



Collecting Perishable Data with ArcGIS Online

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Presentation Outline

Part 1 - Setup use case

- Purpose of the app
- Description of the data

Part 2

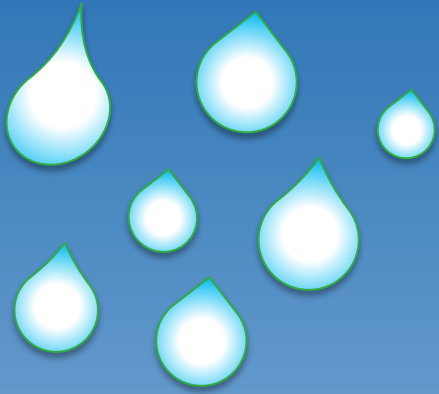
- Explain Application Structure and use issues
- Improved usability with Arcade and ArcGIS Online

Demo

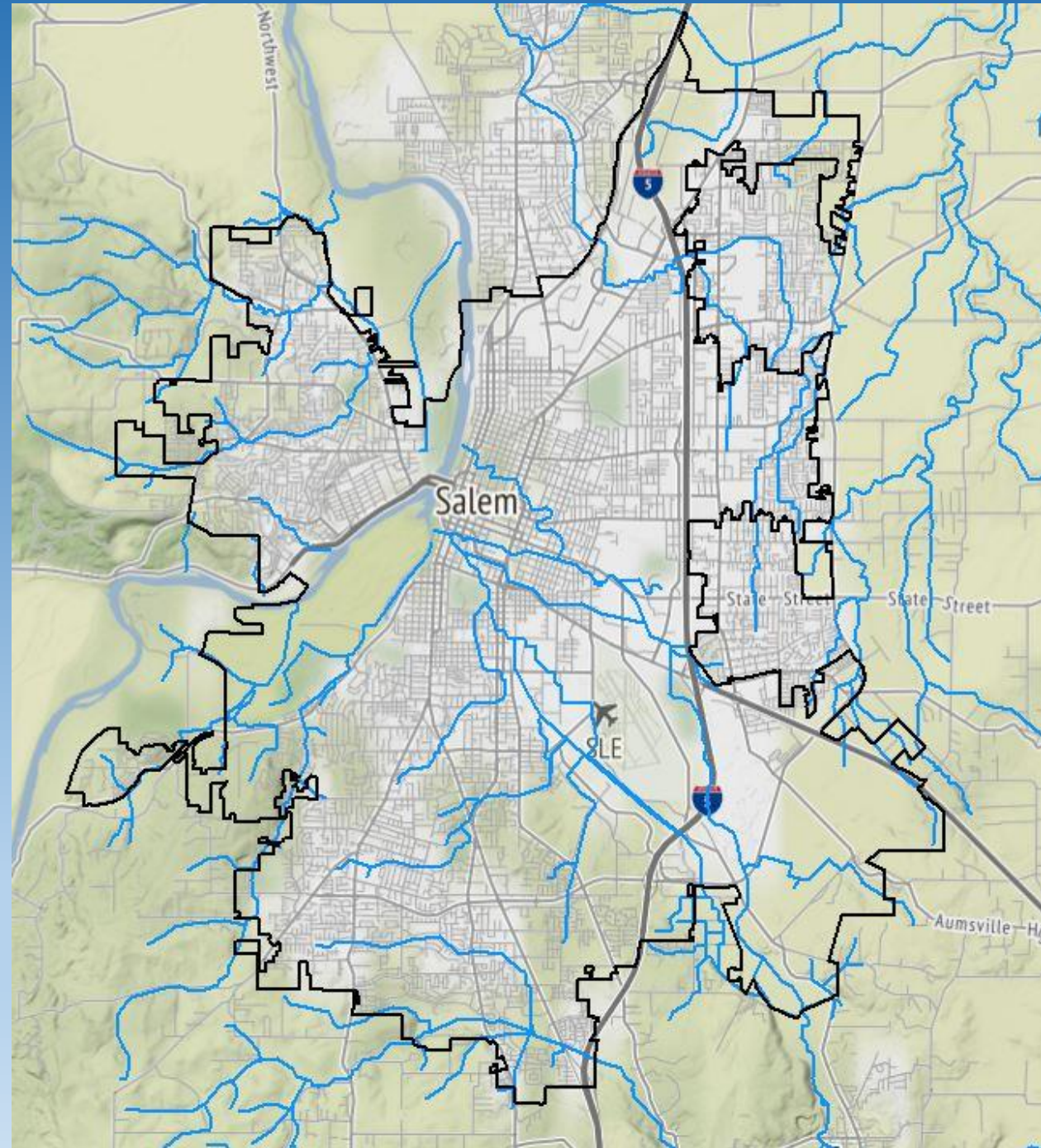
- Alternative data model: Survey123, Custom urls, Microsoft Flow

