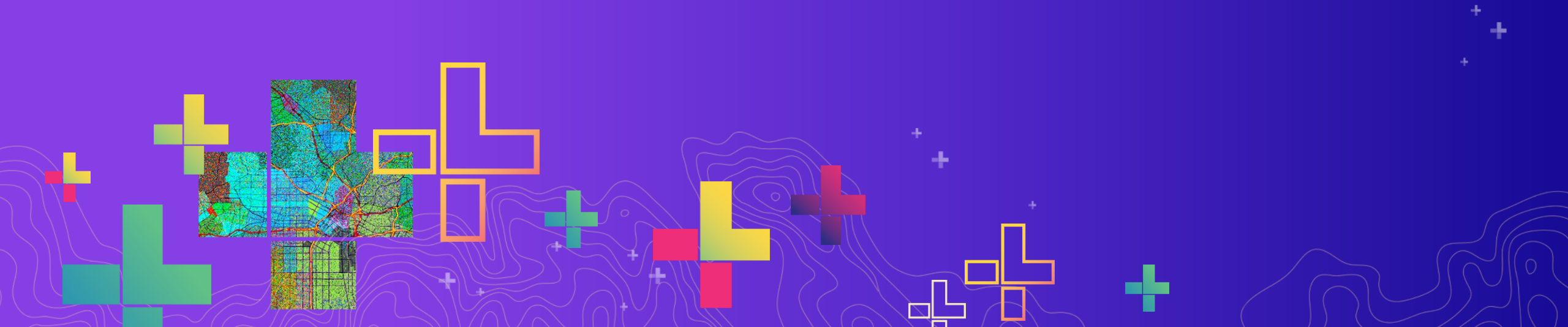




# Collecting, Mapping, Analyzing, and Communicating Field Data with ArcGIS

Joseph J. Kerski, PhD GISP, Esri

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

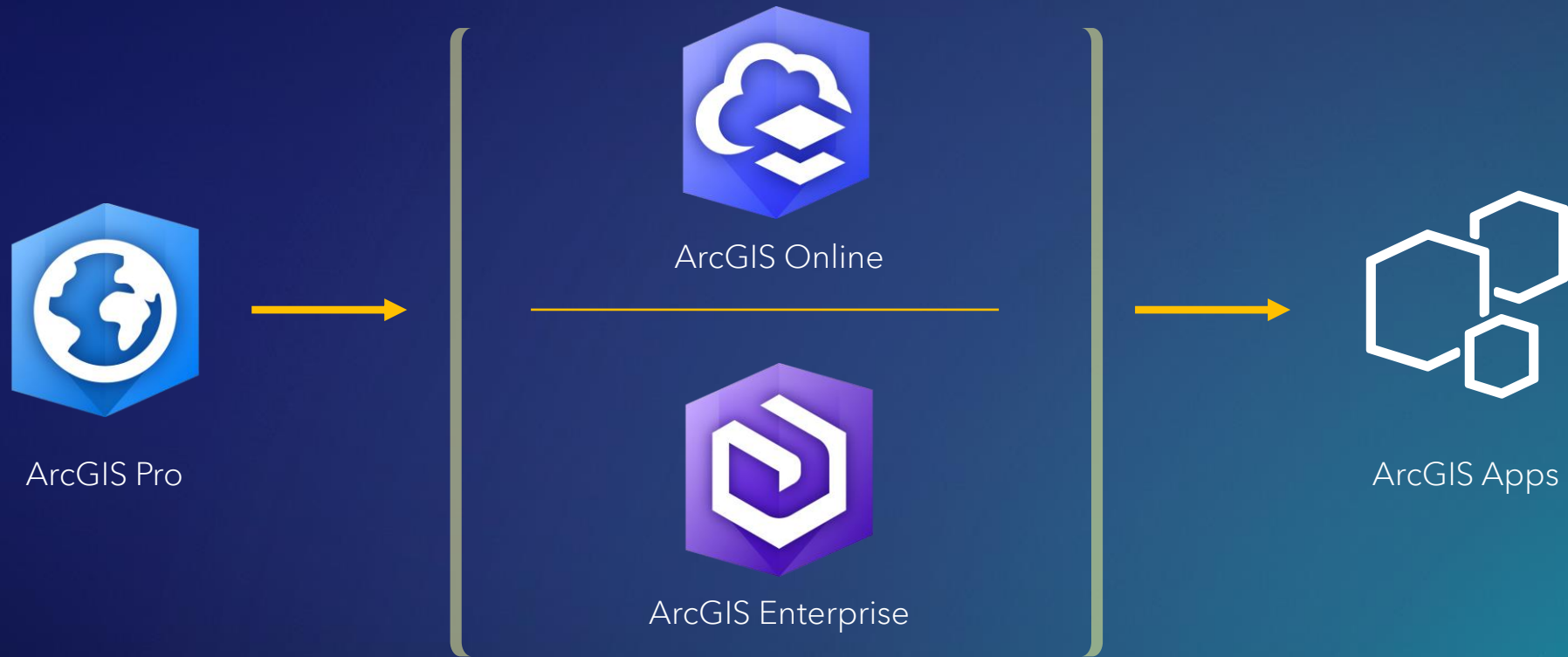


# Why teach with field tools?

1. Collect needed data.
2. Connect people with issues in their own community.
3. Develop skills in field data collection, citizen science, data assessment, mapping, spatial analysis.

