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Using Near Real-Time Data to Follow the Pony Express Re-Ride

National Trails

Brian Deaton - GIS Specialist

Sarah Rivera - GIS Specialist

Background

The National Pony Express Association (NPEA) runs an annual re-ride of the Pony Express National Historic Trail that commemorates the mail delivery business operated between April 1860 and October 1861.

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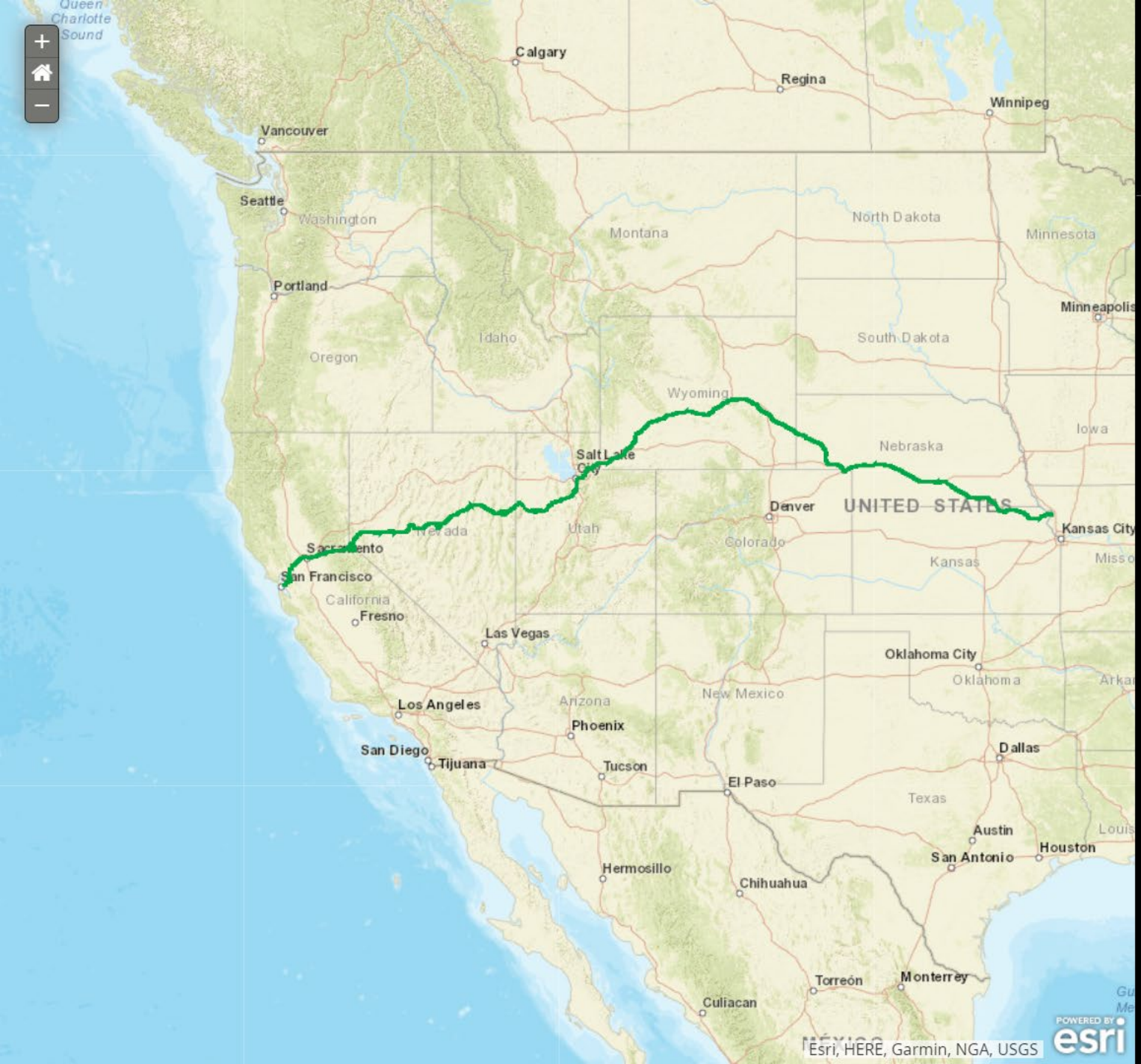
Background

The National Pony Express Association (NPEA) runs an annual re-ride of the Pony Express National Historic Trail that commemorates the mail delivery business operated between April 1860 and October 1861.