Part One – Use Case Background





- 40 inches of rain per year
- 90 miles of streams
- History of flooding





1960

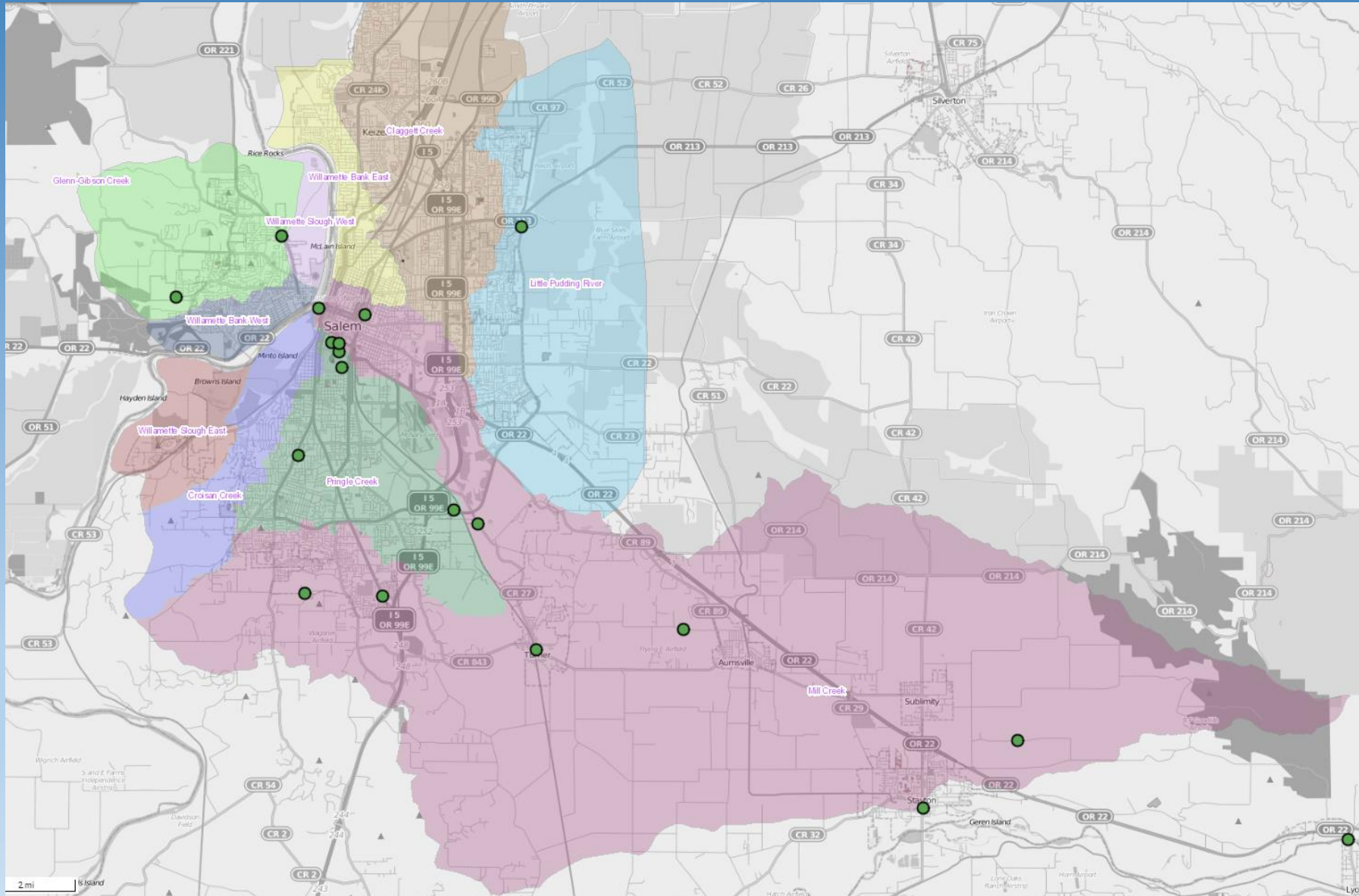


1996



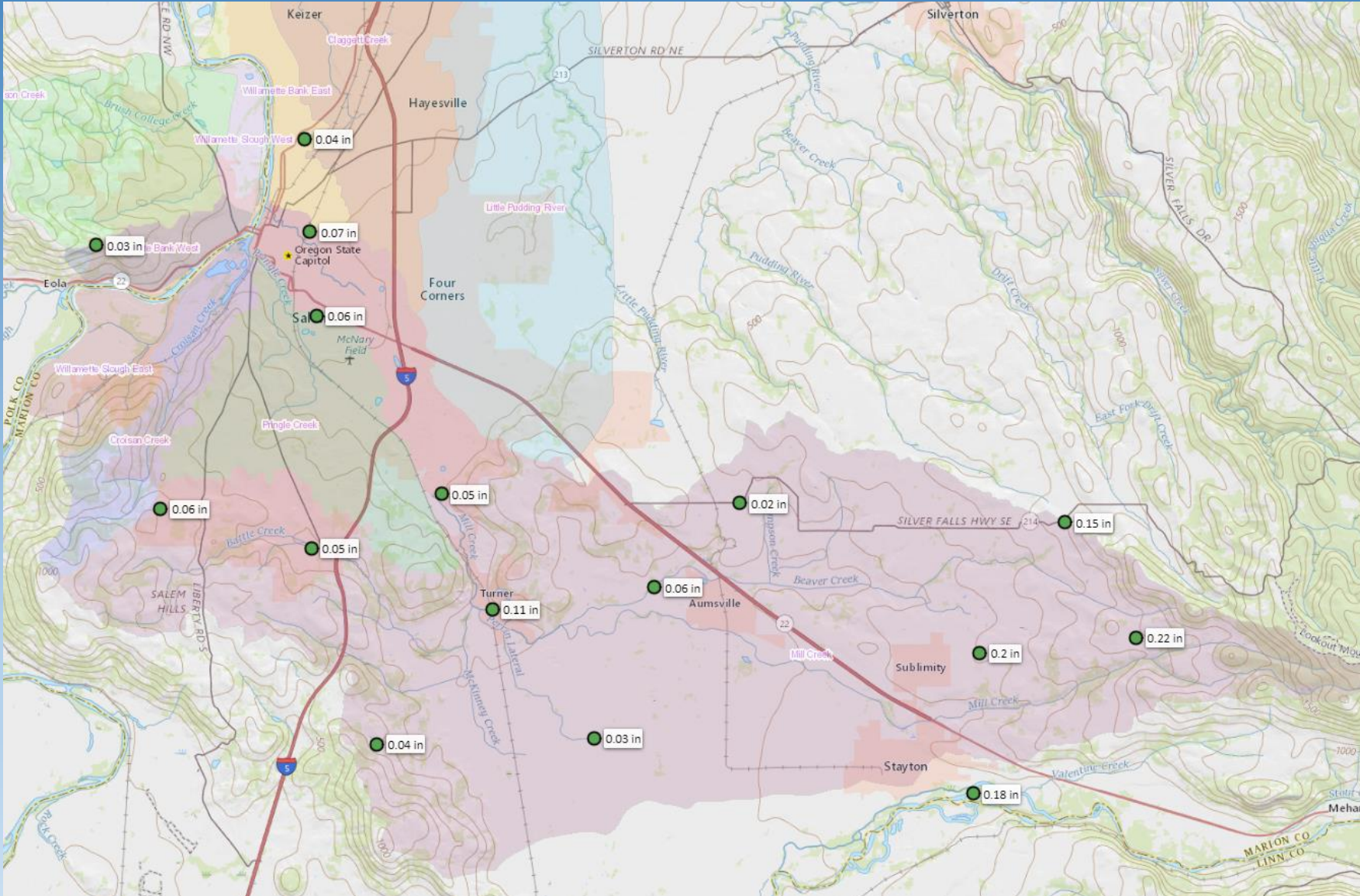
2012

Flood Warning System



- 17 real-time stream gauges
- Located throughout city and Mill Creek Watershed

Flood Warning System Cont'd



- 16 real-time rain gauges
- Located throughout city and Mill Creek Watershed

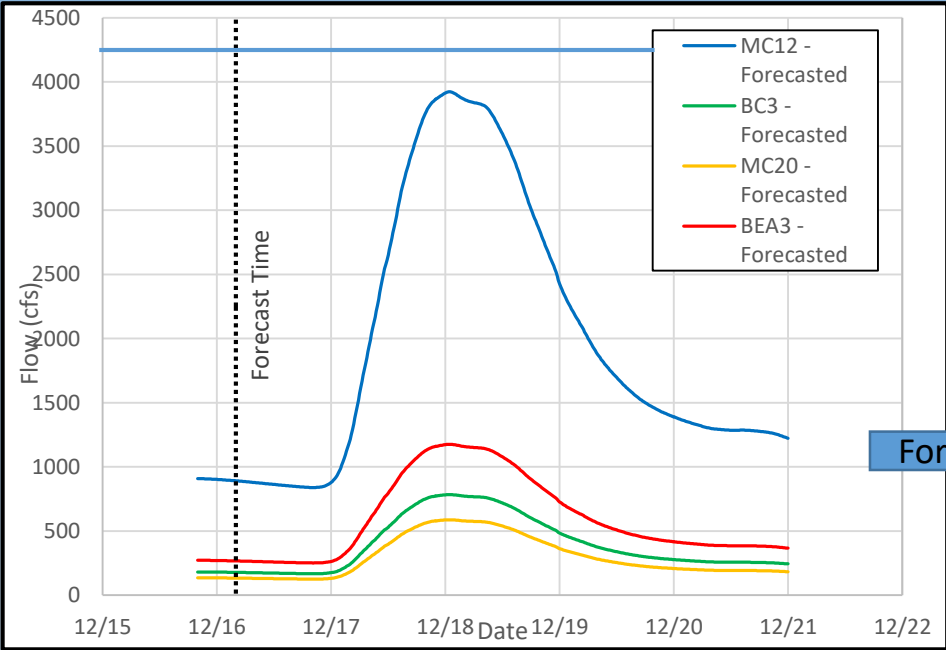
Hydrologic Model



"2015-12-13 01:15:00"	,.04,.02,.03,.01,0,.01,0,.02
"2015-12-13 01:30:00"	,0,0,.02,.02,0,0,.02,.03
"2015-12-13 01:45:00"	,.02,.03,.01,.04,0,.01,0,.02
"2015-12-13 02:00:00"	,.02,.04,.02,.02,0,.01,.01,.01
"2015-12-13 02:15:00"	,.04,.05,.02,.02,.01,.05,.02,.02
"2015-12-13 02:30:00"	,.04,0,.05,.02,0,.03,.06,.05
"2015-12-13 02:45:00"	,0,0,.01,.04,0,0,.02,.02
"2015-12-13 03:00:00"	,0,.01,0,.01,.01,0,0,.01
"2015-12-13 03:15:00"	,0,0,0,0,.01,0,0,0
"2015-12-13 03:30:00"	,.01,.01,0,0,.02,0,0,0
"2015-12-13 03:45:00"	,0,.01,0,0,.02,.01,.01,0
"2015-12-13 04:00:00"	,.02,.02,.01,0,.03,.01,.01,.01
"2015-12-13 04:15:00"	,.03,.04,.02,.01,.11,.01,.02,.01
"2015-12-13 04:30:00"	,.02,.02,.02,.01,.09,.02,.02,.02
"2015-12-13 04:45:00"	,0,.02,.01,.01,.03,.01,.01,.01
"2015-12-13 05:00:00"	,.01,.03,.02,.01,.04,.01,.01,.01
"2015-12-13 05:15:00"	,.03,.02,.01,.02,.03,.02,.02,.01
"2015-12-13 05:30:00"	,0,.01,.01,.01,.01,.01,.01,.02
"2015-12-13 05:45:00"	,.01,0,.01,.01,.02,.01,0,0
"2015-12-13 06:00:00"	,0,.01,.01,0,.01,.01,.01,.01
"2015-12-13 06:15:00"	,.01,0,0,.01,0,0,0,0
"2015-12-13 06:30:00"	,0,.01,.01,0,.01,0,0,0
"2015-12-13 06:45:00"	,.01,.01,0,0,.02,.01,.01,.01
"2015-12-13 07:00:00"	,0,.01,.01,.01,.01,.01,0,0
"2015-12-13 07:15:00"	,.01,0,0,.01,0,0,.01,0
"2015-12-13 07:30:00"	,0,0,0,0,0,.01,.01,.01
"2015-12-13 07:45:00"	,0,0,0,0,0,0,0,0
"2015-12-13 08:00:00"	,0,0,0,.01,.01,0,0,0

