



# ArcGIS Online: Web Mapping with Arcade Expressions

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# Agenda

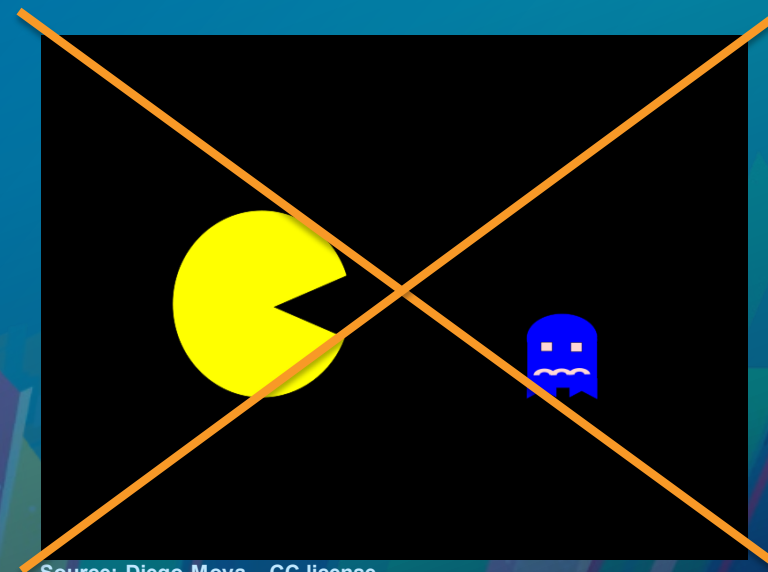
- What is Arcade?
  - Demo: Write Your First Expression
- Why Use Arcade?
- Where to find it
  - Demo: Simple Arcade within a Web Map
- Get Fancy
  - Demo: Complex arcade expressions, Feature Sets
- Testing
  - Considerations
  - What's Next
  - Resources

# What is Arcade?

- Named after the arch not Pac-Man
- Lightweight expression language for working with your ArcGIS data (think excel for ArcGIS)
  - ArcGIS Pro
  - ArcGIS Online
  - Runtime SDKs
  - JavaScript API
  - Web Apps
- Simple or complex expressions to make data-driven adjustments to your web maps



Source: Andrew Dunn – CC license



Source: Diego Moya – CC license



# What is Arcade?

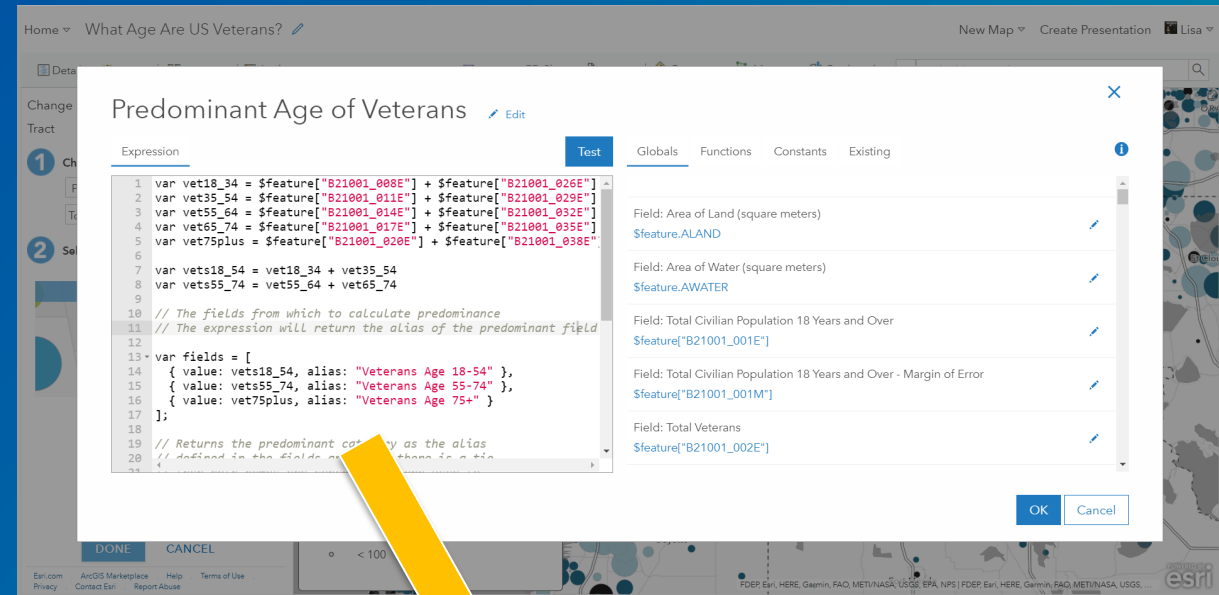
- Not a replacement for Python or geoprocessing