Every year, riders carry a mochila saddle bag filled with mail, following the designated route of the National Historic Trail over a span of 10 days and more than 1,800 miles.

This past year, the ride was held June 10, 2019 to June 20, 2019 from St. Joseph, Missouri to Sacramento, California. The NPEA is one of the many partners our office works with to promote, identify, and develop the National Historic Trails. The association was formed in 1977 as a volunteer organization to identify, establish, and mark the Pony Express Trail. Since 1980, the partner organization has been conducting the Re-Ride between Sacramento and St. Joseph.

Credit: National Pony Express Association



Pony Express National Historic Trail

Using Near Real-Time Data to Follow the Pony Express Re-Ride

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Our Project

Collaboration with the **National Pony Express Association** to redevelop the workflow for displaying near real-time data for the re-ride.

--

Step 1 - Using the SPOT Device XML Feed

Step 2 - Translating the XML tags to spatial data with the Data Interoperability Extension in ArcGIS Pro

Step 3 - Developing a python script to aggregate XML Feed to a feature service

Step 4 - Creating the web application

Previous Re-Rides

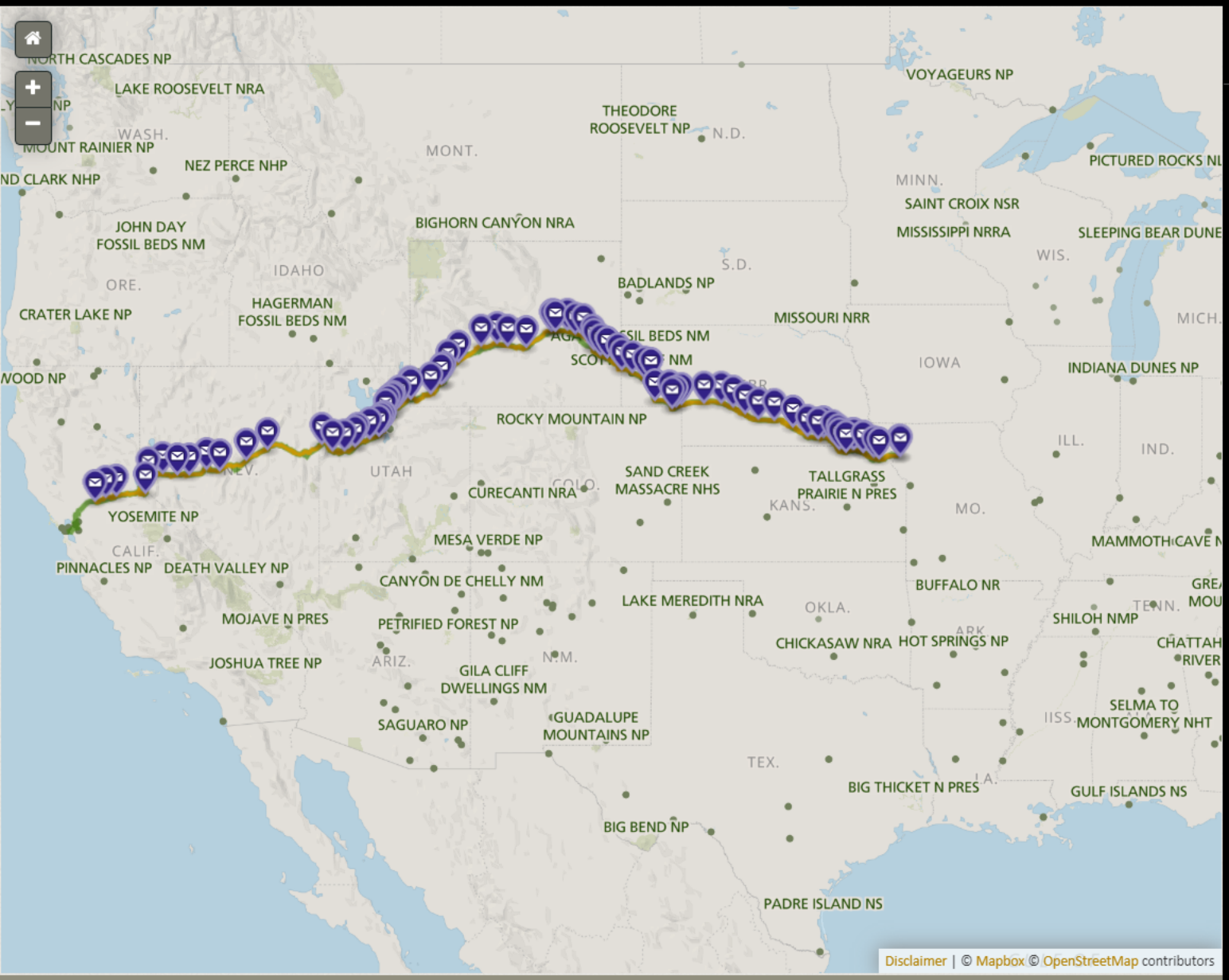
In the past, our office used NPMap to display the SPOT data