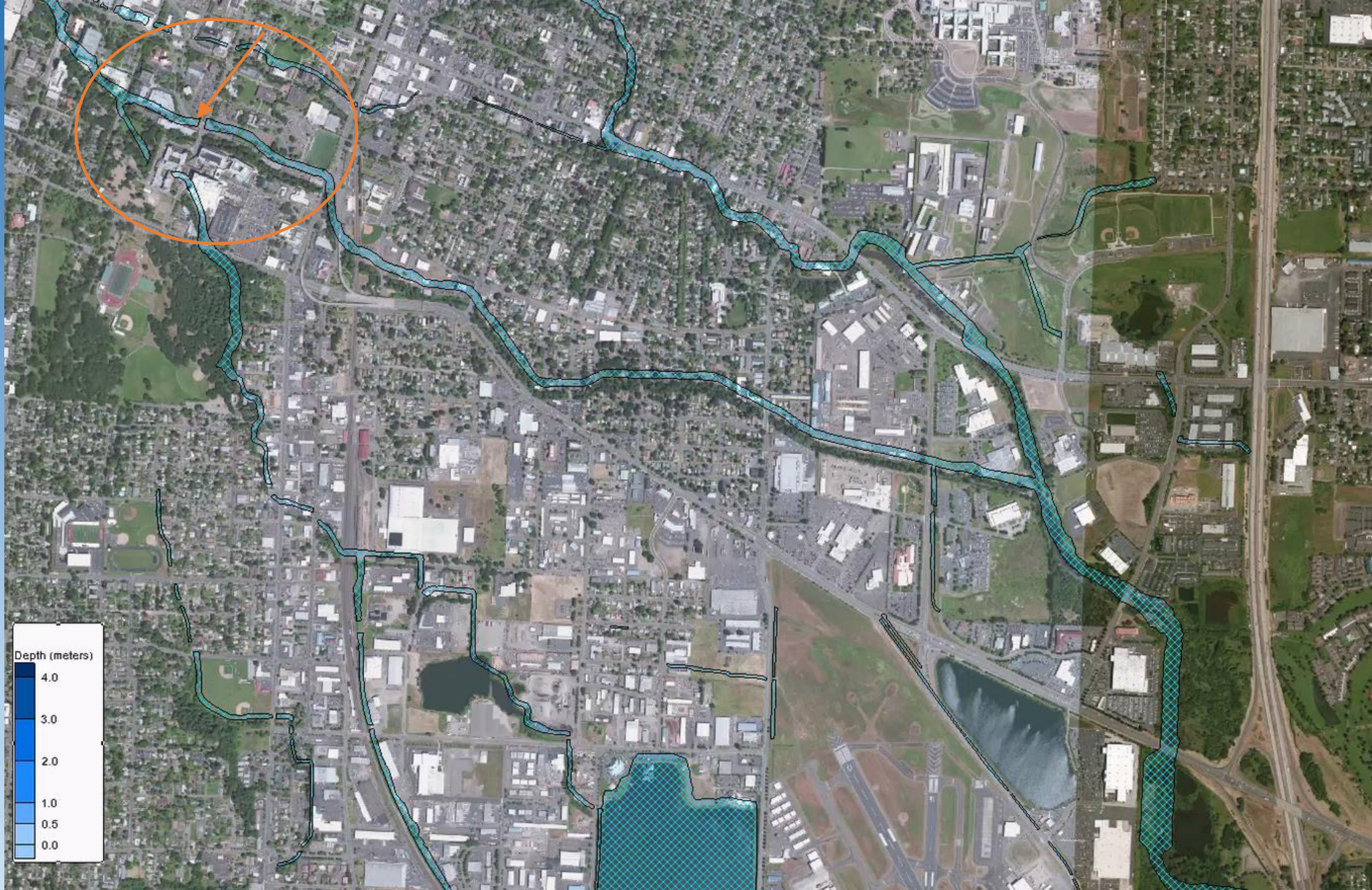
HEC HMS
Model

Projected rainfall, ground saturation, snow conditions



Forecast inundation





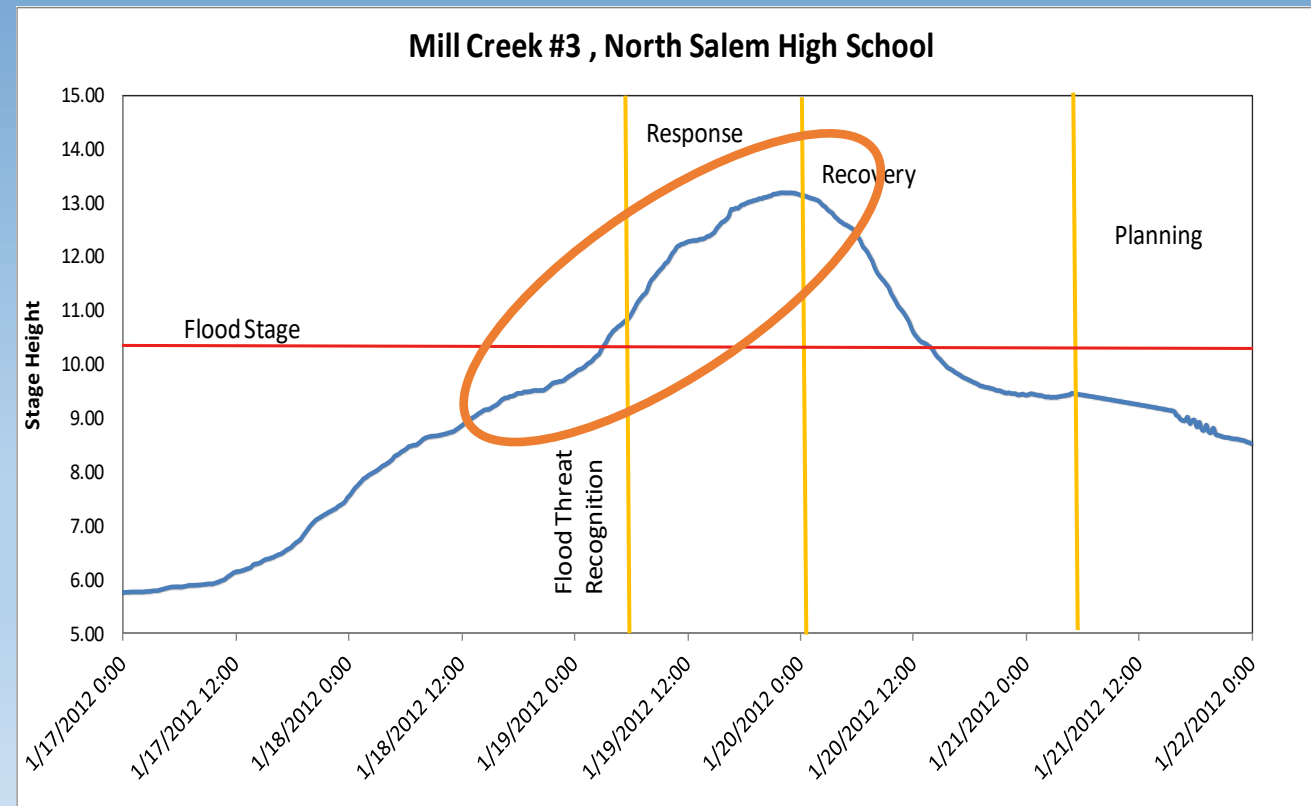
What is Perishable Data?

Documented observations of phenomena that are subject to rapid change and/or are useful for a limited time

- Temporally significant
- Must be collected quickly to be of use

Value:

- Operational awareness/response
- Post-event analyses
- Calibrate/verify flood models and inundation levels



Operational Awareness

Where is the water going? How will that affect flood impact? Will changes affect flood model projections?

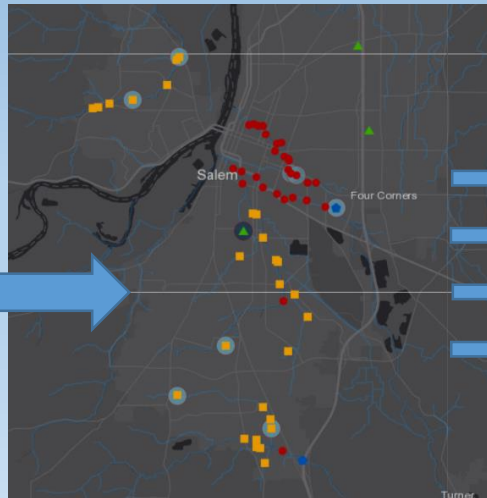
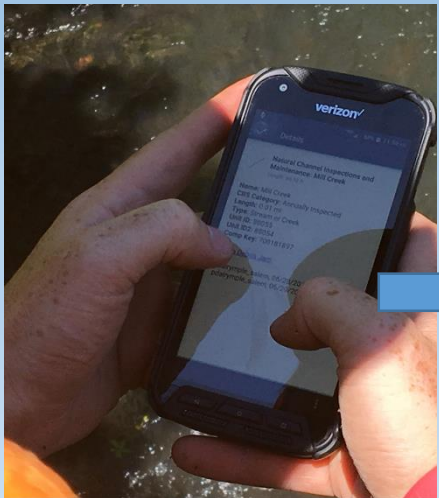
Diversion structure on Mill Creek @ Start of Shelton Ditch



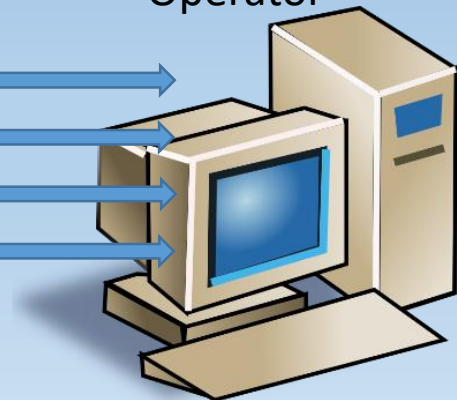
Operational Awareness



Field data inform Flood Warning System Operator → Observations OC'd & Synthesized → Shared with EOC as needed



Flood Warning System Operator



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<https://www.everbridge.com/blog/why-every-eoc-leader-needs-to-read-the-2018-nims-update/>

What kind of Perishable Data are we interested in?

Pictures and Date/Time Stamps!!

Predefined locations of interest

- Bridges
- Culverts
- Diversion structures
- Detention Basins

Ad Hoc Data Collection

- Street flooding
- Flood Damage
- Inundation Documentation
- High Water Marks/Wrack Lines