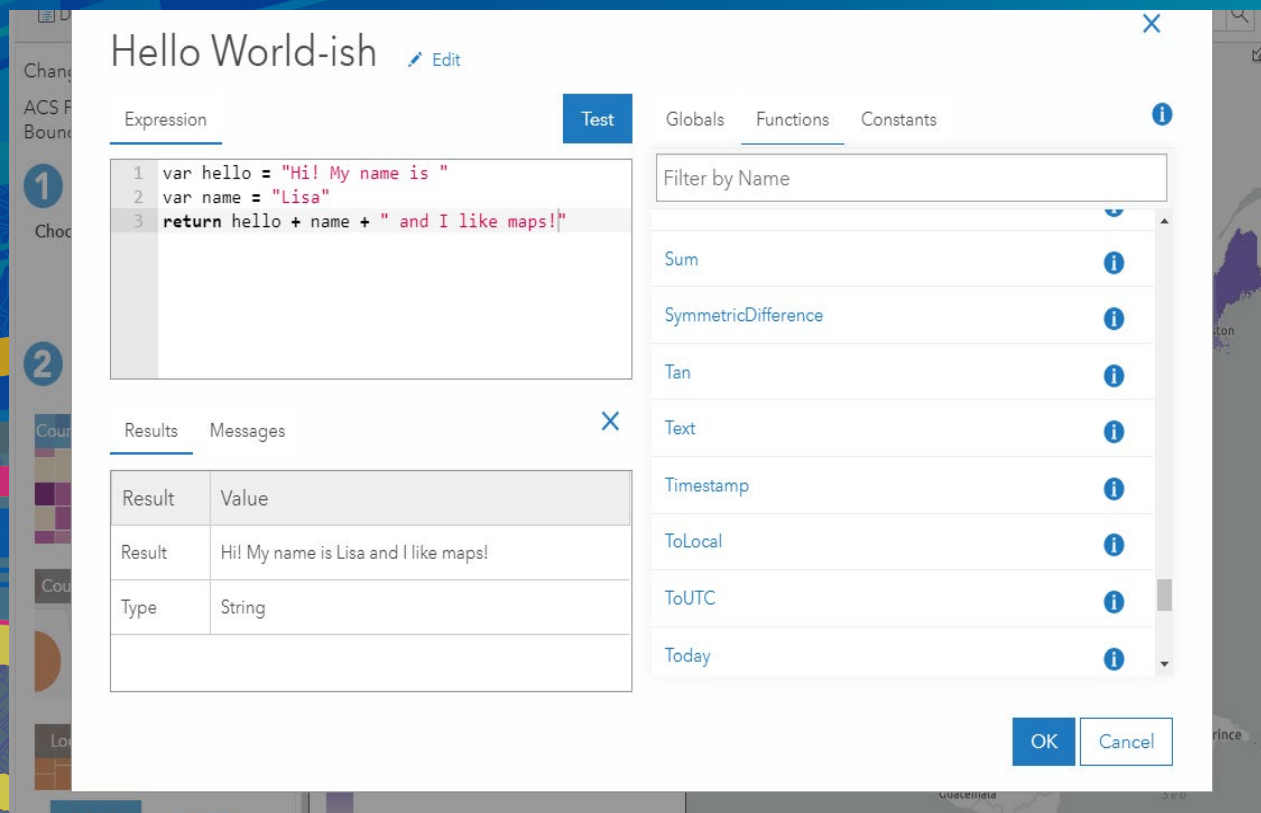
- Arcade is lightweight and simple

- In-map calculator



- Alternative to calculating a new field – meaning you don't have to own the layer






