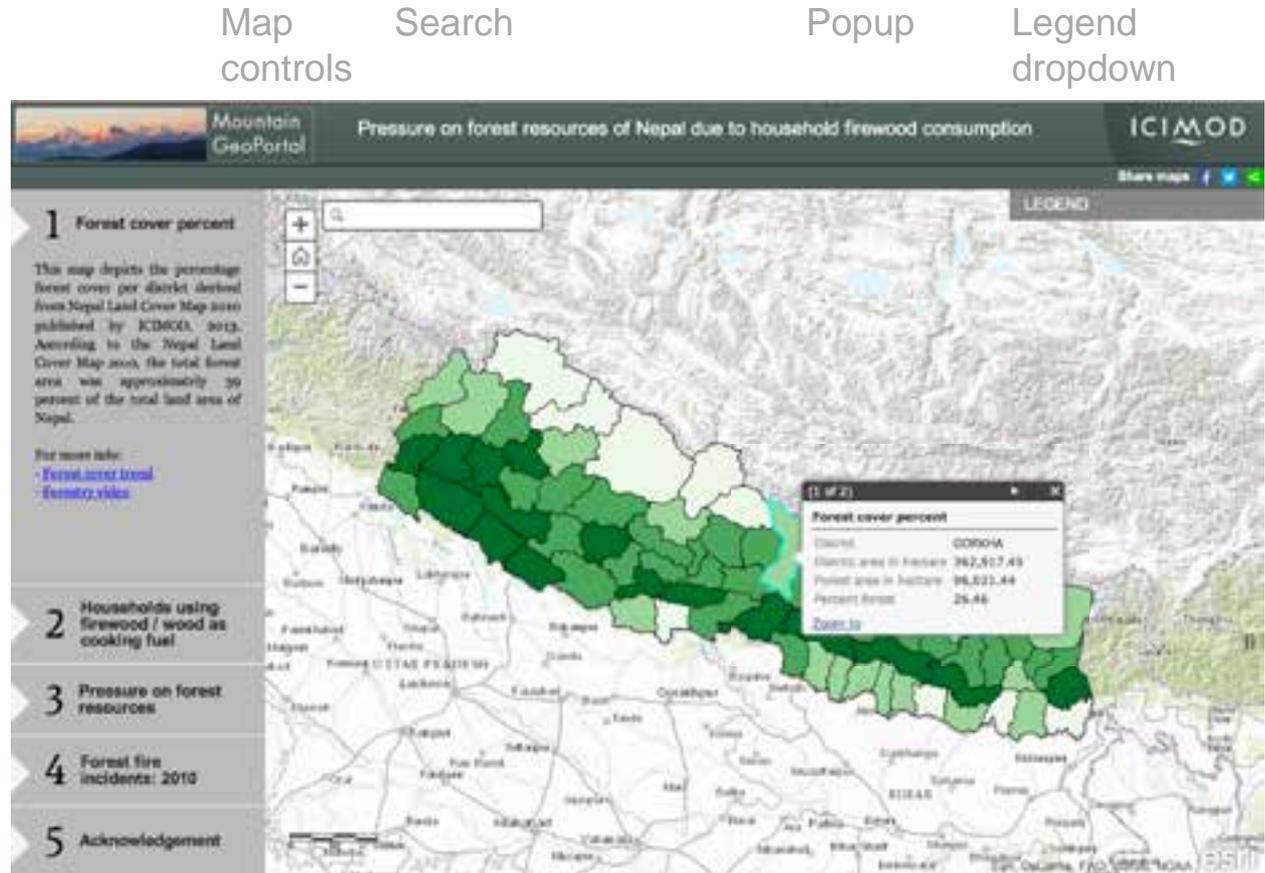


# Design tips: Simple user experience

Limited choices,  
intuitive design

Don't be afraid  
to use overt  
clues

Side  
panel  
tabs



Numbers

# Design tips: Simple user experience

Limited choices,  
intuitive design

Don't be afraid  
to use overt  
clues

...and to parse  
UE into steps

USGS Historical Topographic Map Explorer

USGS science for a changing world esri

Go to a location to the location you want to explore, then Click on a place to see its historical maps.