Flood Damage
Inundation Photos
Street Flooding
Wrack Line/High Water Mark

Bridge Observation Points



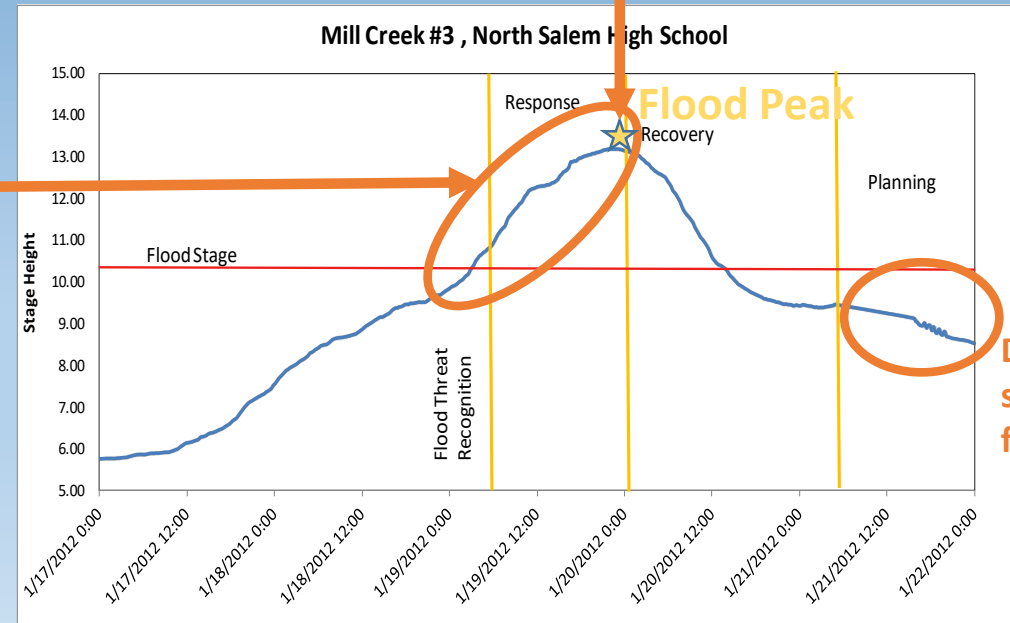
Culvert Observation Points



Detention Basin Observation Points

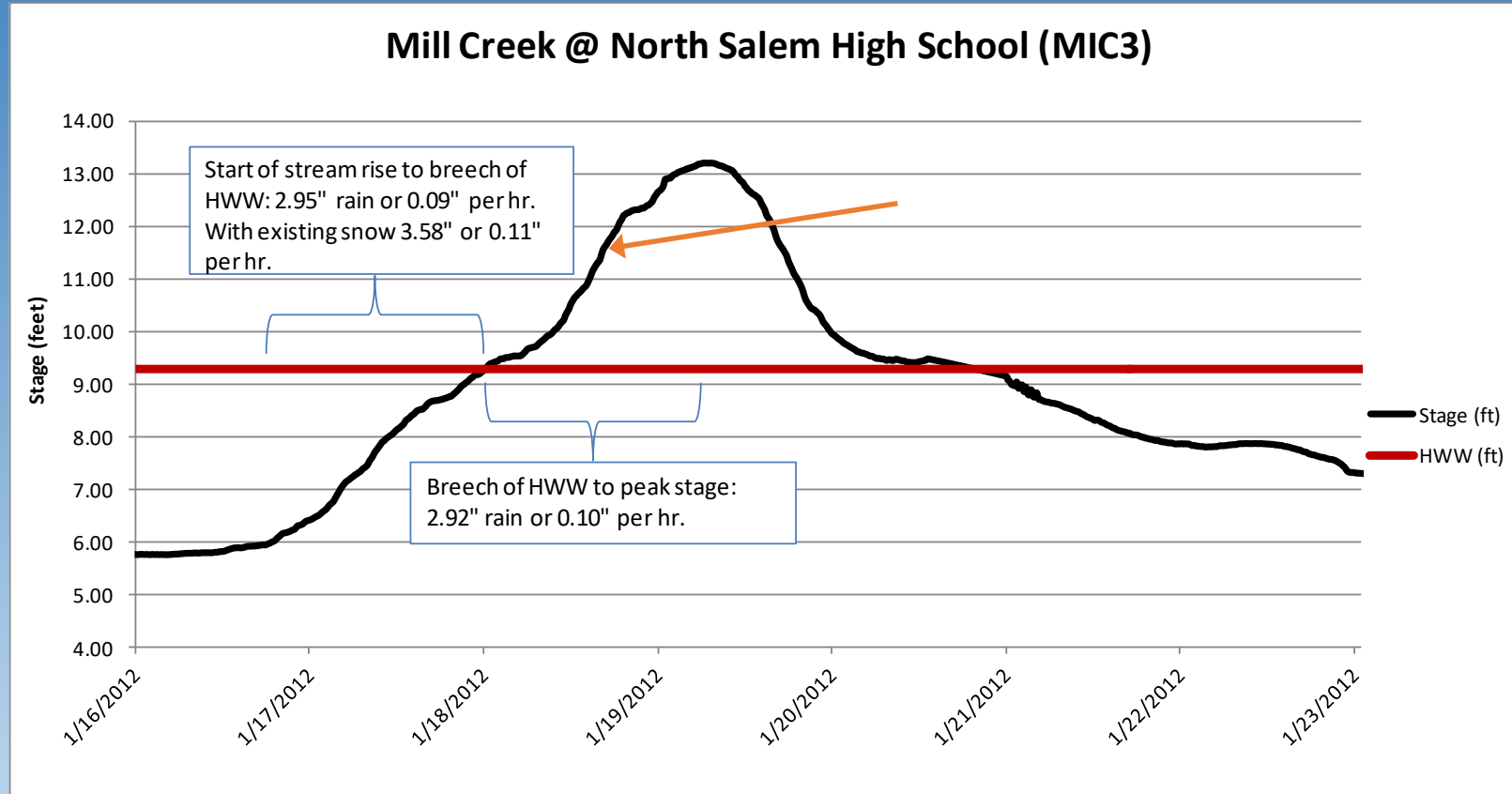


Diversion Structure Observation Points



De-construct event scenario to inform future response

Calibrate/Verify Flood Model



- 10.1 ft. (raw)
- 10.4 ft. (raw)
- 10.6 ft.(raw)
- 11.5 ft. (raw)
- 11.9 ft. (raw)
- 12.2 ft (raw).

Mill Creek Begins to flood 21st and State St **(12 hours after Stage Alarm)**

Mill Creek begins to flood 14th and A St NE

Mill Creek floods State St. between 17th and 24th

Shelton Ditch begins to flood Winter St. SE/Bellevue St. SE

Flooding on Turner Rd North of Kuebler

Shelton Ditch begins to flood over 25th St. SE

Request and Data Collection Needs

- Received list from Flood Warning Operator of locations of interest and observations needed for each site
- Developed Matrix to classify sites according to observation needs

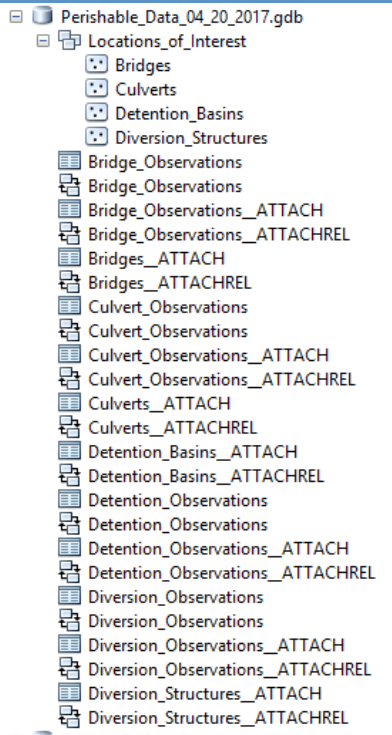
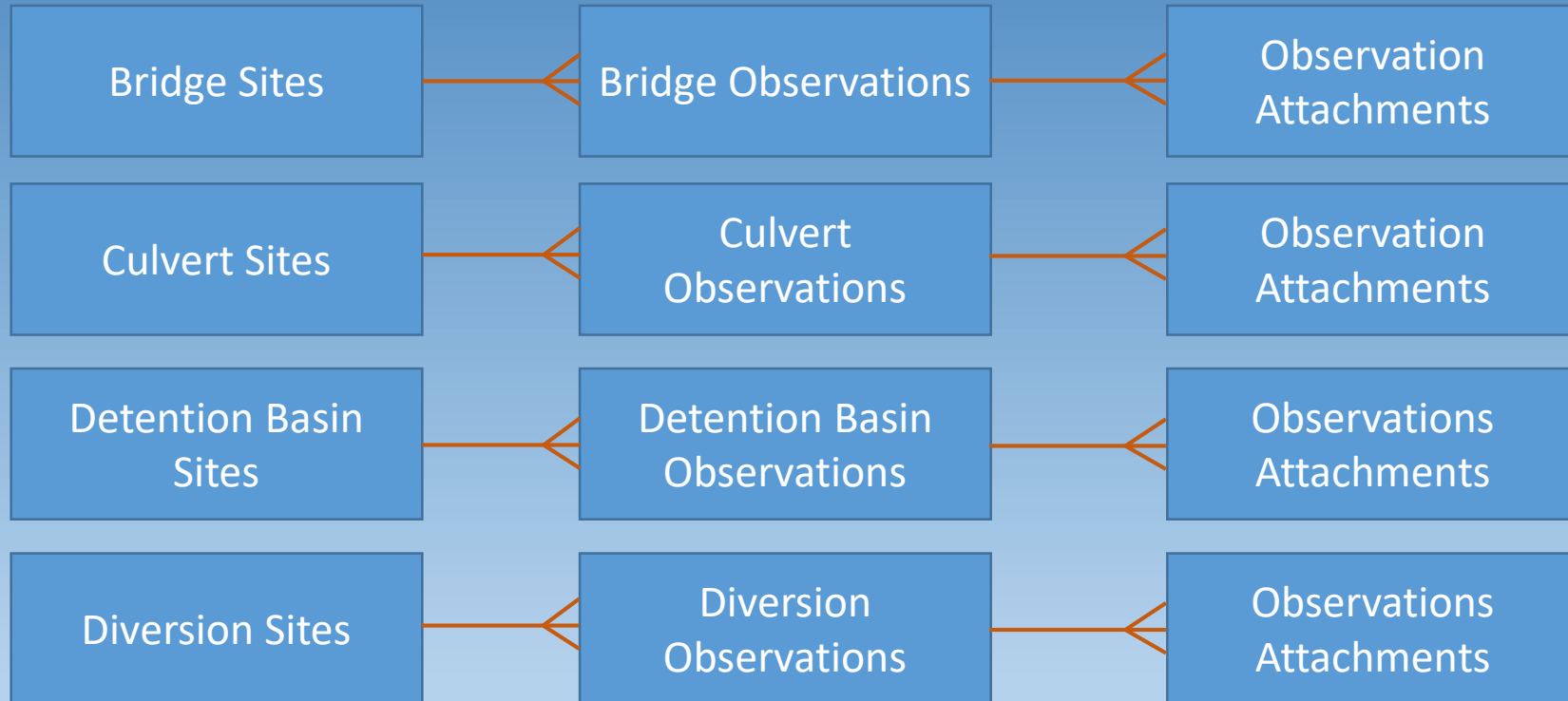
Site	Structure	Basin	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
BATT2_B	Bridge	Battle Creek	1	0	0	1	1	1	1	1	1	0	0	0	A	Lath installed at time of inspection (Y/N)				
VPRIN2_B	Bridge	W Pringle	1	0	0	1	1	1	1	1	1	0	0	0	B	Roadway stream flooding (Y/N)?				
VPRIN5_B	Bridge	W Pringle	1	0	0	1	1	1	1	1	1	0	0	0	C	Is there debris blocking flow (Y/N). If (Y), what is the estimated drop (feet) in water surface elevation downstream the debris?				
MILL1_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0	D	Noticeable debris on upstream side of bridge (Y/N)				
MILL2_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0	E	Water level above upstream of bridge opening (Y/N)				
MILL3_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0	F	Stream flooding upstream of bridge (Y/N)				
MILL4_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0	G	Stream flooding downstream of bridge (Y/N)				
MILL5_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0	H	Roadway flooding due to catch basins being unable to drain (Y/N)				
MILL6_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0	I	Stream water level above upstream culvert opening (Y/N)? If No, estimate number of inches to top of culvert opening.				
MILL7_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0	J	Water level above downstream side of culvert opening (Y/N)?				
MILL8_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0	K	Is there debris blocking flow (Y/N)?				
MILL9_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0						
MILL10_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0						
MILL11_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0						
MILL12_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0						
MILL13_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0						
MILL14_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0						
MILL15_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0						
MILL16_B	Bridge	Mill	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL1_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL2_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL3_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL4_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL5_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL6_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL7_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL8_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
SHEL9_B	Bridge	Shelton	1	0	0	1	1	1	1	1	1	0	0	0						
PRIN1_B	Bridge	Pringle	1	0	0	1	1	1	1	1	1	0	0	0						
BATT3_C	Culvert	Battle Creek	1	1	0	0	0	0	0	0	1	1	1	0						
BATT4_C	Culvert	Battle Creek	1	1	0	0	0	0	0	0	1	1	1	0						
POWEL_C	Culvert	Powell Creek	1	1	0	0	0	0	0	0	1	1	1	0						
POWEL2_C	Culvert	Powell Creek	1	1	0	0	0	0	0	0	1	1	1	0						
SCOT1_C	Culvert	Scotch	1	1	0	0	0	0	0	0	1	1	1	0						
WALN1_C	Culvert	Wain	1	1	0	0	0	0	0	0	1	1	1	0						
WALN2_C	Culvert	Wain	1	1	0	0	0	0	0	0	1	1	1	0						
WALN3_C	Culvert	Wain	1	1	0	0	0	0	0	0	1	1	1	0						
WALN4_C	Culvert	Wain	1	1	0	0	0	0	0	0	1	1	1	0						
PRIN2_C	Culvert	Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
PRIN3_C	Culvert	Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
VPRIN1_C	Culvert	W Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
VPRIN3_C	Culvert	W Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
VPRIN4_C	Culvert	W Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
VPRIN6_C	Culvert	W Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
MPRIN1_C	Culvert	M Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
MPRIN2_C	Culvert	M Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
MPRIN3_C	Culvert	M Pringle	1	1	0	0	0	0	0	0	1	1	1	0						
CLKA2_C	Culvert	Clark	1	1	0	0	0	0	0	0	1	1	1	0						
GLENI_C	Culvert	Glenn	1	1	0	0	0	0	0	0	1	1	1	0						
GOLD2_C	Culvert	Glenn	1	1	0	0	0	0	0	0	1	1	1	0						
GLEN3_C	Culvert	Glenn	1	1	0	0	0	0	0	0	1	1	1	0						
GLEW_C	Culvert	Glenn	1	1	0	0	0	0	0	0	1	1	1	0						