# Write Your First Expression

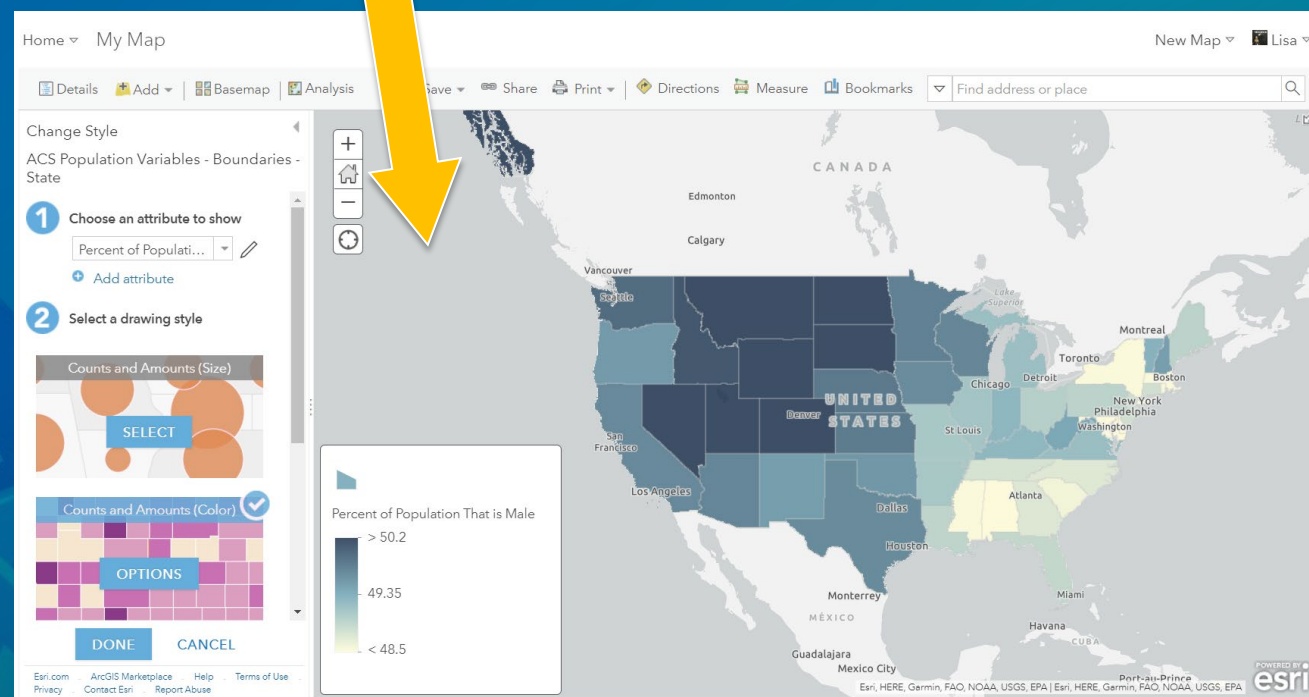
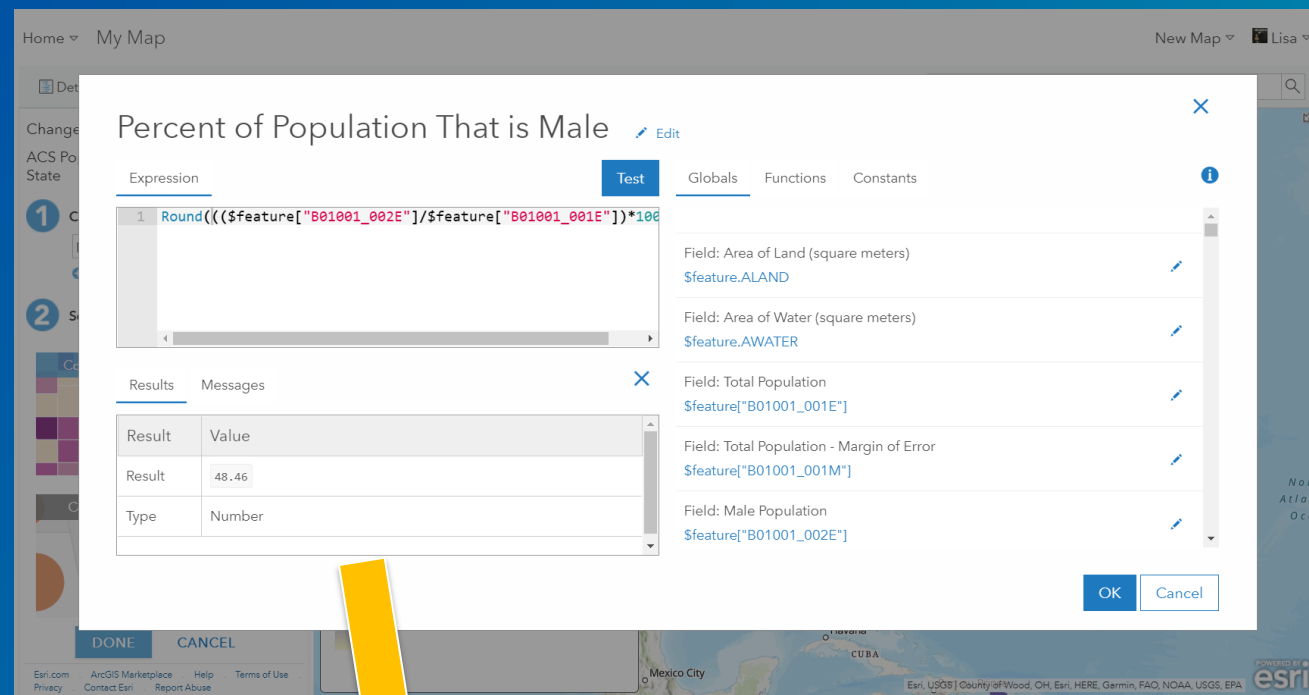
Lisa Berry