New Orleans

3 Slide transparency on map to compare, or drag/throw to re-order maps.

New Orleans East 1939 download map

Historical Map Scales

| Scale   | Color       |
|---------|-------------|
| 250,000 | Dark Blue   |
| 125,000 | Medium Blue |
| 62,500  | Light Blue  |
| 31,250  | Light Green |
| 12,000  | Dark Green  |

Timeline: 1851 1856 1865 1870 1875 1880 1885 1890 1895 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000

# Design tips: Map and context

Map and website/app should be seamlessly integrated (2-3 examples)

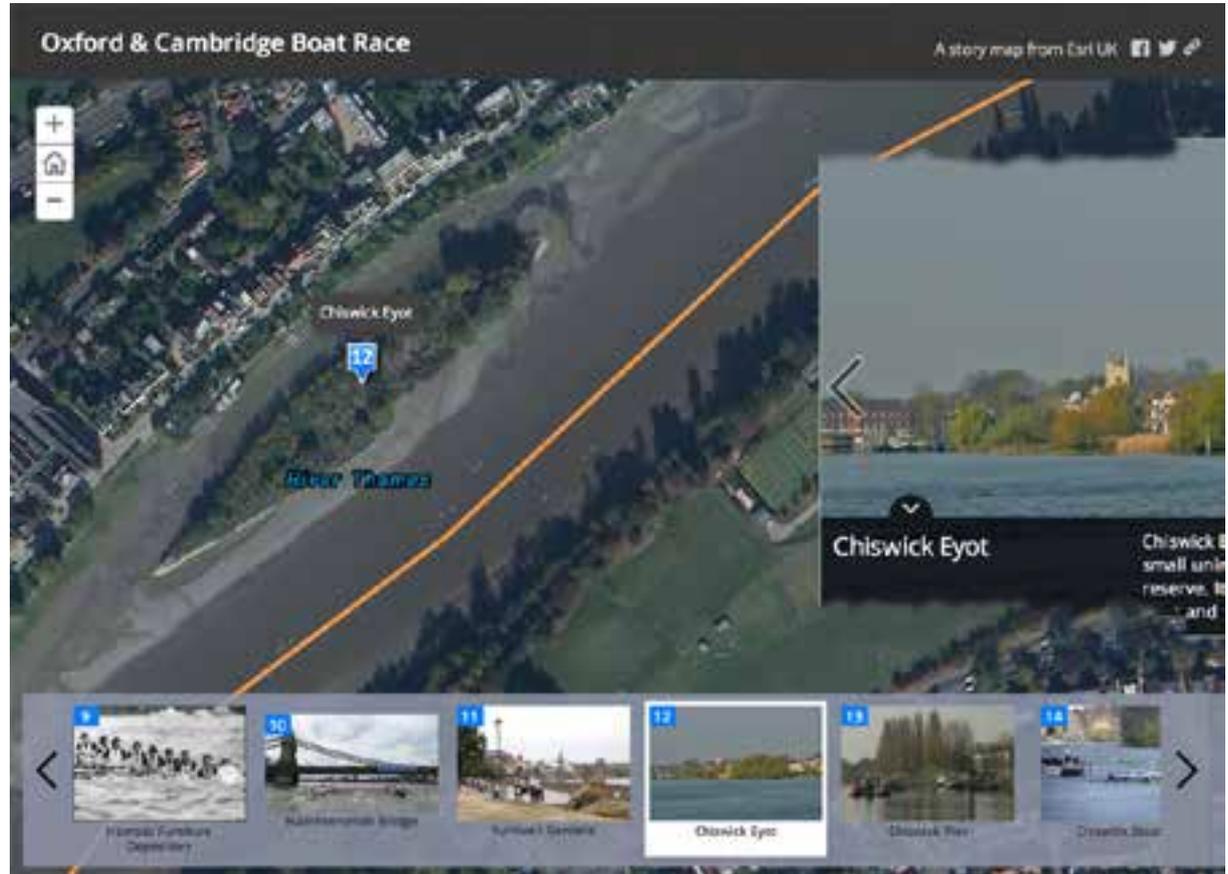
Example: City of St. Albert, Alberta



# Design tips: don't be satisfied

Current Map Tour

...is starting to feel  
boxy and dated



# Design tips: don't be satisfied

Future Map Tour?

More immersive



# Design tips: don't be satisfied

Future Map Tour?