Part Two – Application & Data Collection Structure

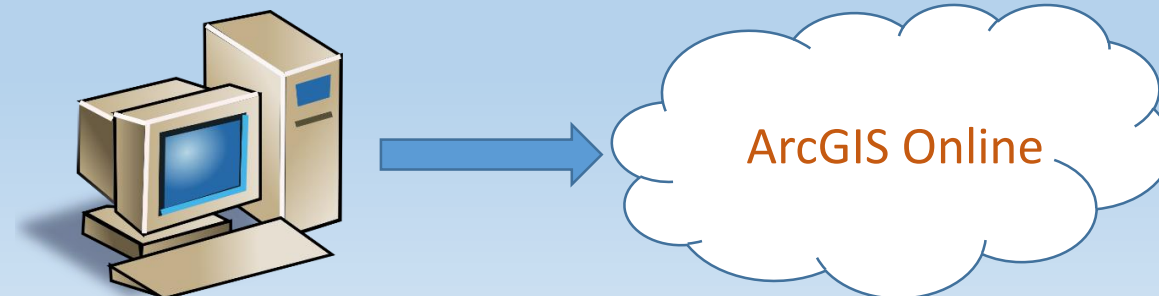


Build Schema, Publish Feature Services

1:Many Relationships for feature classes



*Domain Values for validation



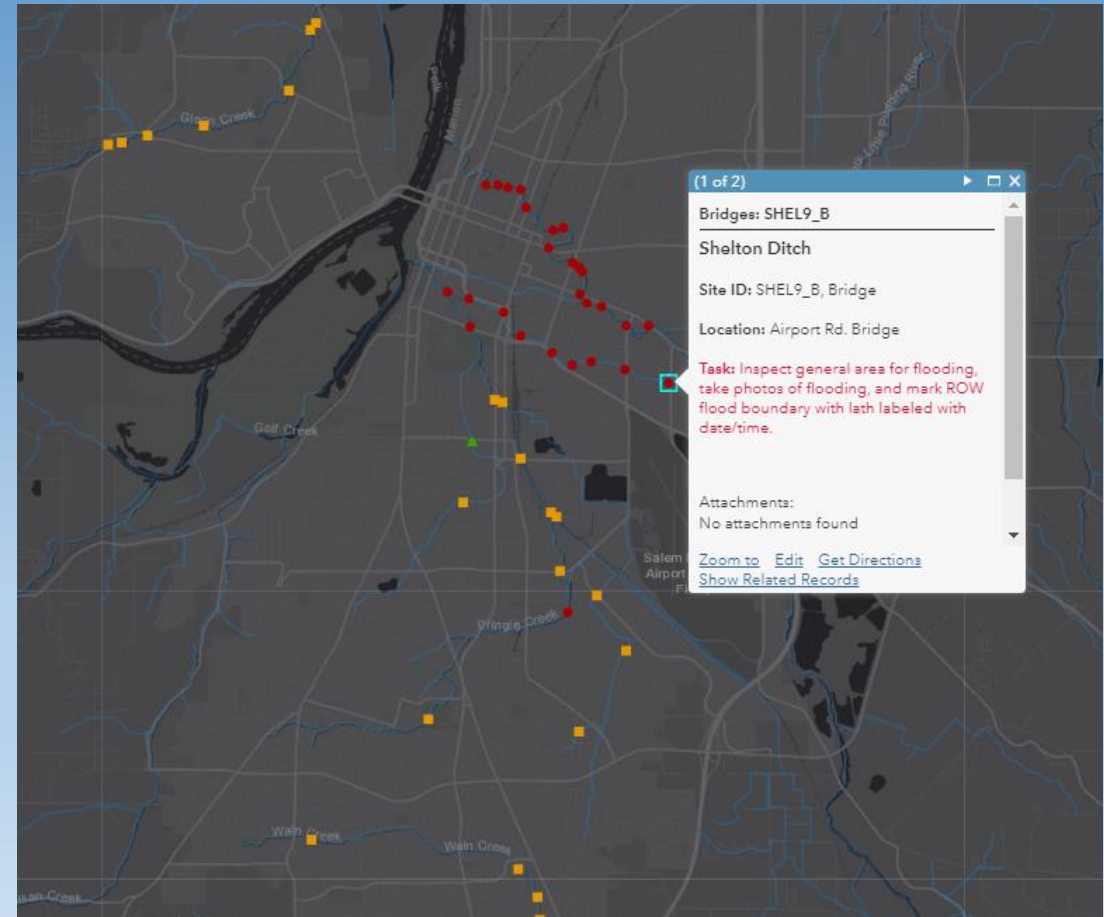
Build Web Map, Test



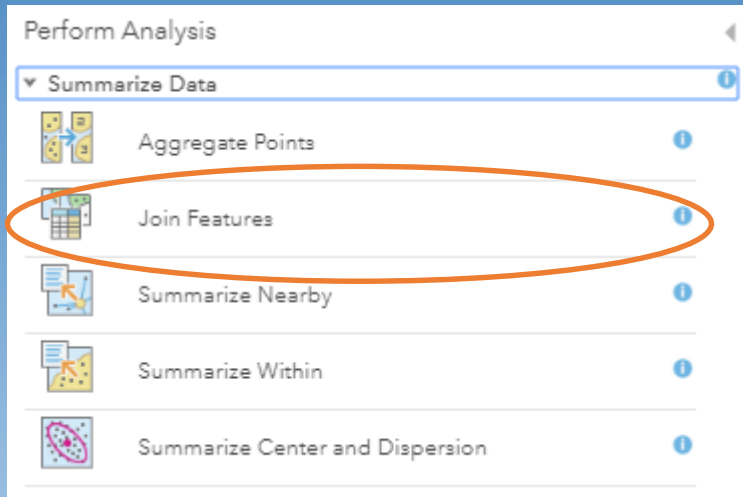
App needs to be fast and easy to use for non-technical end users

A screenshot of a mobile app form for data entry. The form has a dark header with a checkmark icon and a status bar at the top showing 39° and 91% battery. The form fields are: LOCATION ID (SHEL7_B), DATE/TIME (Enter a date or Use current), LATH INSTALLED AT TIME OF INSPECTION? (<No value>), DEBRIS UPSTREAM? (Yes), WATER LEVEL ABOVE UPSTREAM SIDE OF BRIDGE OPENING? (<No value>), STREAM FLOODING UPSTREAM OF THE BRIDGE? (<No value>), and STREAM FLOODING DOWNSTREAM OF BRIDGE? (<No value>). The bottom of the form has a dark bar with a plus icon.