# Why Use Arcade?

- Forgot to add a field? Used the wrong data type? Don't own the data? No problem!
  - On-the-fly calculations and data manipulation
  - Easy to get started (excel-like functions and syntax)
  - Expressions carry through to your downstream applications (portable)
  - Secure
  - Geospatial
- 

# Simple but Powerful

- Excel-like
- Simple
  - Write a basic calculation
  - Use a built-in function
  - Re-use existing expressions
- Examples:
  - Combine fields together
  - Format existing fields
  - Unit conversion
  - Rotate symbols
  - Improved text labeling





## Percent of Population Who is Male

[Edit](#)

Expression

Test

Globals

Functions

Constants

Existing

i

1 Round(\$feature["B01001\_002E"]/\$feature["B01001\_001E"])\*100

Expression

Globals

Functions

Constants

Existing

Popup Text (Pop-up)

i

Strength of Predominance (Transparency)

i

Veterans Age 18-54 (Pop-up)

i

Veterans Age 55-74 (Pop-up)

i

Veterans Age 75+ (Pop-up)

i

OK

Cancel

DONE

CANCEL



# Test it!

## Percent of Population Who is Male [Edit](#)

Expression

Test

Globals

Functions

Constants

i

```
1 Round((((($feature["B01001_002E"]/$feature["B01001_001E"])*100))
```

Results

Messages

Result	Value
Result	48.46
Type	Number

Field: Area of Land (square meters)

`$feature.ALAND`

Field: Area of Water (square meters)

`$feature.AWATER`

Field: Total Population

`$feature["B01001_001E"]`

Field: Total Population - Margin of Error

`$feature["B01001_001M"]`

Field: Male Population

`$feature["B01001_002E"]`

OK

Cancel

# Where to find it in the Web Map

## Symbology

Change Style

HUD Insured Multifamily Properties

1 Choose an attribute to show

Show location only

2

USPS Address Type

USPS Standardized ZIP+4 Code

Was Ever Active 202/811 Grants/Loans for F

Watch List Date

ZIP Code

ZIP Return Code

New Expression

## Rotation

☒ Rotate symbols (degrees)

1st Contract 1 Bedroom Units

Rent to FMR Ratio 1

Rent to FMR Ratio 2

Total Assisted Unit Count

Total Number of Children

Total Number of People (in thousands)

Total Unit Count

Total Units Across All Active Contracts Associate

New Expression

## Pop-up Configuration

Attribute Expressions

Adding expressions allows you to create new information from existing fields for use in pop-ups.

ADD

Project Manager Name {expression/expr1}

Property Name {expression/expr1}

Address Line 1 {expression/expr2}

City {expression/expr3}

Annual Expenditure Amount for the Current Year

Average Federal Spending per Unit per Month

## Transparency

Set transparency based on attribute values

Apply transparency to each feature based on the attribute values in a field or an expression.