**Can you name this location?**

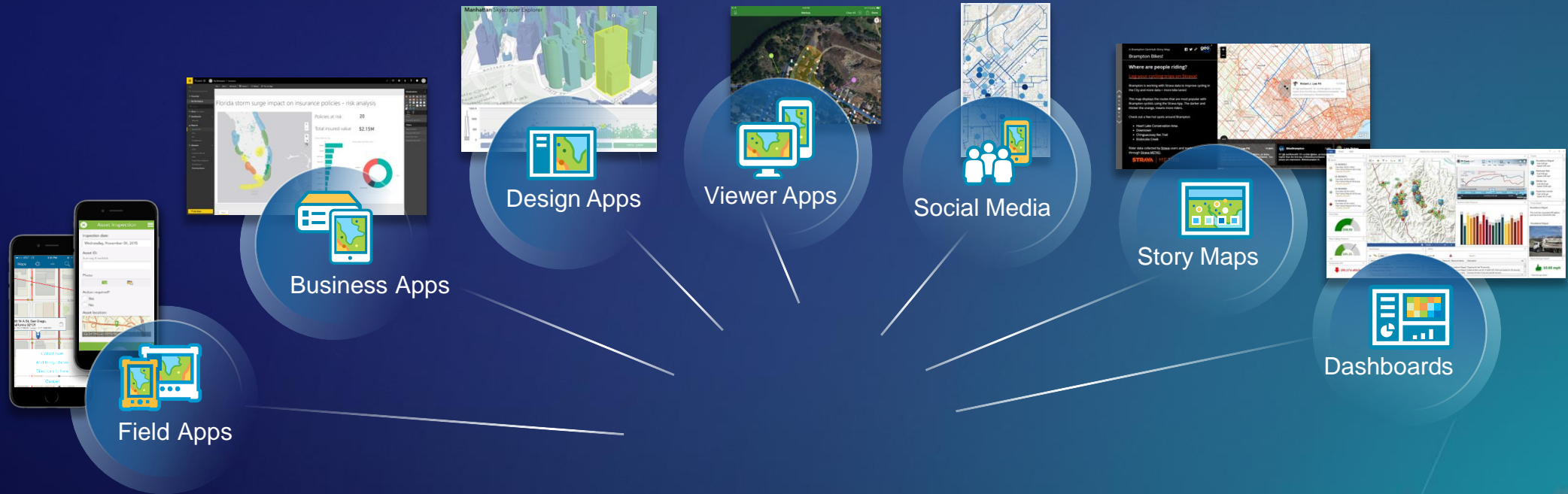
# The Web GIS Paradigm



ArcGIS for Developers

# ArcGIS Apps Bring the Power of Location to Everyone

Extending the Reach of GIS



*Across Organizations and Beyond*

# Apps by theme

Focused, powerful, ready to use



## Office



ArcGIS  
Earth



Esri  
CityEngine



Maps for  
Office 365



Maps for  
SharePoint



ArcGIS  
Insights



Esri Business  
Analyst



GeoPlanner  
for ArcGIS



Story  
Maps



ArcGIS  
Dashboards



## Field



ArcGIS  
QuickCapture



ArcGIS Field  
Maps



Tracker  
for ArcGIS



Survey123  
for ArcGIS



Drone2Map  
for ArcGIS

# Apps by theme

Focused, powerful, ready to use



## Office



ArcGIS Earth



Esri CityEngine



Maps for Office 365



Maps for SharePoint



ArcGIS Insights



Esri Business Analyst



GeoPlanner for ArcGIS



Story Maps



ArcGIS Dashboards



## Field



ArcGIS QuickCapture



ArcGIS Field Maps



Tracker for ArcGIS



Survey123 for ArcGIS



Drone2Map for ArcGIS

# Workshop workflow



**1- Collect data  
Using Survey123**



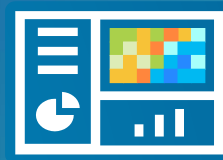
**2-Map data  
Using ArcGIS Online**



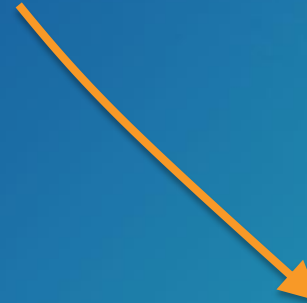
**5 - Create Story Map**



**3- Analyze data  
Using ArcGIS Online**



**4- Create  
Dashboard**



# How can you map field-gathered data?

## 5 selected methods:

1. Add a set of geotagged photos as “photos with locations” to ArcGIS Online.
2. Collect a GPX file from GPS receivers and smartphone fitness apps.  
> Add to ArcGIS Online.
3. Generate table in CSV or TXT > Add to ArcGIS Online.
4. Use Esri **Survey123**, Collector, or QuickCapture to collect data.
5. Use other field apps: eBird, Globe Observer, Mapillary, iNaturalist, or other field apps.  
Export to CSV > Add to ArcGIS Online.



# We will build this example: Survey, ArcGIS Online Map, Story Map, Operations Dashboard

<https://community.esri.com/community/education/blog/2019/08/27/how-walkable-is-your-community>



A selection of walkability images submitted to the storymap.



## What is the Walkability of this Location?

Map data © OpenStreetMap contributors, CC-BY-SA

Category	Percentage
Pedestrian Friendly	69.23%
Pedestrian Unfriendly	30.34%
Null	0.43%

Last update: a few seconds ago

### What is the Walkability of this location?

- Pedestrian Friendly
- Pedestrian Unfriendly

Last update: a few seconds ago

Category	Percentage
Excellent for Pedestrians	28.63%
Good for Pedestrians	33.33%
Not ideal for Pedestrians	18.38%
Neutral	11.54%
Horrible for Pedestrians	8.12%

Last update: a few seconds ago

Operations Dashboard for ArcGIS

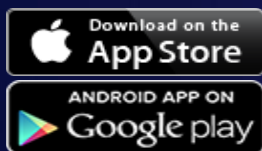
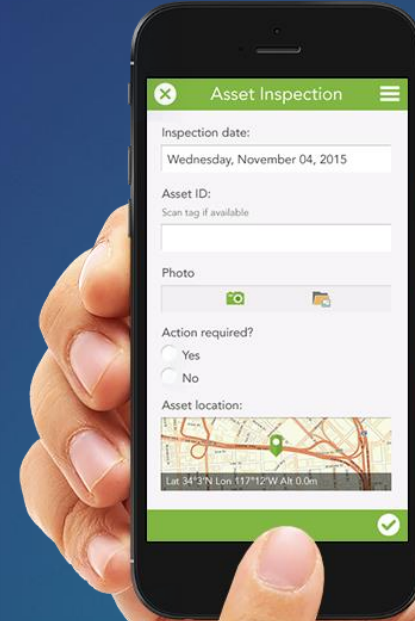
# Survey123 for ArcGIS