16-20

National Pony Express Association Annu...

National Pony Express Association Re-Ride Live Map Tracker 2018

National Park Service
U.S. Department of the Interior



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Pony Express National Historic Trail

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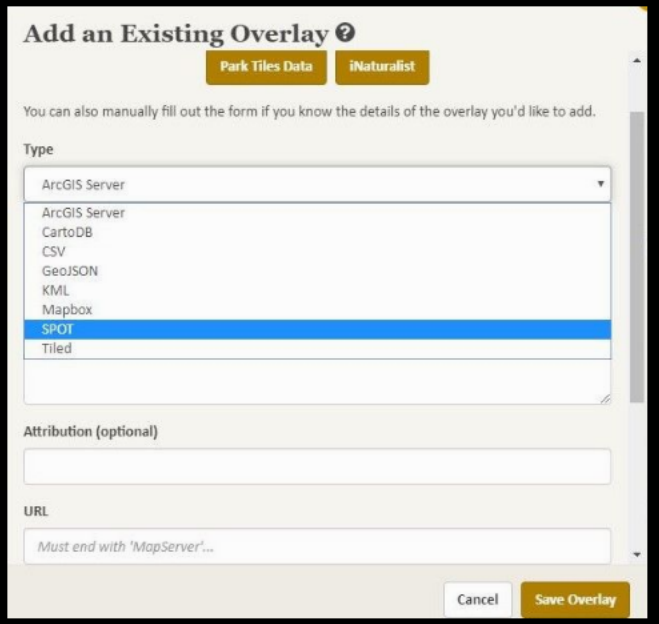
Previous Re-Rides

In the past, our office used NPMap to display the SPOT data

The SPOT ID was used to obtain the data instead of the XML feed



SPOT Device XML Feed

16-20

```
<?xml version="1.0" encoding="UTF-8" standalone="true"?>
- <response>
  - <feedMessageResponse>
      <count>7</count>
    - <feed>
        <id>0RtFEjoXad8oTdxvyMlfJdHimvRqsJXqI</id>
        <name>National Pony Express Reride 2016</name>
        <description>National Pony Express Reride 2016</description>
        <status>ACTIVE</status>
        <usage>0</usage>
        <daysRange>7</daysRange>
        <detailedMessageShown>false</detailedMessageShown>
        <type>SHARED_PAGE</type>
      </feed>
      <totalCount>7</totalCount>
      <activityCount>0</activityCount>
    - <messages>
      - <message clientUnixTime="0">
          <id>1145337206</id>
          <messengerId>0-3032022</messengerId>
          <messengerName>National Pony Express Reride</messengerName>
          <unixTime>1549901432</unixTime>
          <messageType>UNLIMITED-TRACK</messageType>
          <latitude>40.7631</latitude>
          <longitude>-111.89223</longitude>
          <modelId>SPOT3</modelId>
          <showCustomMsg>N</showCustomMsg>
          <dateTime>2019-02-11T16:10:32+0000</dateTime>
          <messageDetail/>
          <batteryState>GOOD</batteryState>
          <hidden>0</hidden>
          <altitude>1376</altitude>
        </message>
      - <message clientUnixTime="0">
          <id>1145337265</id>
          <messengerId>0-3032022</messengerId>
          <messengerName>National Pony Express Reride</messengerName>
          <unixTime>1549900832</unixTime>
          <messageType>UNLIMITED-TRACK</messageType>
          <latitude>40.76323</latitude>
          <longitude>-111.89266</longitude>
          <modelId>SPOT3</modelId>
          <showCustomMsg>N</showCustomMsg>
          <dateTime>2019-02-11T16:00:32+0000</dateTime>
          <messageDetail/>
          <batteryState>GOOD</batteryState>
          <hidden>0</hidden>
          <altitude>0</altitude>
        </message>
      - <message clientUnixTime="0">
```