Field: None

Rent to FMR Ratio 2

Total Assisted Unit Count

Total Number of Children

Total Number of People (in thousands)

Total Unit Count

Total Units Across All Active Contracts Associated

Watch List Date

New Expression

## Labels

Label Features

HUD Insured Multifamily Properties

☒ Label Features

Text: Property Name

Percent of Household Members Age 62 or Older

Percent of All Household Members Below Age 18

Percent of Households with Income Below 80 Percent of Median

Median of Total Annual Income for the Household

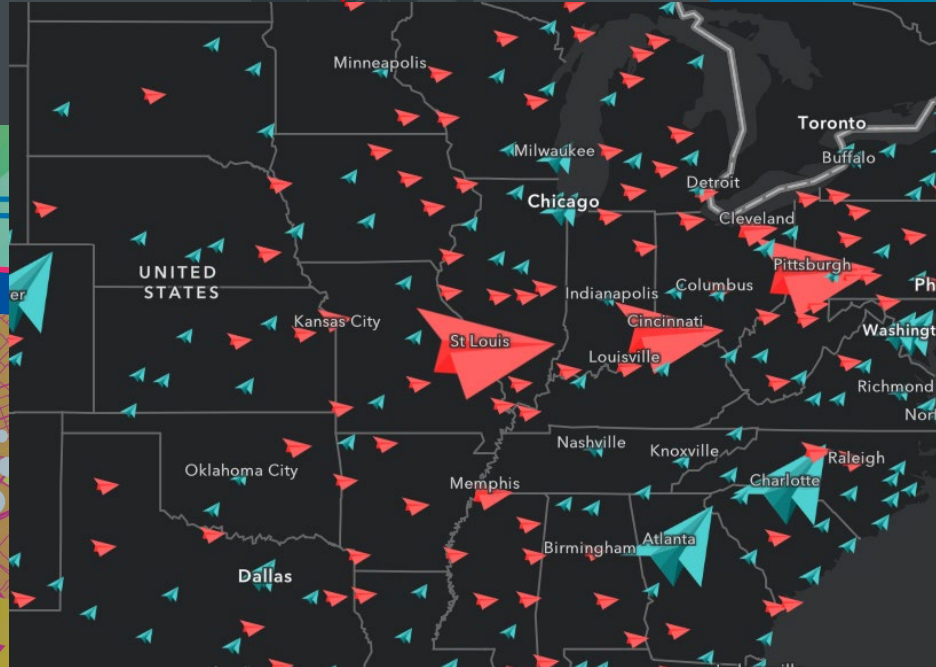
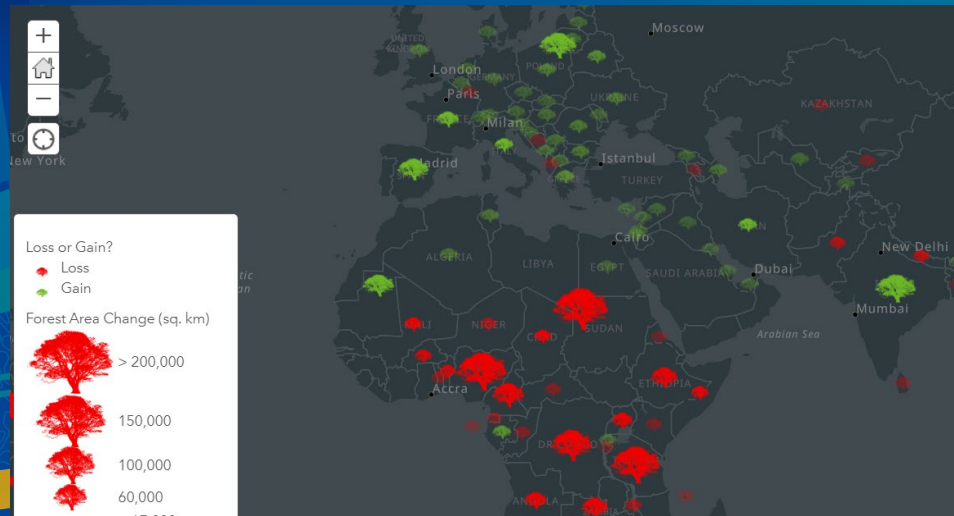
LAST\_UPDT\_DTTM