Form-centric field data collection

Leverages Smart forms

Analyze results immediately



# Survey123 workflow



**1- Ask Questions**  
(Design & Publish)

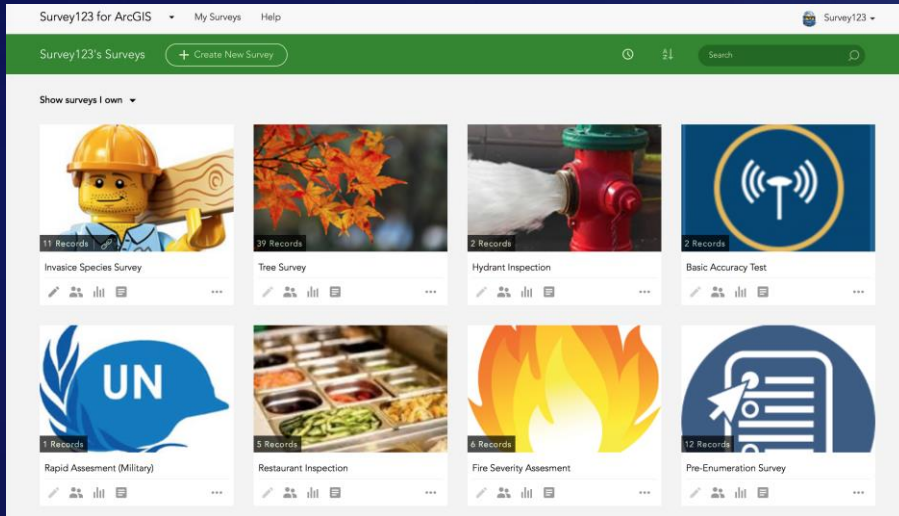


**2- Get Answers**  
(Capture Data)



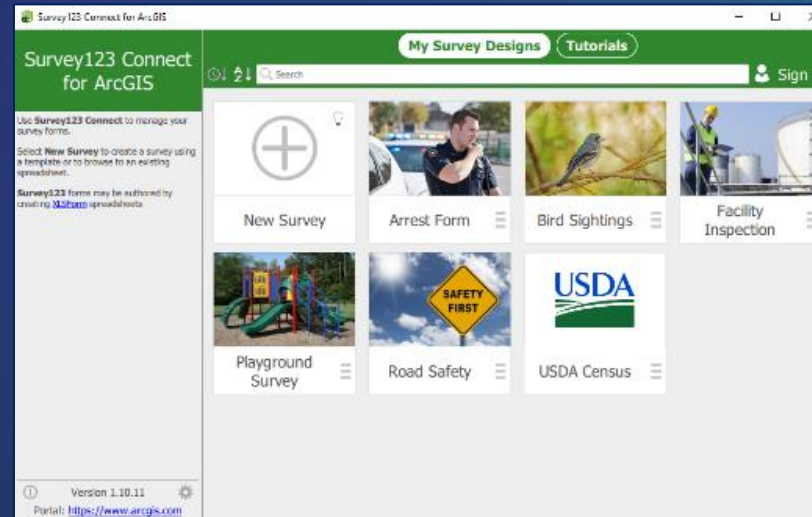
**3- Make Decisions**  
(View & Analyze)

# Survey123 Components



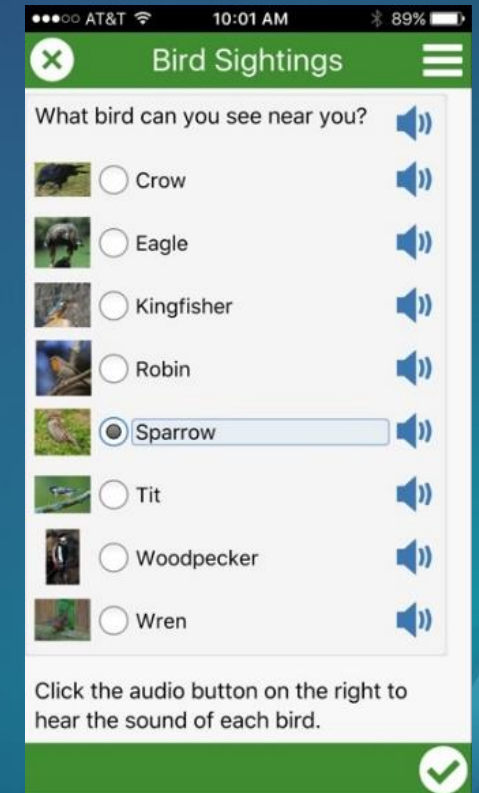
## Survey123 website

- Author Simple Surveys
- Complete Simple Surveys
- Manage Access
- Analyze Results



## Survey123 Connect – Author Complex Surveys

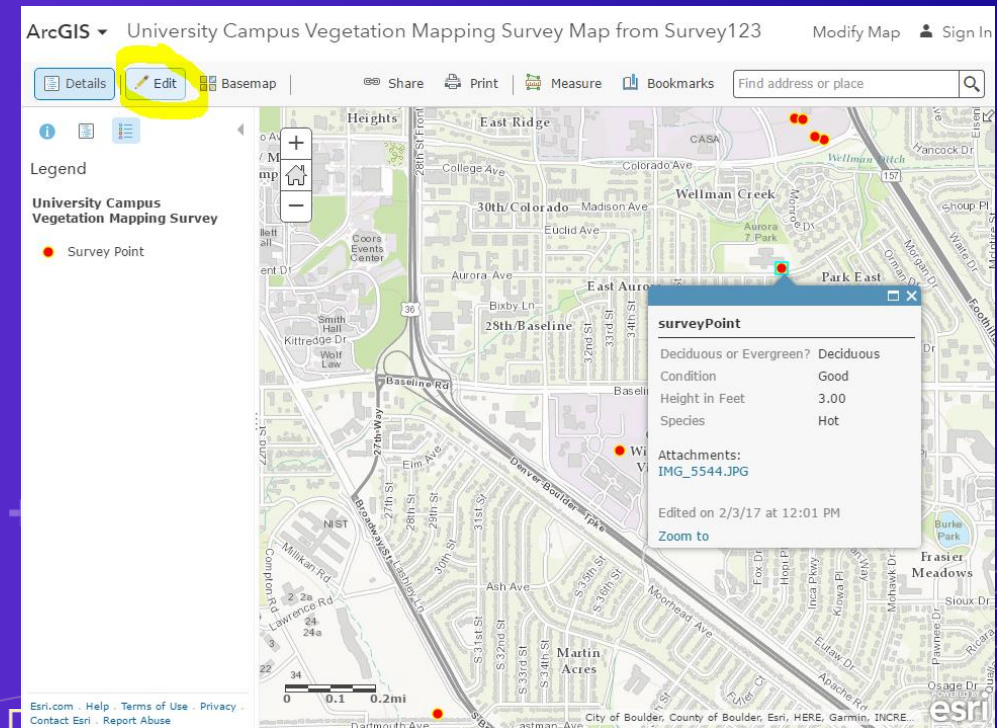
## Survey123 for ArcGIS – Complete Surveys