Pony Express National Historic Trail

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SPOT Device XML Feed

Spot Device

4 Tags:

1. id
2. dateTime
3. latitude
4. longitude

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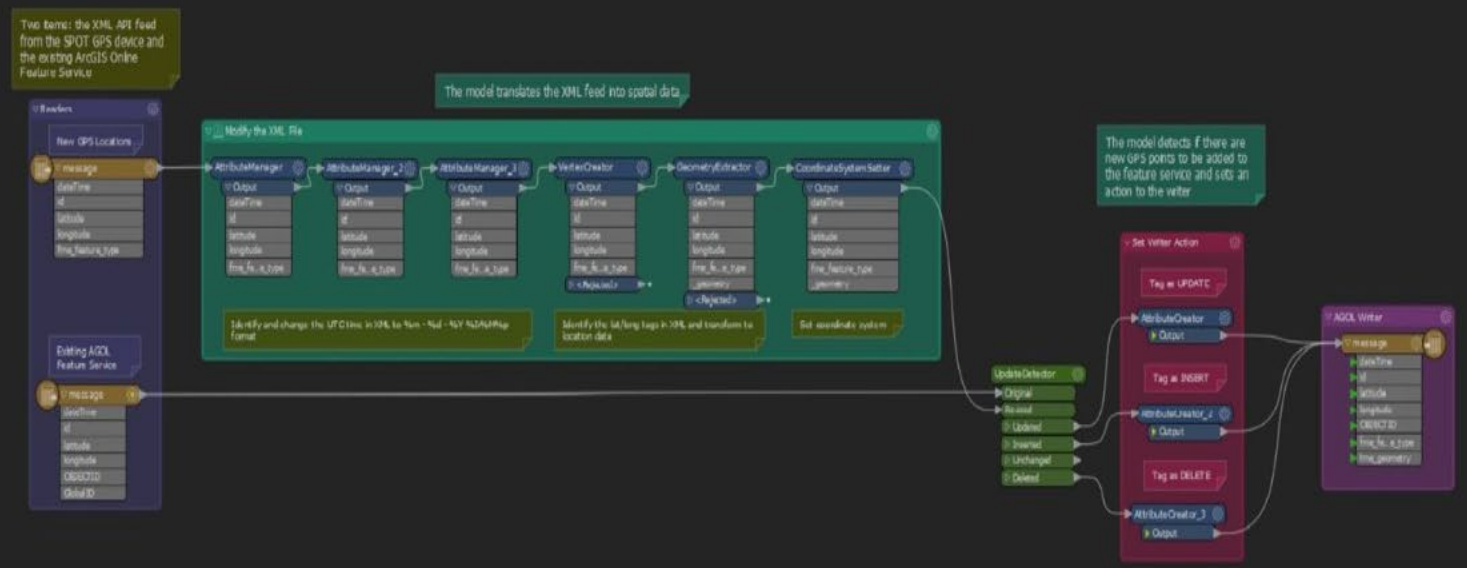

Data Interoperability Extension

The data interoperability extension on ArcGIS Pro uses the FME workbench application

What is FME Workbench?