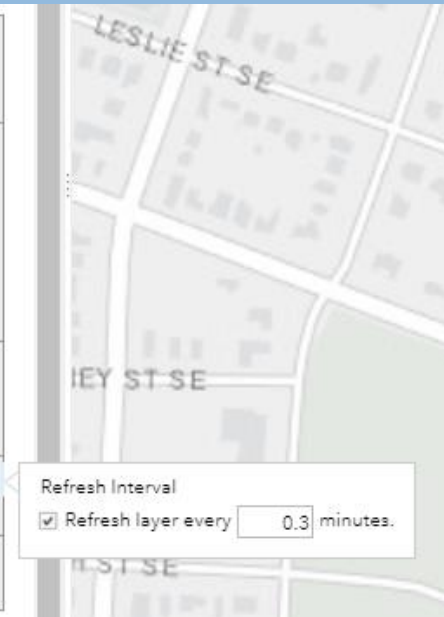
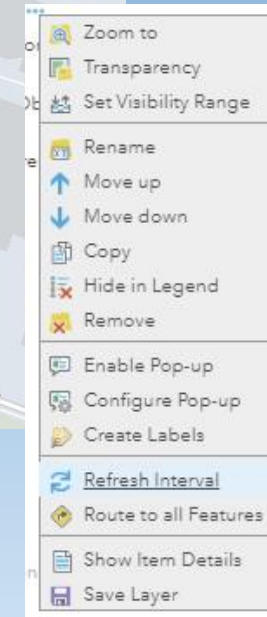
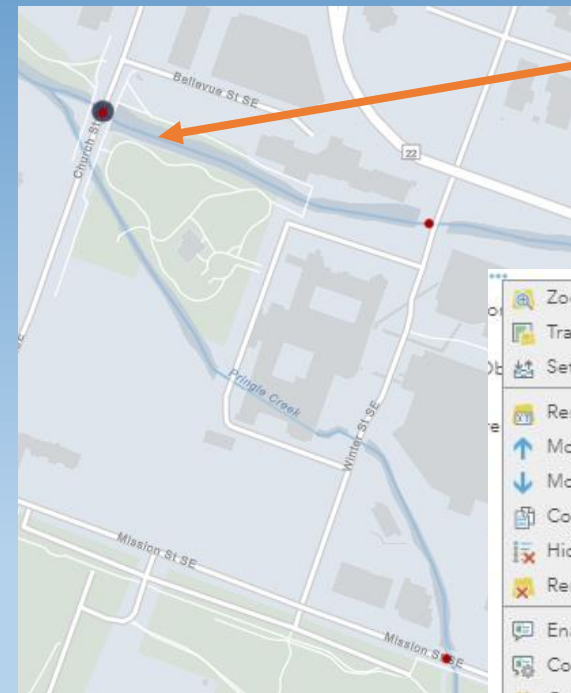
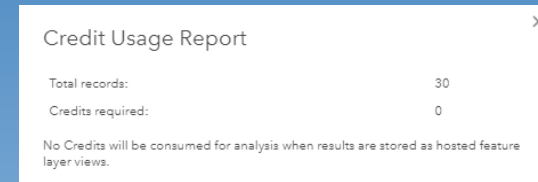
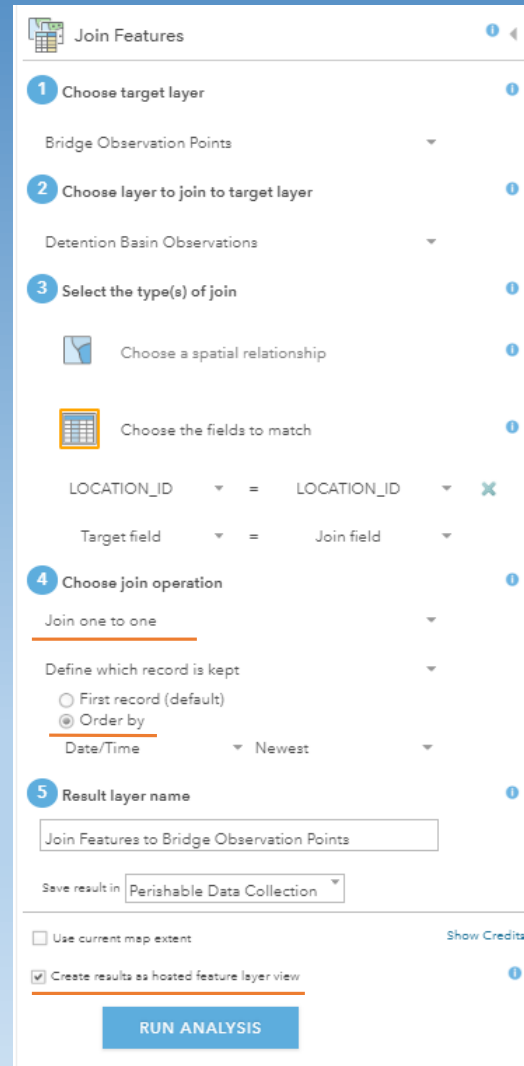
Primary Complaint: Inability of Flood Warning System Operator to see which sites have been visited and how recently



How can we call attention to the addition of related records?

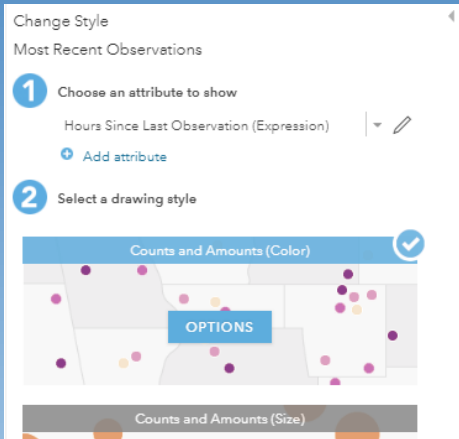


1. Join parent feature layer to child table and create a new feature layer view
2. Place new join view below parent feature in TOC
3. Set refresh interval

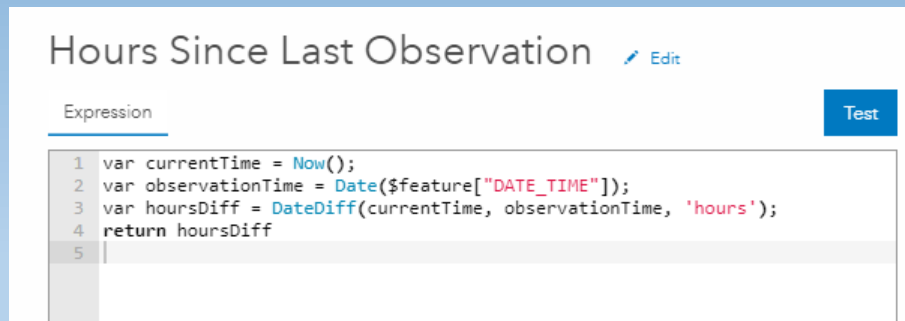


Time-Aware Symbology

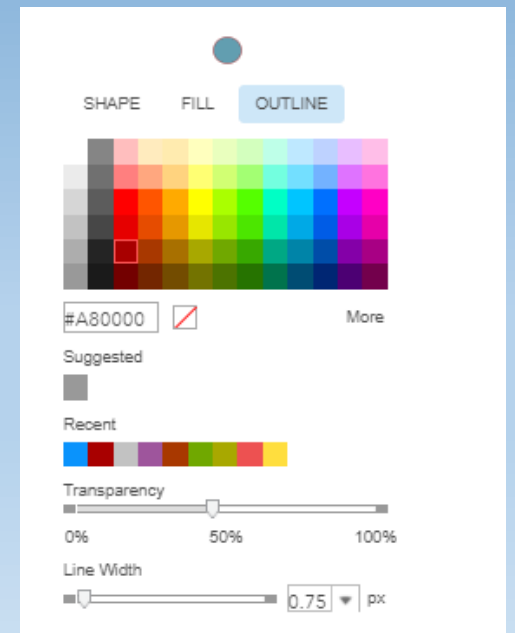
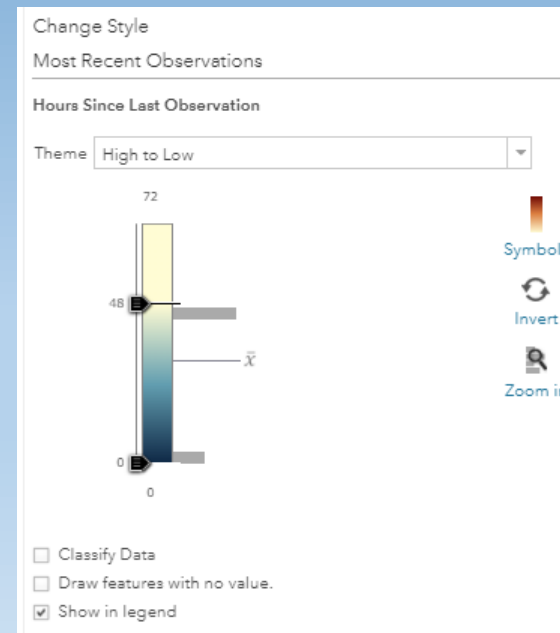
1. Add arcade expression to symbology for join feature layer view



2. Add arcade expression to symbology for join feature layer view



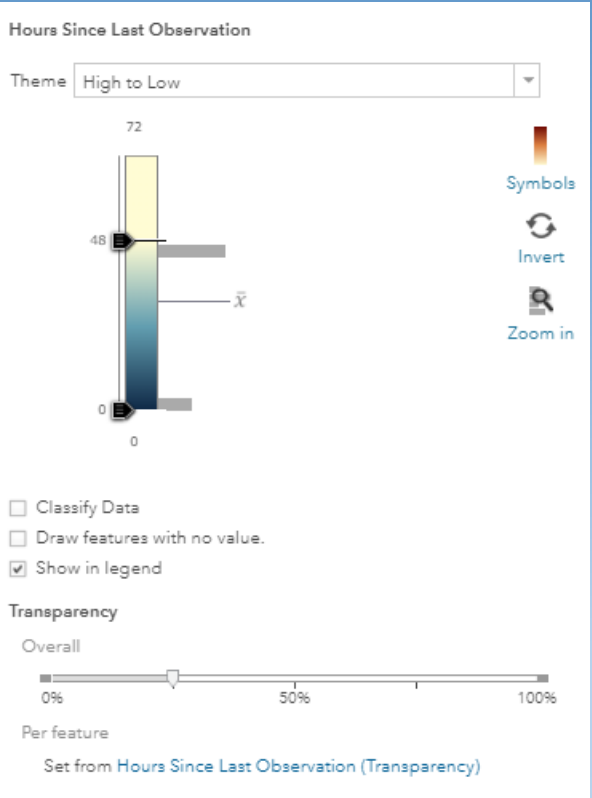
3. Pick outline that stays constant as fill changes with time