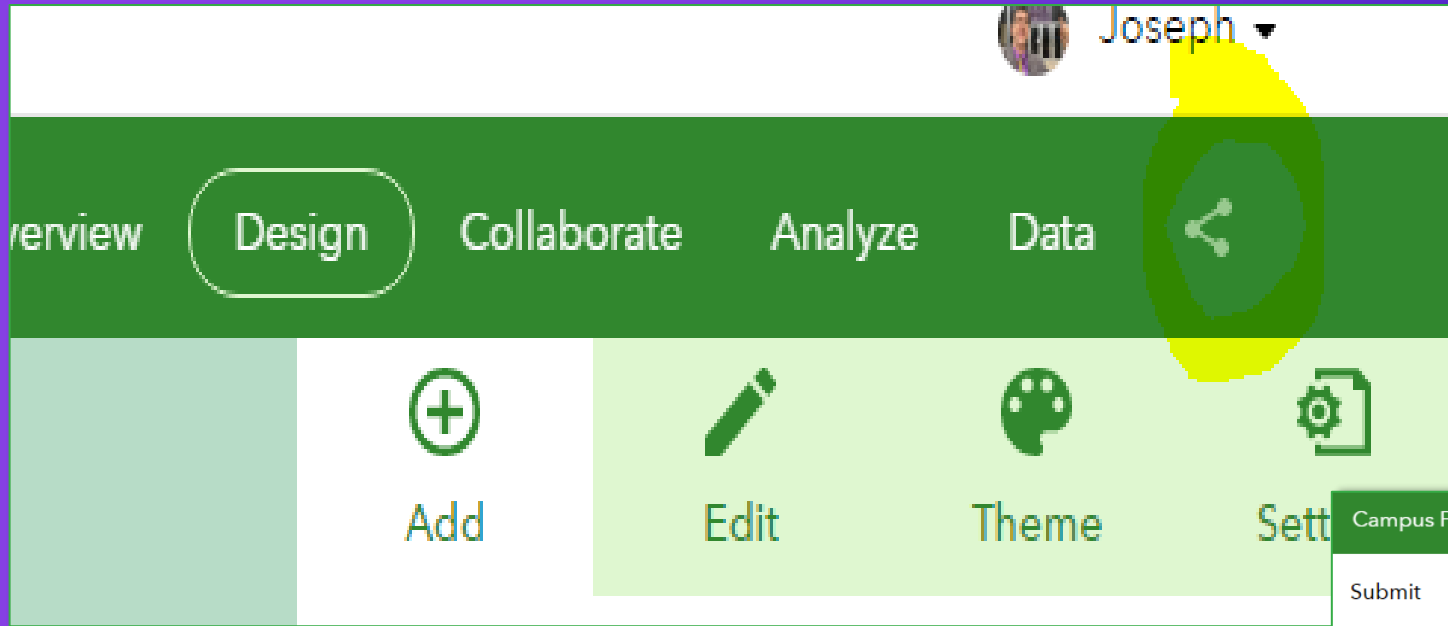


# Yes, you can!

- Download Survey123 data
- Use Survey123 with higher precision GPS
- Citizen Science enable your surveys
- Use the Survey123 app or NOT use it! (the app looks a bit nicer than the web browser display, and the app allows for off-line data collection)
- Add data to your web map in a browser



# + How to citizen science enable your surveys



Campus Field Objects using Survey123 Web Form ... Overview Design

**Submit**

Choose who can submit data to this survey:

- Everyone (Public)
- Members of my organization (Esri Workshop)
- Following Groups:
  - DataCollection

**Analyze**

**Group Settings**

Survey link:

<https://survey123.arcgis.com/share/00db49c6f5114854b2c523b63cd20e02?open=menu>

- Open the survey in browser directly
- Ask the user how to open the survey, in browser or in the Survey123 field app
- Open the survey in the Survey123 field app directly. (Learn more about this option)

# 2 ways to create a Survey123


Today we will use this method



### Create a New Survey

#### Using the web designer


- Get started quickly
- Best for simple surveys
- Author your survey graphically



Get Started

#### Using Survey123 Connect

- Using a desktop application
- Full smart form capabilities
- Author through XLSForms (spreadsheet)



Get Started



# How to create a survey using Survey123 Connect (Excel) method

1. [Survey123.arcgis.com](https://survey123.arcgis.com) > Build survey using Survey123 Connect.
2. Build survey using worksheets.
3. Publish survey to ArcGIS Online; test; create map from survey; save; share.
4. Collect data in the field using Survey123 app on smartphone (or web browser if crowdsourced).

type	name	label	hint
date	<u>ReportDate</u>	Date	
time	<u>ReportTime</u>	Time	
begin group	basic	Collect Field Data:	
<u>select_one LivNonLiv</u>	LivNonLiv_1	Living or <u>Non Living</u> ?	
<u>select_one ObjectType</u>	ObjectType_1	Select Object Type:	
end group			
integer	<u>Height_m</u>	<u>Height_m</u>	Give height in meters rounded to nearest integer
<u>geopoint</u>	Location	Location	
image	Photograph	Photograph	

<u>list_name</u>	<u>name</u>	label	image	<u>label::language1</u>	Object
<u>LivNonLiv</u>	Living	Living			
<u>LivNonLiv</u>	<u>Non_Living</u>	<u>Non Living</u>			
<u>ObjectType</u>	tree	tree			Living
<u>ObjectType</u>	shrub	shrub			Living
<u>ObjectType</u>	<u>other_living</u>	other living			Living
<u>ObjectType</u>	chair	chair			<u>Non_Living</u>
<u>ObjectType</u>	bench	bench			<u>Non_Living</u>
<u>ObjectType</u>	trashcan	trashcan			<u>Non_Living</u>
<u>ObjectType</u>	<u>other_nonliving</u>	other nonliving			<u>Non_Living</u>

Open a web browser and go to this survey for campus vegetation mapping:

<https://bit.ly/2pbnWDT>



### Campus Vegetation Mapping

Map Vegetation - trees, shrubs, and other plants - on your campus.