Annual Expenditure Amount for the Current Year

Annual Expenditure Amount for the Previous Fiscal Year

Align

New Expression



# Simple Arcade within a Web Map

Lisa Berry/Paul Barker

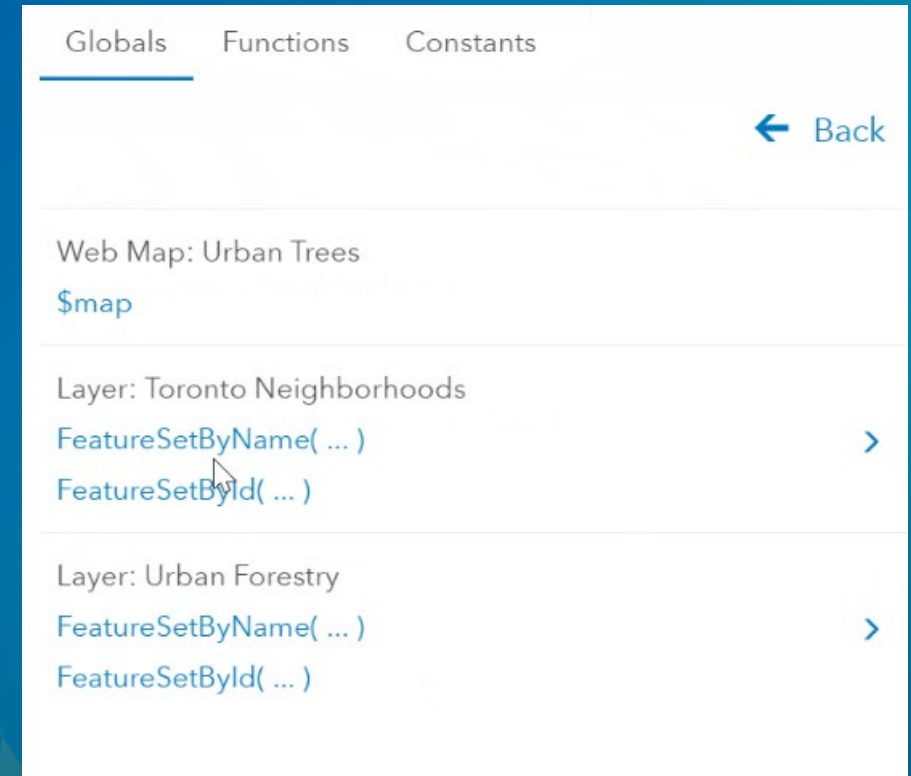


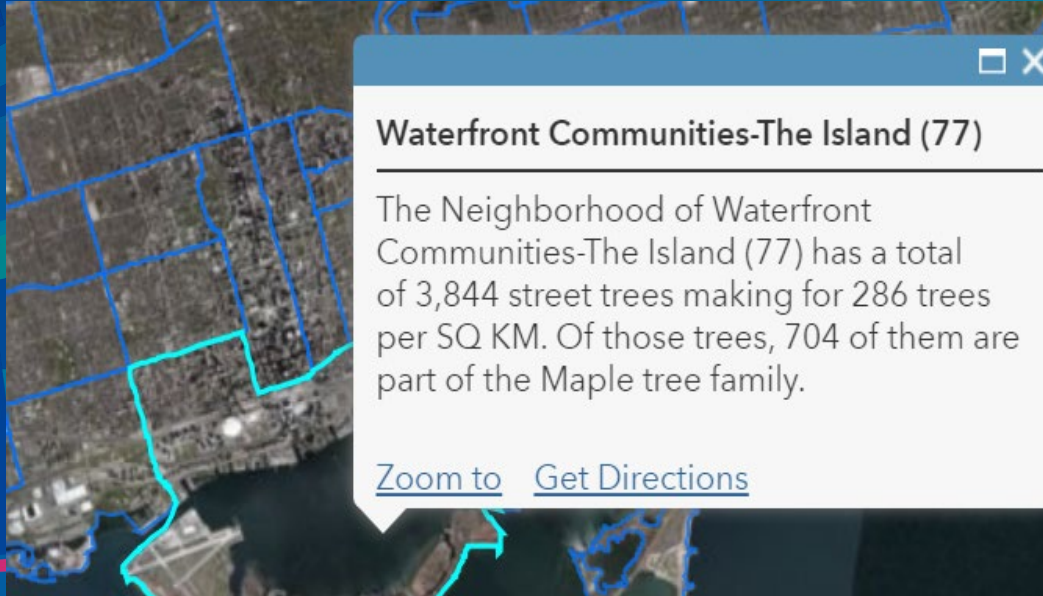
# Get Fancy

- Discover and clean-up your data
  - Variables
  - User-built functions
  - Boolean logic
  - For loops
  - Conditional statements
  - Geometry functions
  - Feature Sets
- Examples:
  - Access related data in your popup
  - Complex calculations such as an index created from multiple fields
  - Render based on geographic relationships