Give user choices



# Design tips: Publishing isn't a **one-time** **thing**

You can (and should)  
tweak, improve,  
enhance

You've created a  
monster—you'll need  
to feed it

The screenshot shows the Esri Story Maps website. At the top, there is a navigation bar with links for 'Story Maps', 'APPS', 'GALLERY', 'COLLECTIONS', 'SUPPORT', and 'BLOG'. The Esri logo is in the top right corner. The main header features a blue background with the text 'Use Story Maps to Inform and Inspire Your Audience'. Below this, a sub-header reads 'Story maps combine interactive maps and multimedia content into elegant user experiences. They make it easy for you to harness the power of maps to tell your stories.' There are two buttons: 'WHAT'S A STORY MAP?' and 'FOLLOW US'. To the right, a tablet and a smartphone display various Story Map examples. Below the header is a section titled 'Featured Story Maps' with the subtext 'Get ideas for your own story maps from these examples created by a growing community of authors. View more story maps in our Gallery.' This section contains two rows of six Story Map thumbnails each, each with a title below it: 'iStockphoto Twitter Map', 'Birds Beyond The Borders', 'Zoo Babies', 'World Cup Venues', 'Full or Empty?', 'Elephant Poaching', 'Twitter Dashboard', 'The White House Celebrates', 'Invasive Tomahawk, Little Fish, Big', 'The Unknown World on the Ocean Floor', 'A Year in the Life of a Piping Plover', and 'San Diego Essential'.

# Design tips: Look around!

Be inspired by what  
others are doing

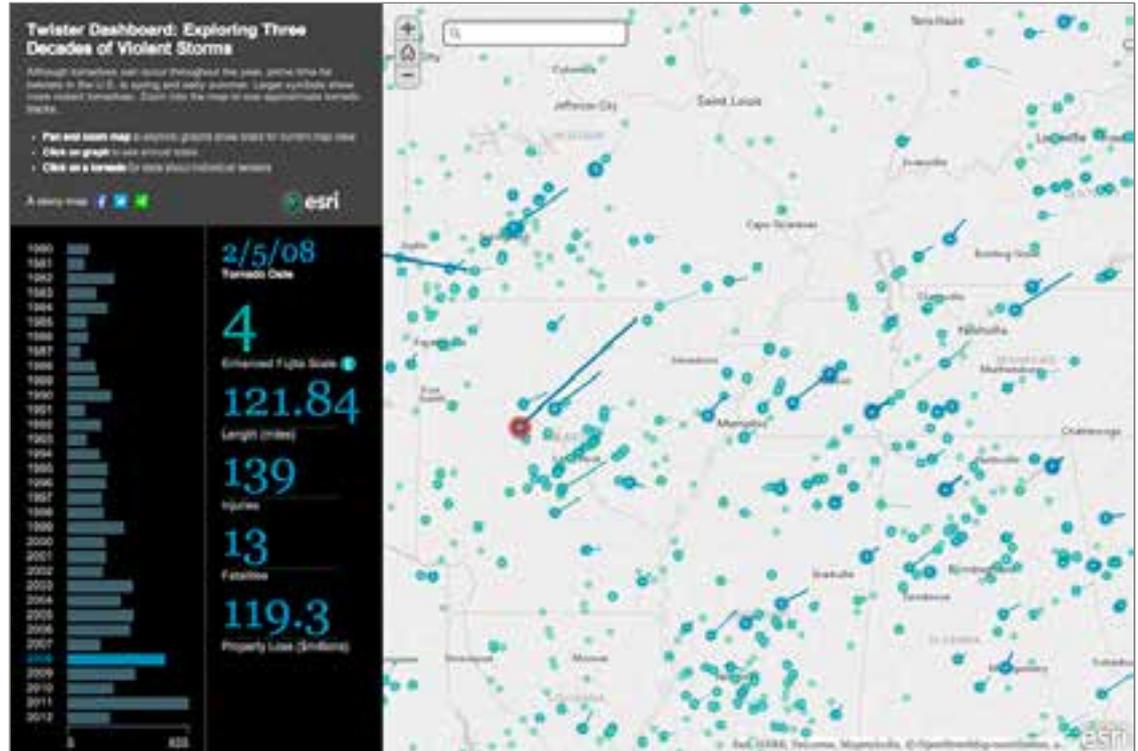
The image displays three overlapping news article snippets, illustrating design inspiration. The top snippet shows a weather forecast for "Snow Fall" with navigation links like "TO THE PLAN", "SEARCH RESULTS", "BLACKBOARD", "DISCOVER", "NEWS CENTER", and "APP THE GOALS". The middle snippet is a news article titled "Middle East: Battlelines drawn" by Michael Peck, dated 08/27/2013 04:00. It features a sub-headline "Fears are growing the Syrian war might become a region-wide religious conflict" and a lead paragraph starting with "The Syrian soldier unlocked a bullet-pocked gate at south Damascus's Rayada Zahra shrine...". Below the text is a map of the Middle East with a legend for "Choose a country and click the legend below and click on the map." The legend includes: Syria (20.0%), Turkey (10.0%), Jordan (15.0%), Lebanon (10.0%), Iraq (10.0%), Saudi Arabia (10.0%), and Other. The bottom snippet is a news article titled "THE MYSTERIOUS DISAPPEARANCE OF MALAYSIA AIRLINES FLIGHT MH370" with a photo of a media conference. The article text begins with "The Malaysian flight MH370 disappeared on the night of March 8, 2014, and a search...".