**Deciduous or Evergreen? \***  
Indicate whether the plant is deciduous or evergreen.

**Condition \***  
Indicate how healthy the plant is:

**Height in Meters \***  
Indicate the height in meters to nearest integer.

Please input a number between 1 and 150

**Species**  
Indicate the tree species (maple, ash, locust, spruce, etc.)

**Location \***

USDA, FSA | San, NARS, Garmin Powered by Mapbox  
Lat: 40.00392 Lon: -105.26684

**Submit Photograph Here**  
Submit your photograph here (max size = 10 MB)

[Click here to upload image file. \(<10MB\)](#)

After filling in fields, verify results that you have submitted, on this map: <https://arcg.is/1bPeTG>

ArcGIS ▾ A University and School Campus Vegetation Mapping Survey Map

Details | Edit | Basemap | Share | Print | Measure | Bookmarks | Find address or place

Legend

University Campus Vegetation Mapping Survey

- Survey Point

(1 of 2)

**surveyPoint**

Deciduous or Evergreen?	Evergreen
Condition	Fair
Height in Meters	29.00
Species	Pine

Attachments:  
[image.jpeg](#)

Edited on 2/3/17 at 12:00 PM

[Zoom to](#)

**Let's go to work!**

**This lesson is organized in 4 parts:**

Part 1: Creating a field survey using Survey123.

Part 2: Creating and analyzing a map from your survey data.

Part 3: Creating a dashboard from your survey data.

Part 4: Creating a storymap from your field data.

# 1. Create Survey

[1a]. <https://survey123.arcgis.com> > Sign in

[1b]. Create new survey > Use the web designer > Get Started > Provide some metadata (name, tags, summary): Walkability Survey | Walkability, pedestrians, smart cities | A survey to assess if and how different areas in a community are walkable. > Create.

[1c]. Design the survey.

[1c]. Design the survey.

(1) Add question #1: Multiple Choice: Pedestrian Friendly or Unfriendly? Create 2 choices: Pedestrian Friendly, and Pedestrian Unfriendly. Make 2 choices only. Make this a required question. > Save.

(2) Add question #2: Likert. Label: Rate the walkability of this site. For “items” indicate: Horrible for pedestrians, Not ideal for pedestrians, Neutral, Good for pedestrians, Excellent for Pedestrians. > Save.

(3) Add question #3: Multiple Choice: Label: Tick all characteristics that describe the site: Dedicated path or sidewalk, Wide path or sidewalk, Poor surface condition, Dangerous cross traffic, No path or sidewalk, Obstructions: Branches, snow, etc., Unsafe. 7 characteristics total. Do not allow “Other”. > Save.

(4) Add question #4: Geopoint. Label: Where is the site located? Set Default Map to “OpenStreetMap”. Tick “Ask for device’s location when opening this question.” For the map’s location, set the scale and location where you anticipate you will collect the most data. > Save.

(5) Add question #5: Image. Label: Submit a photograph of the site. > Save.

- [1d]. Preview the survey. Close. If necessary, make adjustments. When satisfied, > Publish.
- Go to Collaborate tab > Tick: Ask the user how to open the survey, in browser or in the survey123 field app. Then, under “who can submit to this survey?” share at least with your organization, or groups within your organization.
- Under “What can submitters do?”, tick “add and update records”. Before leaving this screen, copy the “arcg.is” link near the top of the Collaborate page under “Link.” Example: <https://arcg.is/0z1vfu>. At bottom of screen > Save.
- [1e]. Test it! Add 1 point to your survey. You can use your own photos or the ones the author provided in the zip file. If you use the latter, the Evergreen Colorado pedestrian friendly photo is located at coordinate: 39.624631, -105.322921 with rating of “Good for pedestrians” and “Dedicated path or sidewalk” and “Obstructions: Branches, snow, etc.”. The Lakewood Colorado #1 pedestrian unfriendly photo is located at coordinate: 39.708678, -105.110154 with rating of “Not ideal for pedestrians” and “Dangerous cross traffic.” The Lakewood Colorado #2 pedestrian unfriendly photo is located at coordinate: 39.712871, -105.102729 with rating of “Not ideal for pedestrians” and a characteristic of “No path or sidewalk.”



## 2. Create map

[2a]. Open a new browser tab > Go to [www.arcgis.com](http://www.arcgis.com) > Sign in > Go to Content, My Content. In list of folders on left, find the folder (beginning with “Survey” in the title) with your new survey. This folder will contain a form, a feature layer (hosted, view), and another feature layer (hosted). Click on feature layer (hosted) and examine the metadata. Fill in summary and description as “Walkability survey feature layer.” >

[2b]. In upper right, Open in Map Viewer. Pan and zoom the map to your study area. Verify that your added point exists. If desired, change basemap. Change style to Pedestrian Friendly or Unfriendly. Under Options > Unique Symbols, choose symbols that contrast with each other.

[2c]. Save your map and provide some metadata. Share your map with everyone using the resulting URL.