FME has the core concept of Reader -> Transformation -> Writer

Reader

The reader has two inputs: the XML API feed and the feature service

Transformation

For new GPS points, it needs to go through the transformation process

Three XML tags are getting read: dateTime, latitude and longitude

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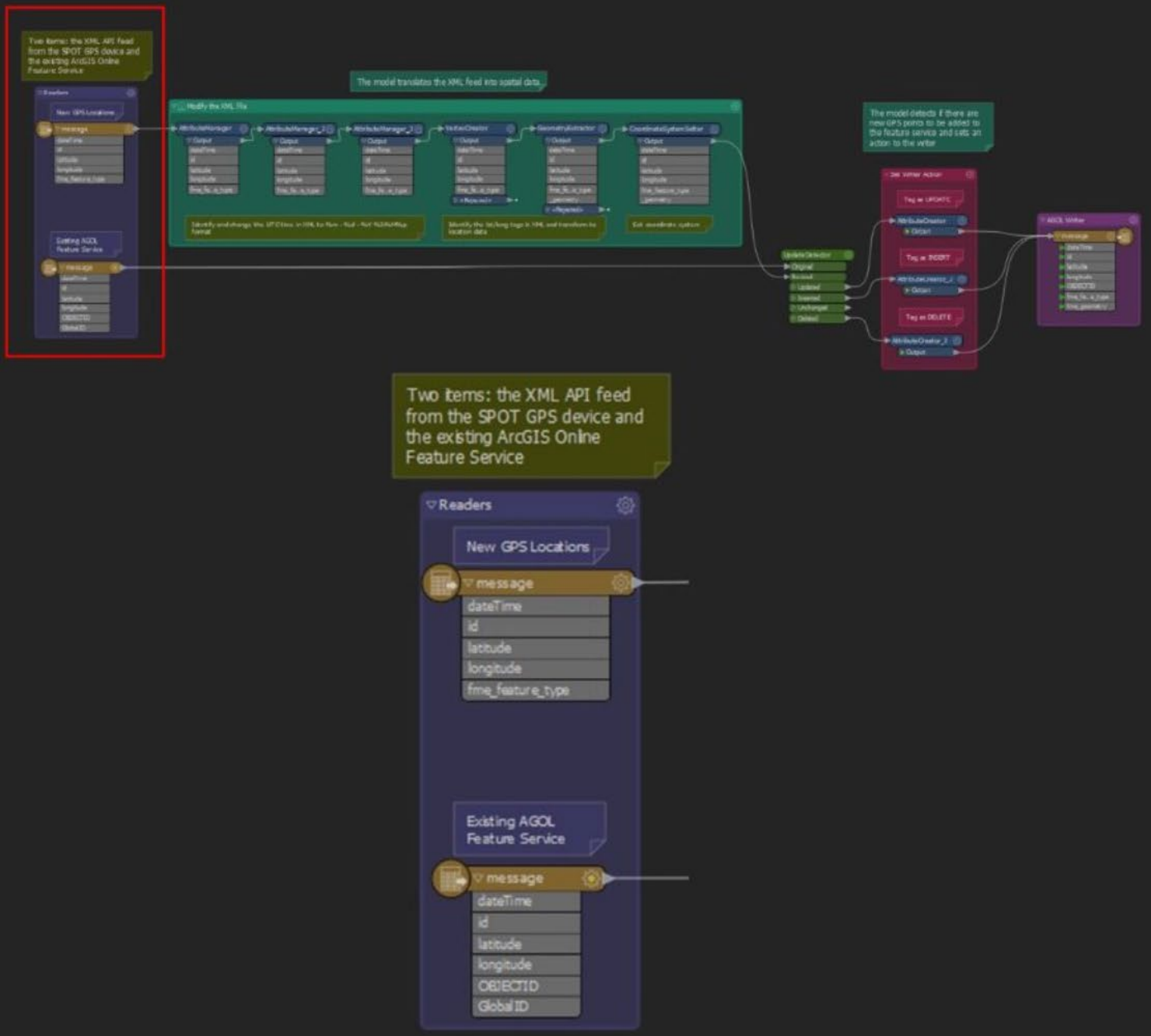

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Three XML tags are getting read: dateTime, latitude and longitude

The AttributeManager tool is reading the dateTime tag while the VertexCreator, GeometryExtractor and CoordinateSystemSetter are creating the spatial data

Writer

Once the data goes through the transformer, it needs to be written out to a format using a Writer

Before it goes through the Writer, the detector tool will read the data to see if there has been any changes. Based off of what it detects, it will UPDATE, INSERT or DELETE data to the hosted