# What's a Feature Set?

- Feature sets are a way to access information from multiple features
  - From the same layer or any layer within your map (\$map) or service (\$datastore)
  - Work with data that is related either informally or formally
  - Can be very powerful when used responsibly





## Trees per SQ KM

 Edit

Expression

Test

```
1 // define the FeatureSet Variable
2 var trees = FeatureSetByName($map, "Urban Forestry")
3
4 // Intersect the featureset with the neighborhood
5 // and get the total number of trees (count) for that
6 // neighborhood
7 var countTrees = Count(Intersects(trees,$feature))
8 var treeDensity = countTrees / AreaGeodetic($feature, 'square-kilometer')
9 return Round(treeDensity,2)
10
```

# Get Fancy

Paul Barker/Lisa Berry



# Troubleshoot your Expressions

- Plan things out in your head or on paper before you start
- The test feature and button are your friend
- Leverage log statements to debug code
- Factor out logic into functions in larger expressions

The screenshot displays an ArcGIS web application interface. On the left, the 'Contents' panel shows layers for 'Urban Forestry', 'Toronto Neighborhoods', and 'Imagery'. The main map area shows a satellite view of a city with a blue boundary. A popup window titled 'High Park-Swansea (87)' is open, displaying text about the neighborhood's street trees. Below the map, the Chrome DevTools 'Network' tab is active, showing a list of requests. The first request is highlighted, showing a query to the ArcGIS REST API.

**High Park-Swansea (87)**

The Neighborhood of High Park-Swansea (87) has a total of 6,245 street trees making for 1,165 trees per SQ KM. Of those trees, 1,881 of them are part of the Maple tree family.

[Zoom to](#) [Get Directions](#)

**Network Tab:**

Name	Size	Time
query?f=json&where=FID%3D71&returnGeometry=tru...	6.3 KB	313 ms
query	489 B	1.36 s
query	491 B	1.36 s
query	490 B	1.35 s

# Considerations

- Check your network traffic – how big are your queries?
- When using feature sets, don't make heavy queries (heavy = slow)
  - Use attribute queries instead of spatial queries when possible
- If you don't need it, don't request it!
- Chain functions as much as possible

# What's next

- Making it easier to work with attachments
- Simplifying working with feature sets when the data has relationships
- Additional functions to make your life easier
- Better URL/URI encoding options
- Revamped Arcade Editor





# Resources for Arcade

<http://esriurl.com/ArcadeResources>

## Blogs about Arcade

The ArcGIS Blog homepage features a dark header with the 'ArcGIS Blog' title and navigation links for 'Overview' and 'Topics'. The main content area displays a list of blog posts. Each post includes a thumbnail image, a title, a byline, a short description, and a 'Continue reading' link. The visible posts are:

- Create powerful popups in web apps with Arcade feature sets** by Kristin Diener | ArcGIS API for JavaScript | January 15, 2019. Description: Feature sets allow you to access multiple features within an Arcade expression, enabling you to create powerful popup content.
- What's new with Arcade: Taking a stroll through FeatureSets Part 2** by Paul Baker | ArcGIS Online | December 21, 2018. Description: Arcade is one of the many ways you can make smarter, and more elegant maps. Learn how FeatureSets let you work with other layers in your map.
- Create Custom Field Calculations Using Arcade Expressions** by Lisa Berry | ArcGIS Online | December 18, 2018. Description: Harness the power of Arcade to create simple or complex field calculations.
- What's new with Arcade: Taking a stroll through FeatureSets (Part 1)** by Paul Baker | ArcGIS Online | December 12, 2018. Description: Arcade is one of the many ways you can make smarter, and more elegant maps. Learn how FeatureSets let you work with other layers in your map.

## Story Map Tutorial

The 'How to Smart Map: Arcade' Story Map features a dark-themed map of the world with red location pins. A large, semi-transparent text box in the center contains the title 'How to Smart Map: Arcade' and the subtitle 'Dynamically transform your data using Arcade expressions'. The Esri logo is in the top left corner, and a 'How to Smart Map' link is in the top right. A white arrow points downwards at the bottom center of the map.

## Documentation

The ArcGIS Arcade documentation page has a purple header with navigation links: 'ArcGIS for Developers', 'Dashboard', 'Get Started', 'Documentation', 'Pricing', and 'Support'. The main content area is titled 'ArcGIS Arcade' and 'Version 1.5.0 - December 2018'. It includes a 'Simple, Portable, Expressions!' section explaining that Arcade is an expression language used across the ArcGIS Platform. Below this, there are three colored boxes with icons and titles: 'Write your First Expression' (green), 'Understand the Language' (orange), and 'Arcade Profiles' (blue).