## The End Goal

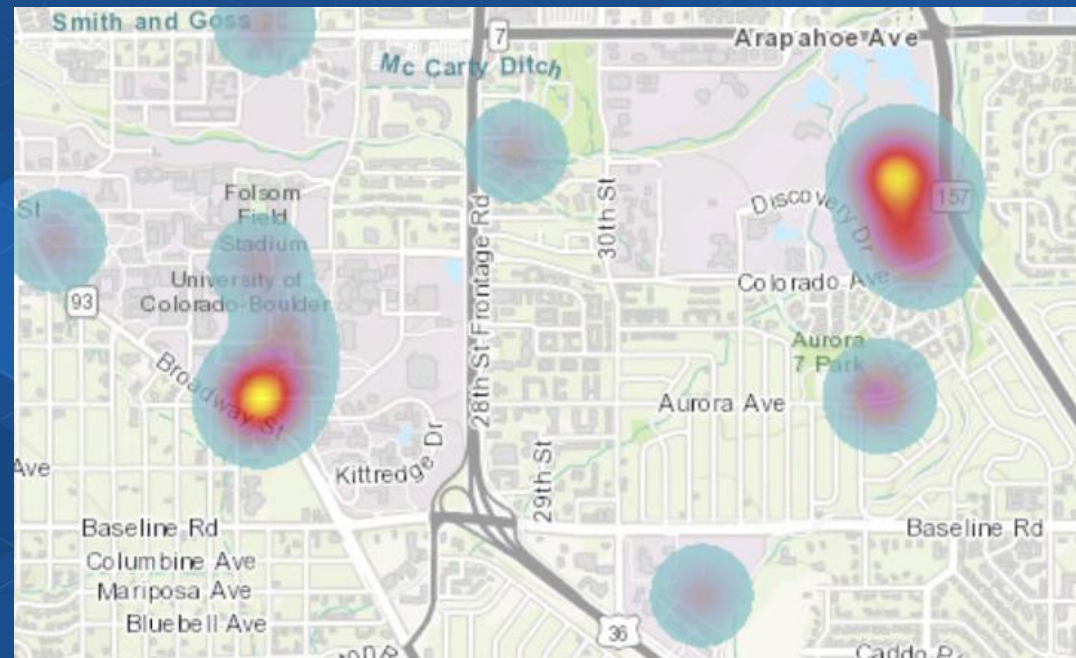
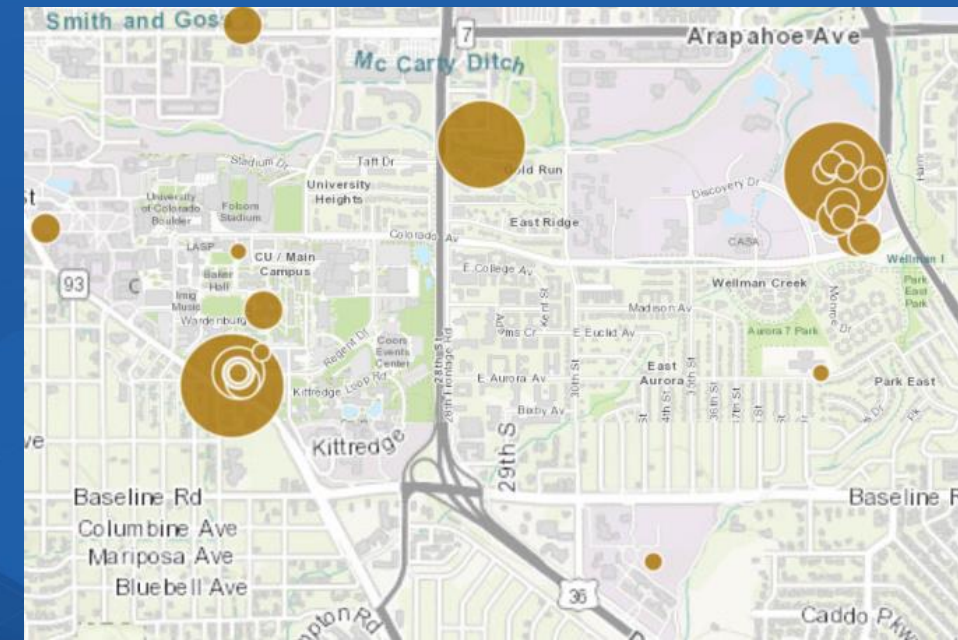
**Not** points on the map,  
but *understanding the  
phenomenon, spatial  
patterns, linkages, trends  
in the data you are  
collecting.*

Hence, spatial analysis.



# Spatial Analysis

- Symbolize, classify your data on maps
- Investigate statistically significant hotspots
- Proximity, routing, overlay, and other map analysis tools
- Add and analyze additional data



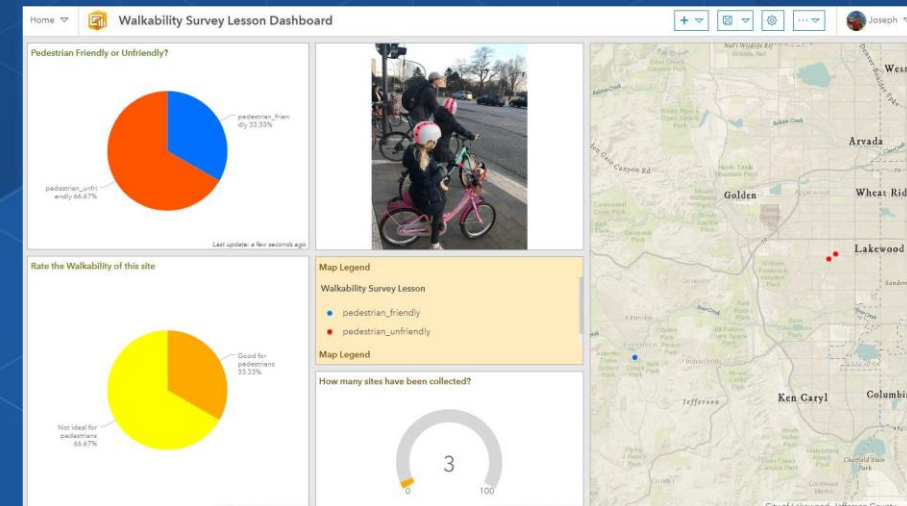
### 3. Create an Operations Dashboard

A dashboard allows you and others to quickly visualize your survey results in a series of maps and graphs.

[3a]. While viewing your web map, > Share > Create a web app > Dashboard. Provide a title such as Walkability Survey Dashboard. Tick “share this app in the same way as the map.” > Done.

[3b]. Edit your dashboard. Use + sign > Pie chart > Select Walkability survey > Grouped Values > Pedestrian Friendly or Unfriendly? Take default colors. Use + sign > Add another pie chart > Select walkability survey > Grouped Value > Rate the walkability of this site. Use + sign > Add map legend. Use + sign > Add gauge. Use + sign > add image. If you need an image, you can use the author’s image on: [https://live.staticflickr.com/7805/33263417808\\_640912b3bf\\_w.jpg](https://live.staticflickr.com/7805/33263417808_640912b3bf_w.jpg).