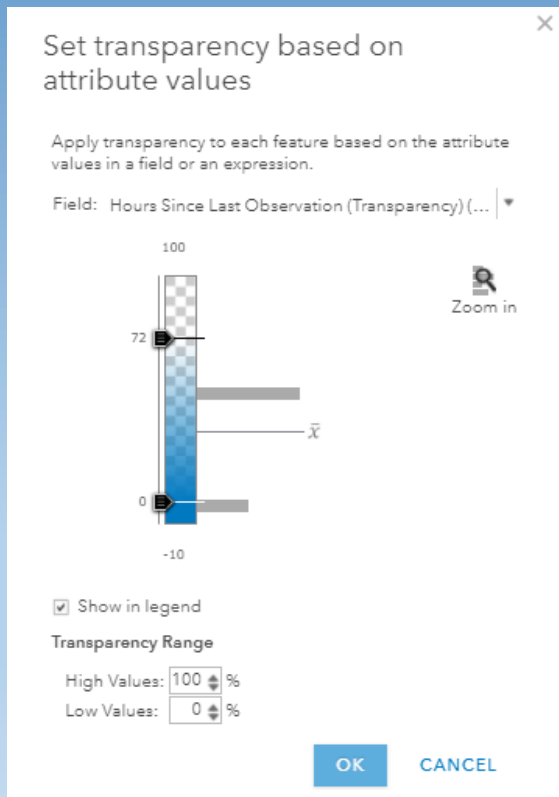
Time-Aware Transparency

(Back to the Future Symbolology)

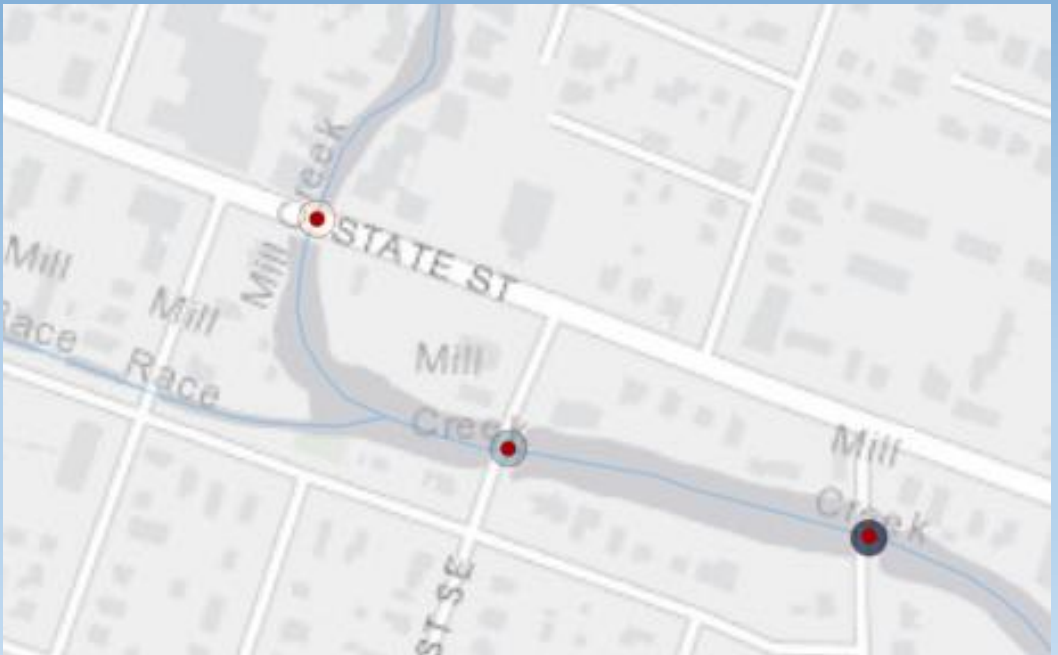
1. Use same DateDiff arcade expression to set transparency based on time since last observation



2. Set Transparency values



[http://www.trgarts.com/TRGInsights/Article/tabid/147/ArticleId/346/Contextual-marketing-back-to-the-future.aspx?dnnprintmode=true&SkinSrc=\[G\]Skins%2F_default%2FNo+Skin&ContainerSrc=\[G\]Containers%2F_default%2FNo+Container](http://www.trgarts.com/TRGInsights/Article/tabid/147/ArticleId/346/Contextual-marketing-back-to-the-future.aspx?dnnprintmode=true&SkinSrc=[G]Skins%2F_default%2FNo+Skin&ContainerSrc=[G]Containers%2F_default%2FNo+Container)



Related Inspection Records in Parent Feature Pop-ups

Configure Pop-up

Bridge Observation Points

☒ Show Pop-ups

Pop-up Title

Bridges: {LOCATION_ID}

Pop-up Contents

Display: A custom attribute display

CONFIGURE

Configure Attributes

☒ Show feature attachments as links

☒ Show when last edited

Attribute Expressions

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

ADD

Recent Observations in Pop-Up {expression/expr0}

Recent Observations in Pop-Up [Edit](#) [Test](#)

Expression

```
1 var tbl = FeatureSetByName($datastore, "Bridge_Observations");
2 Console(Count(tbl));
3 var siteid = $feature["LOCATION_ID"];
4 Console(siteid);
5 var sql = "LOCATION_ID = '" + siteid + "'";
6 Console(sql);
7 var visits = Filter(tbl, sql);
8 var cnt = Count(visits);
9 Console("cnt=" + cnt);
10 var history = "";
11 if (cnt > 0) {
12     history = cnt + " Recent Observation(s)";
13     for (var visit in visits) {
14         var txt_date = Text(visit.DATE_TIME, ' - (Y/MM/DD - HH:mm) ');
15         history += TextFormatting.NewLine + txt_date;
16         Console(history);
17     }
18 } else {
19     history = "No Recent Observations";
20 }
21
22 return history;
```

- Access observations table using \$datastore or \$map and assign as a variable
- Read site ID for current feature
- Define SQL expression to filter the child observations table
- Use SQL expression to filter the table
- Perform a count to determine if number of records is greater than zero
- Read out details if count is greater than zero

Xander Bakker GeoNet Thread:

<https://community.esri.com/docs/DOC-12773-using-featuresetby-functions-in-arcade-to-drill-down-to-other-layers-and-tables>

Related Inspection Records in Parent Feature Pop-ups

Custom Attribute Display

Use the area below to define, format, and lay out the information you want to display.

B I U | | | | | |

Font: Size:

Site ID: {LOCATION_ID}, {STRUCTURE_TYPE}

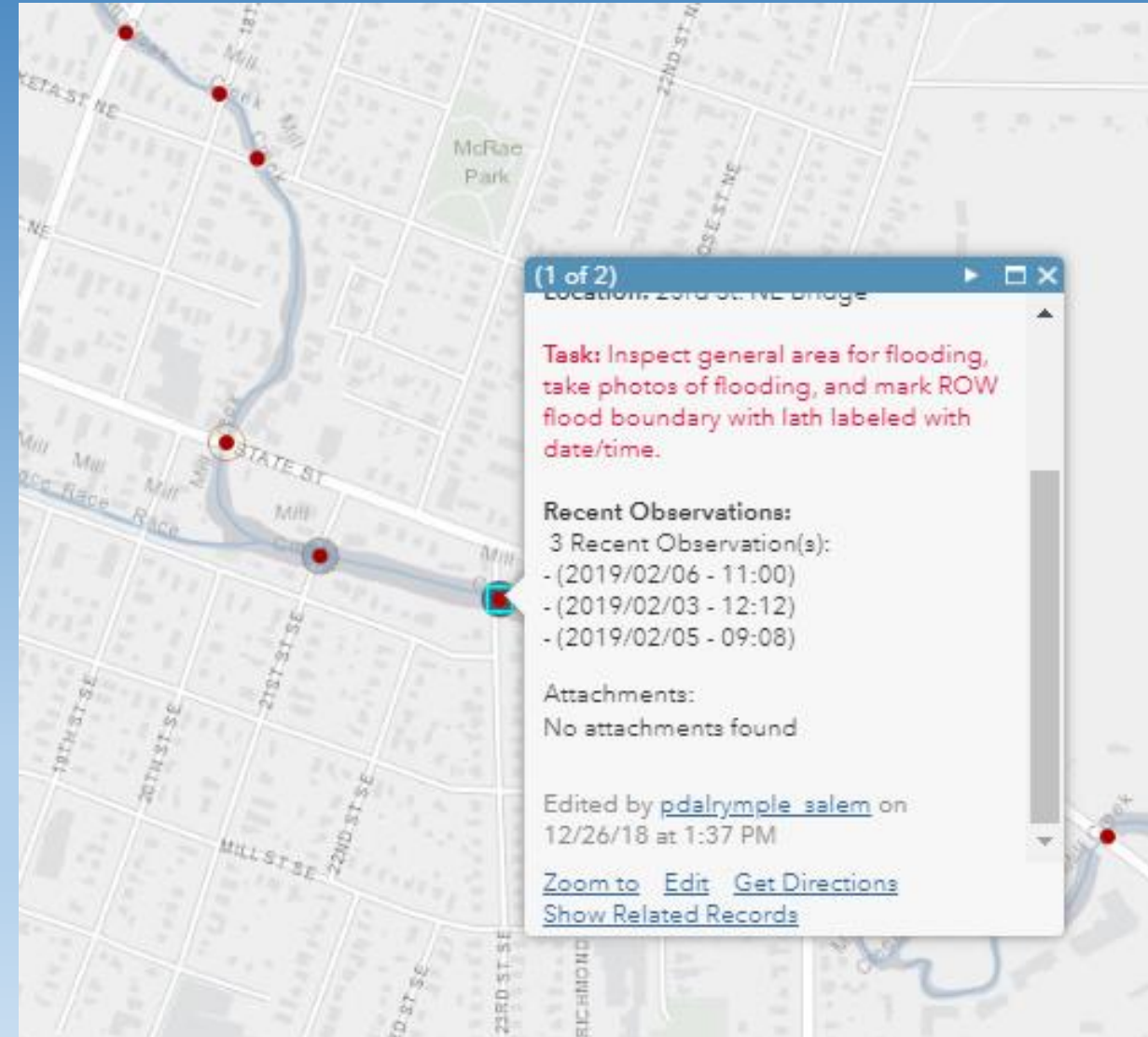
Location: {LOCATION_DES}

Task: {TASK}

Recent Observations:
{expression/expr0}

OK **CANCEL**

- Add expression to pop-up configuration
- Impress your friends....

