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

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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 Pro
- ArcGIS Online
- ArcGIS Enterprise
- ArcGIS Apps
- 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
1- Collect data Using Survey123

2- Map data Using ArcGIS Online

3- Analyze data Using ArcGIS Online

4- Create Dashboard

5- Create Story Map
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
Survey123 for ArcGIS

Form-centric field data collection

Leverages Smart forms

Analyze results immediately
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
Manage Your Surveys

Reporting Tools
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
2 ways to create a Survey123

Today we will use this method.
How to create a survey using Survey123 Connect (Excel) method


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).
<table>
<thead>
<tr>
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<th>name</th>
<th>label</th>
<th>hint</th>
</tr>
</thead>
<tbody>
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<td>ReportDate</td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>time</td>
<td>ReportTime</td>
<td>Time</td>
<td></td>
</tr>
<tr>
<td>begin group</td>
<td>basic</td>
<td>Collect Field Data:</td>
<td></td>
</tr>
<tr>
<td>select_one</td>
<td>LivNonLiv</td>
<td>Living or Non Living?</td>
<td></td>
</tr>
<tr>
<td>select_one</td>
<td>ObjectType</td>
<td>Select Object Type:</td>
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<tr>
<td>end group</td>
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<td></td>
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</tr>
<tr>
<td>integer</td>
<td>Height_m</td>
<td>Height_m</td>
<td>Give height in meters rounded to nearest integer</td>
</tr>
<tr>
<td>geopoint</td>
<td>Location</td>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>image</td>
<td>Photograph</td>
<td>Photograph</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>name</th>
<th>label</th>
<th>image</th>
<th>label::language1</th>
<th>Object</th>
</tr>
</thead>
<tbody>
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<td>Living</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LivNonLiv</td>
<td>Non_Living</td>
<td>Non Living</td>
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</tr>
<tr>
<td>ObjectType</td>
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<td>ObjectType</td>
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<tr>
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<td></td>
<td>Non_Living</td>
</tr>
<tr>
<td>ObjectType</td>
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<td>Non_Living</td>
</tr>
<tr>
<td>ObjectType</td>
<td>other_nonliving</td>
<td>other nonliving</td>
<td></td>
<td></td>
<td>Non_Living</td>
</tr>
</tbody>
</table>
Open a web browser and go to this survey for campus vegetation mapping:

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

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
"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.

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.
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 > 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.html?id=856da9aeb6944e3da2384906c7139dea
This Lesson

Connecting surveys, maps, dashboards, storymaps:

Keep learning!

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

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


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

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