Adjust the size, placement, and add titles to the elements in your dashboard. An example of what your dashboard could look like:



## 4. Create a Story Map

A storymap allows you, with multimedia and interactive web maps, to tell the story about the problem you are studying, along with possible solutions.

[4a]. Go to: <https://storymaps.arcgis.com> > Sign in. This activity uses the new storymaps (not the “classic” storymaps). You should be here: <https://www.esri.com/en-us/arcgis/products/arcgis-storymaps/overview>

Once you are signed into your ArcGIS Online account > Create New Story.

[4b]. Insert the following items into your story map.

**[Title] How walkable is your community?**

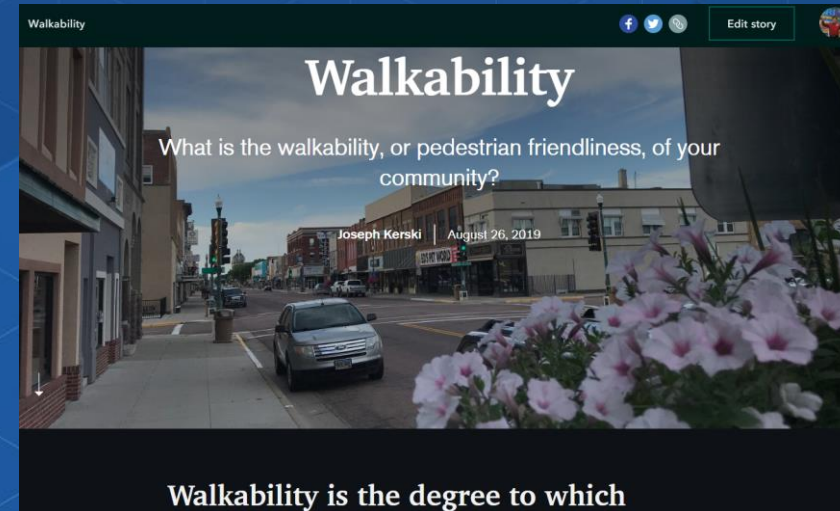
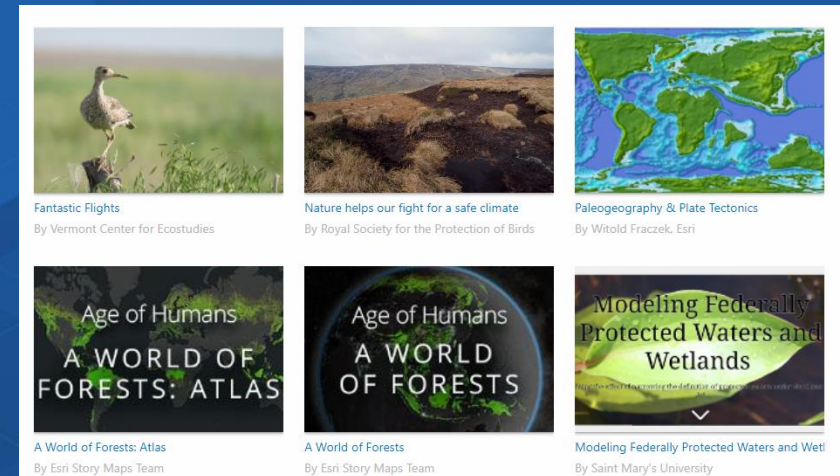
**[Subtitle]**

A survey and map showing the degree of pedestrian friendliness of your community.

**[Cover image: Lakewood Photograph #1 or your own photo.]**

**[Byline]**

By < your initials > | Today’s Date



## **[Quote]**

*“The General Theory of Walkability explains how, to be favored, a walk has to satisfy four main conditions: it must be useful, safe, comfortable, and interesting.”*

*— Jeff Speck, Walkable City: How Downtown Can Save America, One Step at a Time.*

## **[Paragraph]**

Walkability is the degree to which pedestrians, including those in wheelchairs, on bicycles, scooters, and in any other non-vehicle mode, feel safe and able to traverse their community. Whether one wants to walk in a community depends on many factors, such as social norms, safety, personal preferences, and other factors. This study focuses on the physical challenges or lack of challenges that pedestrians face. For pedestrians using wheelchairs or pushing strollers, walkability can also be influenced by curb cuts, stairs, or obstacles on the sidewalk.

**[Paragraph]** Connecting Surveys, Maps, and Apps :- Author: Joseph J. Kerski, PhD GISP, Esri :- Page **7** of **9**

What is the walkability on a street or path in your own community? Submit your own point using the link below:

### **[Button]**

Text in button: **Click to Submit Survey Point.**

Link in button: Find the URL for your Survey123 about walkability and insert it here. Or, use the author's survey here: <https://arcg.is/1nKevj>

### **[Paragraph]**

The results of this survey, with data gathered from pedestrians around the world, can be visualized on the map below.

### **[Map]**

Open a separate tab in your browser and go to [www.arcgis.com](http://www.arcgis.com) > Sign in if necessary > search for your ArcGIS Online map showing the results of your walkability survey. Once you find the map, under the thumbnail, click "Add to Favorites." Or, use the author's web map, here:

<http://www.arcgis.com/home/webmap/viewer.html?webmap=f2c79a4332be488fb15a2254a3bf901e>

Go back to your browser tab where you are editing your story map.

### **[Map]**

> My favorites > select the walkability map, which should now appear in your favorites from the previous step.

Zoom in to the largest scale such that all 3 walkability survey points are visible > Place Map.

Overwrite the default caption with the following text: Map showing walkability survey points. Your map should look like this, below. Your users will be able to interact with it.

## [Embed]

Add a link to your Dashboard. Or use the author's dashboard:

<https://www.arcgis.com/apps/opsdashboard/index.html#/f4e5ce79b4bb4ffc8b29e1c73629bfce>

Change the dashboard caption to: Walkability survey responses.

When done, the dashboard should be embedded into your storymap. Your users will be able to interact with it.

[Heading] Would you say the following location is walkable?

[image] Use the Lakewood Colorado #1 image (or your own image).