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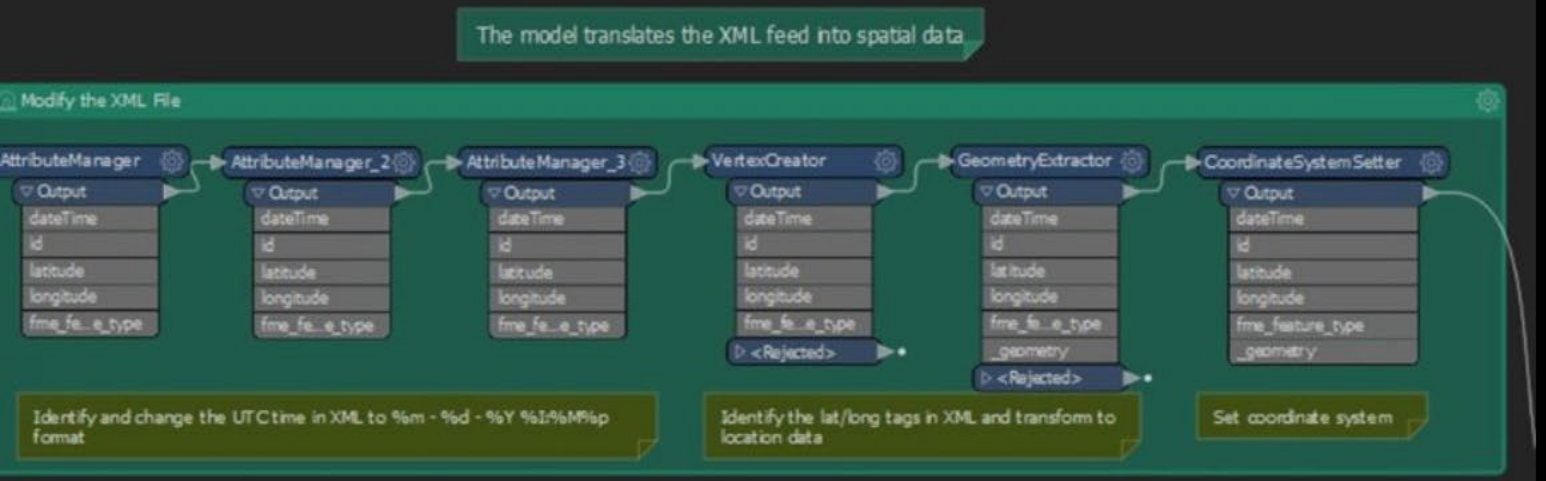