## GitHub – Arcade Examples

The GitHub repository page for 'ArcGIS Arcade expressions' shows a list of files and folders. The files include 'alias', 'any', 'calculation', 'constraint', 'labeling', 'popup', 'visualization', 'LICENSE', and 'README.md'. The 'README.md' file is selected, showing the repository's purpose: 'This repository is intended for sharing and maintaining reusable Arcade expressions across all supported profiles.' It also includes a 'General workflow' section explaining that expressions are organized by their intended execution profile.

## ArcGIS Online Group: Examples

The ArcGIS Online group page for 'Arcade Expressions and You' shows a grid of map examples. The page includes a search bar, filters for 'Group Categories' and 'Item Type', and a list of map items. Each item card displays a thumbnail map, the title, the author, the creation and update dates, and the view count. The items include 'African Ancestry in th...', 'California Prison Ove...', 'Caribbean Ancestry l...', 'Change in Forest Are...', 'Construction and Ext...', 'Dallas Youth Populati...', 'Declining Home Ow...', and 'Deferred Action for...'.

# Learn More About Arcade

## Pump up Your Pop-ups With Arcade

Thursday 11-11:30am

Demo Theater 1 in Oasis

## ArcGIS API for JavaScript: Using Arcade with your Apps

Thursday 2:30-3:30pm

Pasadena/Sierra/Ventura



esri

THE  
SCIENCE  
OF  
WHERE

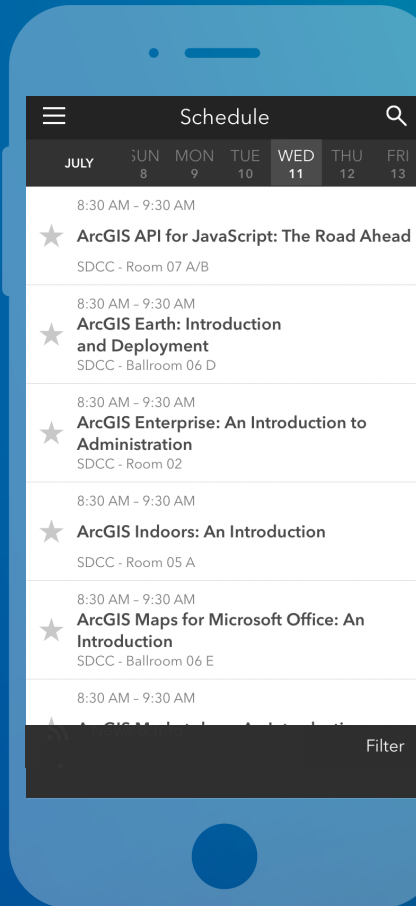


# Please Take Our Survey on the App

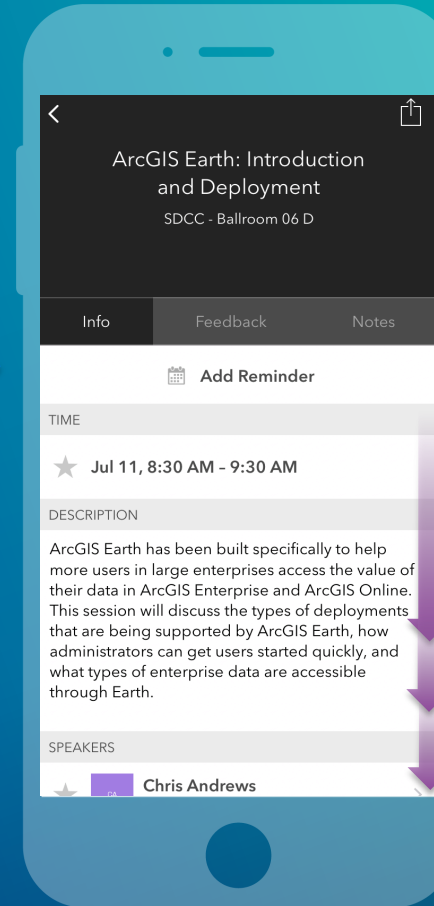
Download the Esri Events app and find your event



Select the session you attended



Scroll down to find the feedback section



Complete answers and select "Submit"