## [Video]

Add "Walking in a Pedestrian Unfriendly Place" video in New Jersey by the author, Joseph Kerski at this URL: <https://youtu.be/wEmZiDv7BjM>

The video should appear as embedded content.



## [Separator] [Paragraph]

Story Map by < your initials > using lesson provided by Joseph Kerski, Esri, as an introduction to Survey123, web maps, operations dashboards, and story maps.

[Separator]

[4c]. When satisfied, preview your story map, test it, publish, and share. The author's story map is here: <https://storymaps.arcgis.com/stories/7afc60296c424214b0be2221232a8346>



# Connect these tools—GIS is a platform!

Embed a survey in a story map!

[The Top 10 beautiful Ports](#)

Use a survey in a dashboard!

Learn Lesson:

[https://www.arcgis.com/home/item.](https://www.arcgis.com/home/item.html?id=856da9aeb6944e3da2384906c7139dea)

[html?id=856da9aeb6944e3da2384](https://www.arcgis.com/home/item.html?id=856da9aeb6944e3da2384906c7139dea)

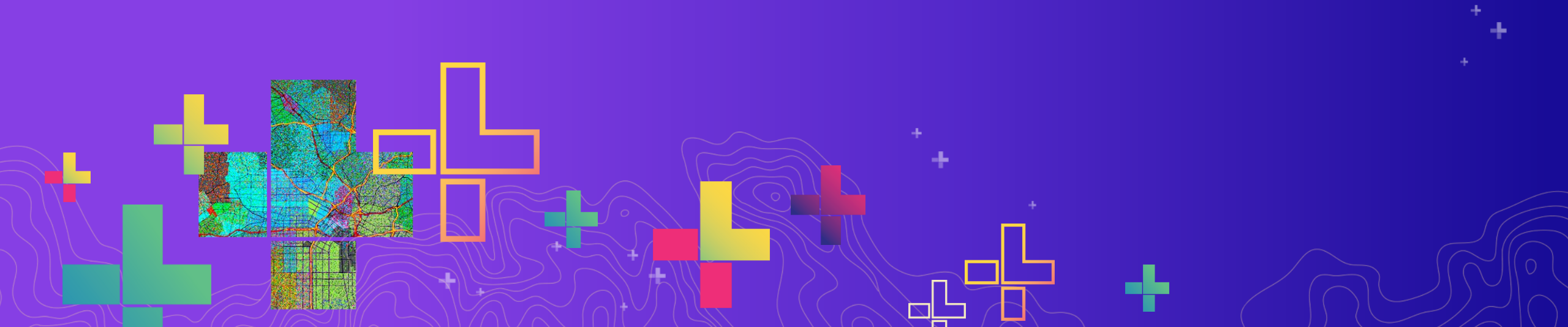
[906c7139dea](https://www.arcgis.com/home/item.html?id=856da9aeb6944e3da2384906c7139dea)

The screenshot shows a web-based GIS application interface. At the top, the title reads "Happy GIS Day! Can You Name the Top 10 Most Beautiful Ports of the World?". Below the title is a navigation bar with tabs labeled "Start Here", "Port #1", "Port #2", "Port #3", "Port #4", "Port #5", "Port #6", "Port #7", "Port #8", and a hamburger menu icon. The main content area is split into two panels. The left panel contains a survey form with the following text: "prize. The deadline to complete the survey is **November 13th**. Winners will be announced during the **GIS Day Celebration on November 14th**. Thanks for participating and enjoy!". Below this is a question: "What is your name or your team's name?\*" with a subtext: "First and Last Name (If you are working as a team, please include at least one of the team member's name)". There is an empty text input field. The second question is "What is the name of Port #1" with a radio button next to the text "Tacoma". The right panel shows a map of the world with numerous colored dots representing ports. A legend titled "LEGEND" and "Ports of the World" is overlaid on the map, showing four categories: "Large port" (red dot), "Medium port" (orange dot), "Small port" (blue dot), and "Very small port" (yellow dot). The map also features standard GIS navigation controls like a home button, zoom in (+) and zoom out (-) buttons, and a scale bar. The bottom right corner of the map area includes the text "POWERED BY" followed by the Esri logo and "Esri, HERE, Garmin, NGA, USGS | Esri".

# This Lesson

Connecting surveys, maps, dashboards, storymaps:

<https://community.esri.com/community/education/blog/2020/03/13/lesson-connecting-surveys-maps-dashboards-and-story-maps>



# Keep learning!

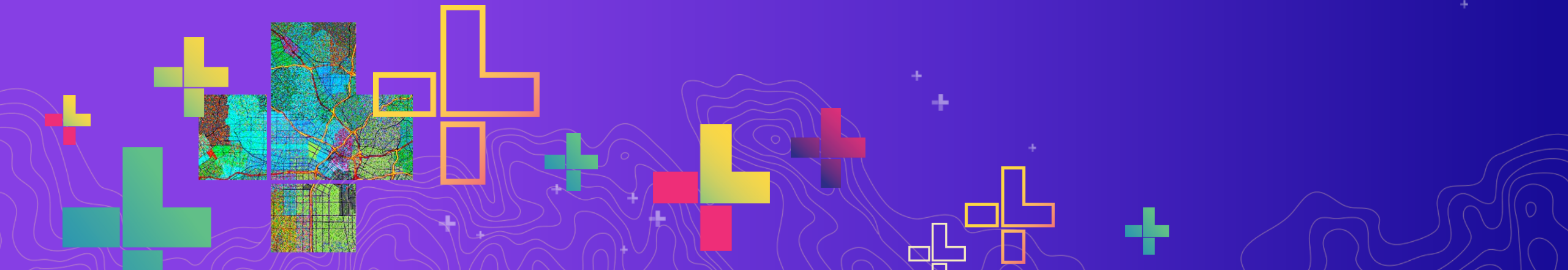
Esri Training: <https://www.esri.com/training> (teaching with GIS, field data collection).

Survey123 for ArcGIS. <https://survey123.arcgis.com>

Esri MOOCs: <http://www.esri.com/mooc> (especially - do-it-yourself web apps).

Esri Community space on Survey123: <https://community.esri.com/groups/survey123>

Learn library of lessons: <https://learn.arcgis.com>





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