# The process: Start fresh

Don't stick with what you have (GIS analysis, older website)

Think anew about

- Who is your audience
- What is your goal
- How you'll interpret and represent for your audience



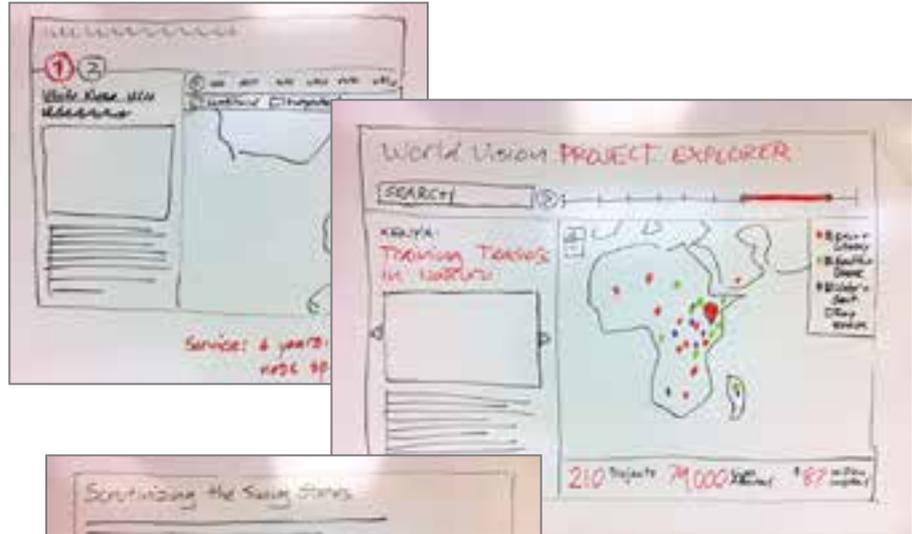
# The process: Brainstorm and sketch

Great digital tools:  
Markers and whiteboard

Outline key elements

Develop rough  
wireframes

Tools? Balsamiq,  
Photoshop,  
PowerPoint, Pencil!



# The process: Iterate and test

Be willing to **abandon** “great” ideas

Digital media are flexible, malleable; **try things**, explore options

**User testing** is key (with whom?--fresh eyes, non-tech people)

- Early in process with static screens, rough implementations
- Later: Refining user experience, terminology, etc.

6



# What to Remember



- Keep it **simple**; eliminate non-essentials
- **Single**-purpose to fit priority audience
- Map and context work **together**
- Cartography includes **user** experience
- Digital - screens small, but maps **deep** (it's a new medium...take advantage of it!)

# Thank you...

Please fill out the session survey:

**ID: 1382**

Online – [www.esri.com/ucsessionsurveys](http://www.esri.com/ucsessionsurveys)

Paper – pick up and put in drop box

# Open Discussion

Larry Orman

[larry@greeninfo.org](mailto:larry@greeninfo.org)

[www.greeninfo.org](http://www.greeninfo.org)



Allen Carroll

[acarroll@esri.com](mailto:acarroll@esri.com)

[www.esri.com/storymaps](http://www.esri.com/storymaps)