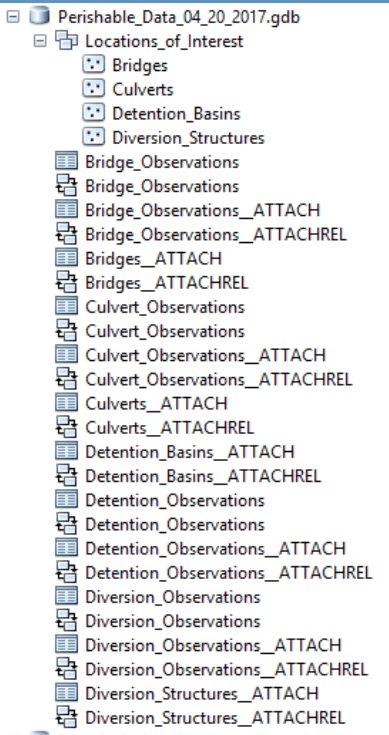
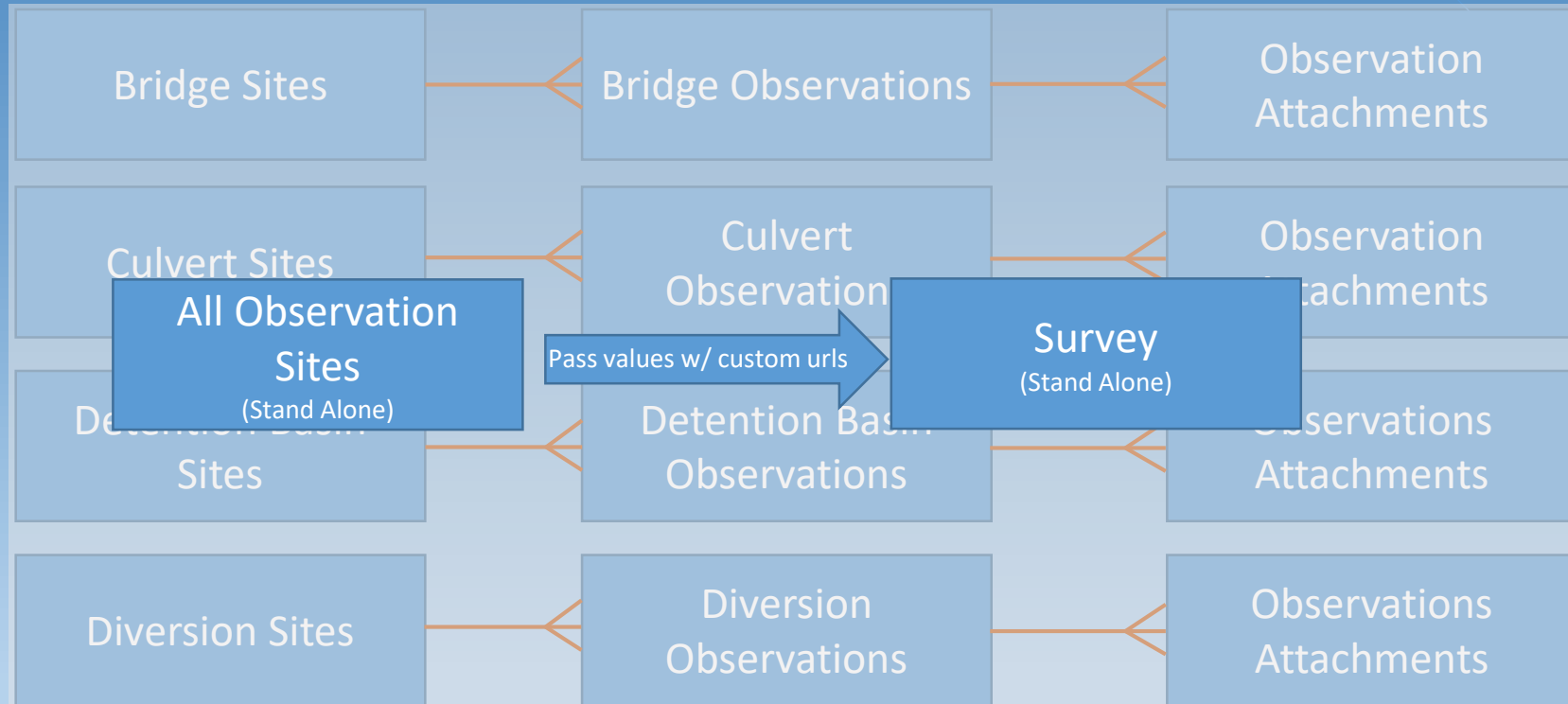


Can we do even more?

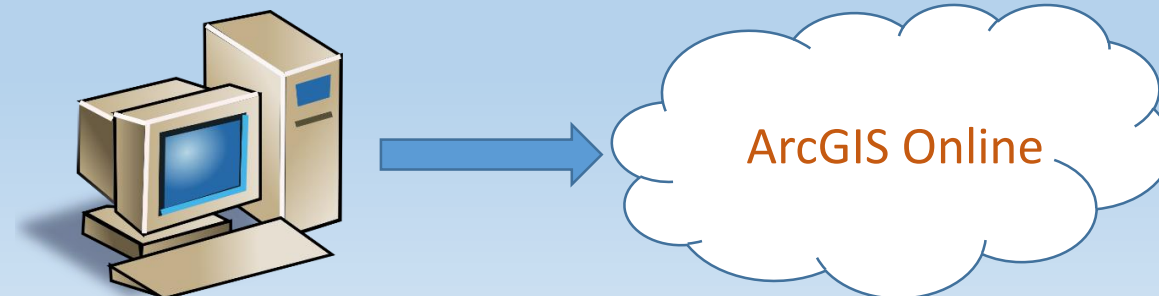


Rethinking the use of multiple feature layers. These can be combined into one, unrelated survey layer.

~~1:Many Relationships for feature classes~~

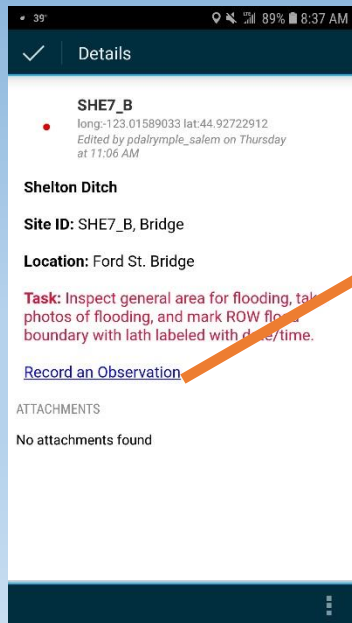


*Domain Values for validation



Demo

- Custom urls to launch Survey123 and pass parent feature values to survey
- Webhooks and Microsoft Flow to send email notifications when new surveys meeting certain criteria are submitted
- Use dynamic content from Survey123 in Microsoft Flow for url parameters to launch ArcGIS Online application, center, and zoom to newly submitted survey point



Details

SHE7_B
long:-123.01589033 lat:44.92722912
Edited by pdalrymple_salem on Thursday at 11:06 AM

Shelton Ditch

Site ID: SHE7_B, Bridge

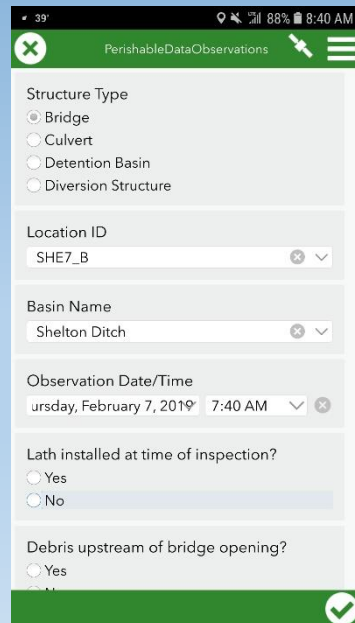
Location: Ford St. Bridge

Task: Inspect general area for flooding, take photos of flooding, and mark ROW flood boundary with lath labeled with date/time.

[Record an Observation](#)

ATTACHMENTS

No attachments found



PerishableDataObservations

Structure Type

☒ Bridge

☐ Culvert

☐ Detention Basin

☐ Diversion Structure

Location ID

SHE7_B

Basin Name

Shelton Ditch

Observation Date/Time

ursday, February 7, 2019 7:40 AM

Lath installed at time of inspection?

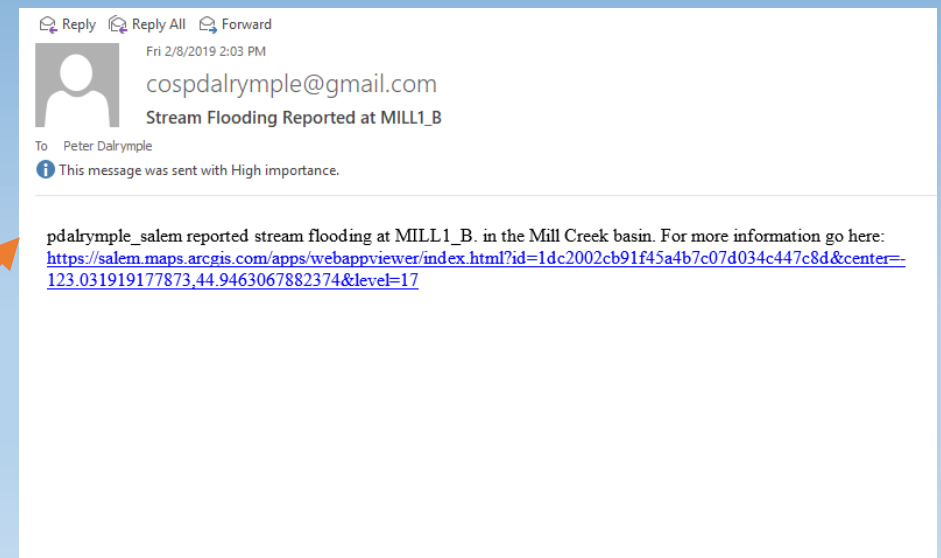
☐ Yes

☐ No

Debris upstream of bridge opening?

☐ Yes

☐ No



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