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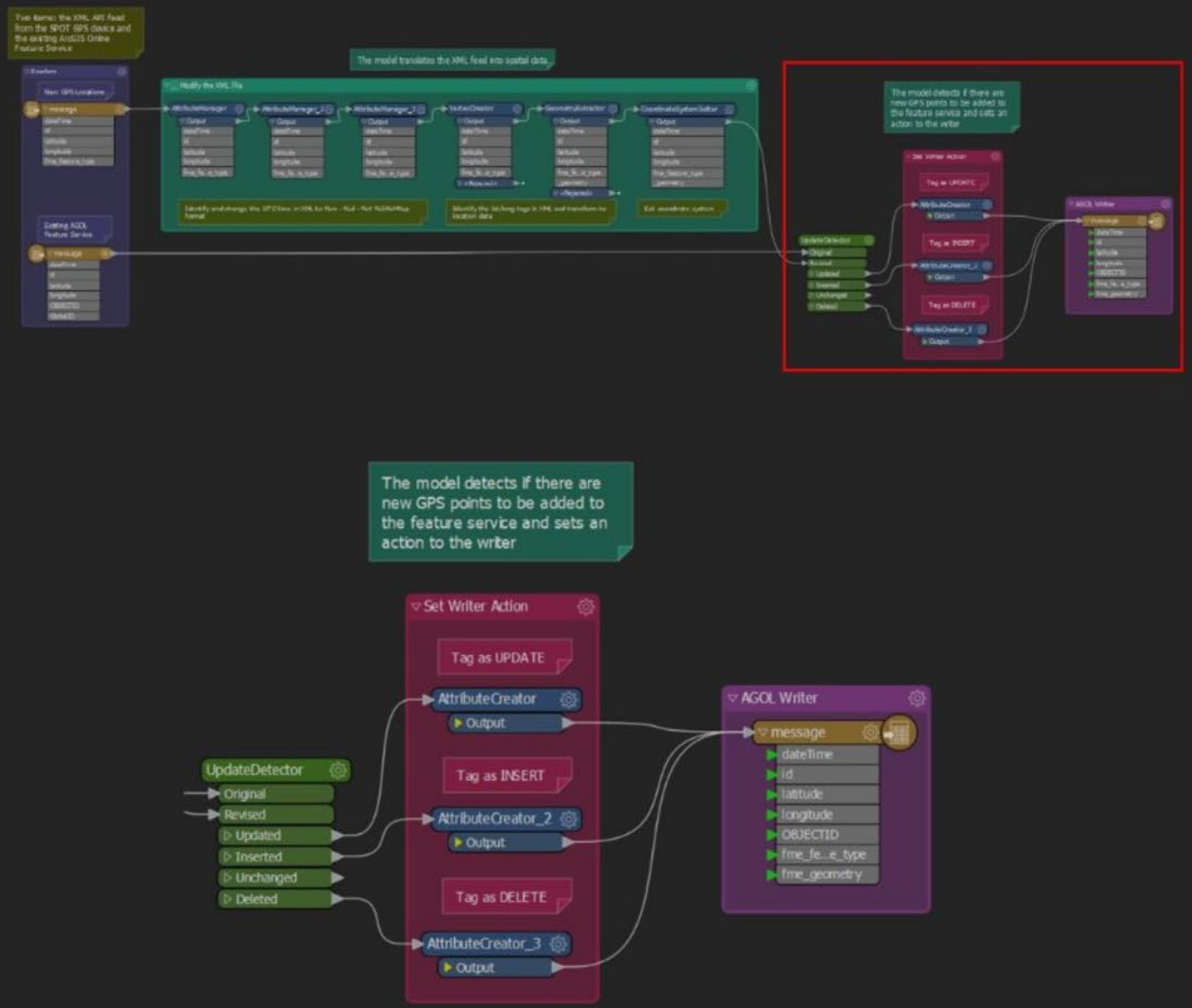
Rider Location Feature Service Creation

Using Near Real-Time Data to Follow the Pony Express Re-Ride

Story not shared ×



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Rider Location Feature Service Creation

Python Script utilizing ArcGIS API for Python runs at the shutdown of the FME workbench model.

- XML hosted feature downloaded locally in a geodatabase
- Local XML hosted feature of rider locations is compared to the Rider Locations feature service
- New features are uploaded into the Rider Locations feature service

Feature Service Creation....

```
    all_features = fme_fset.features
    all_features[0]
    print("ALL Features")
    print(fme_fset.spatial_reference)
    for id in overlap_rows['id']:
        original_feature = [f for f in all_features if f.attributes['id'] == id][0]
        print(str(original_feature))
    features_to_be_added = []

# get a template feature object
    template_feature = deepcopy(original_feature)

# loop through each row and add to the list of features to be added
    for row in new_rows.iterrows():
        print(row)
        new_feature = deepcopy(template_feature)

        print("Creating " + str(row[1]['id']))

    #get geometries in the destination coordinate system
        input_geometry = {'y':float(row[1]['latitude']),
                          'x':float(row[1]['longitude'])}
        output_geometry = geometry.project(geometries = [input_geometry],
                                           in_sr = 4326,
                                           out_sr = fme_fset.spatial_reference['latestWkid']
                                           gis=gis)

    # assign the updated values - adding in values that are within poex_spot_backup
    #(by way of poex_spot_backup_csv) that are not in Spot_XML_POEX_Display_Backup
    #hosted feature.
        new_feature.geometry = output_geometry[0]
        new_feature.attributes['dateTime'] =(row[1]['dateTime'])
        new_feature.attributes['id'] = int(row[1]['id'])
        new_feature.attributes['latitude'] = (row[1]['latitude'])
        new_feature.attributes['longitude'] = (row[1]['longitude'])
```

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- New features are uploaded into the Rider Locations feature service

Feature Service Creation....

Rider Location Feature Service is now updated by the Python Script.

Data Last Updated: Jun 21, 2019, 8:47:09 AM

message (Features: 661, Selected: 0)

dateTime	id	latitude	lor
06 - 10 - 2019 12:17PM	1,214,471,165	39.75618	-94
06 - 10 - 2019 12:26PM	1,214,476,628	39.75631	-94

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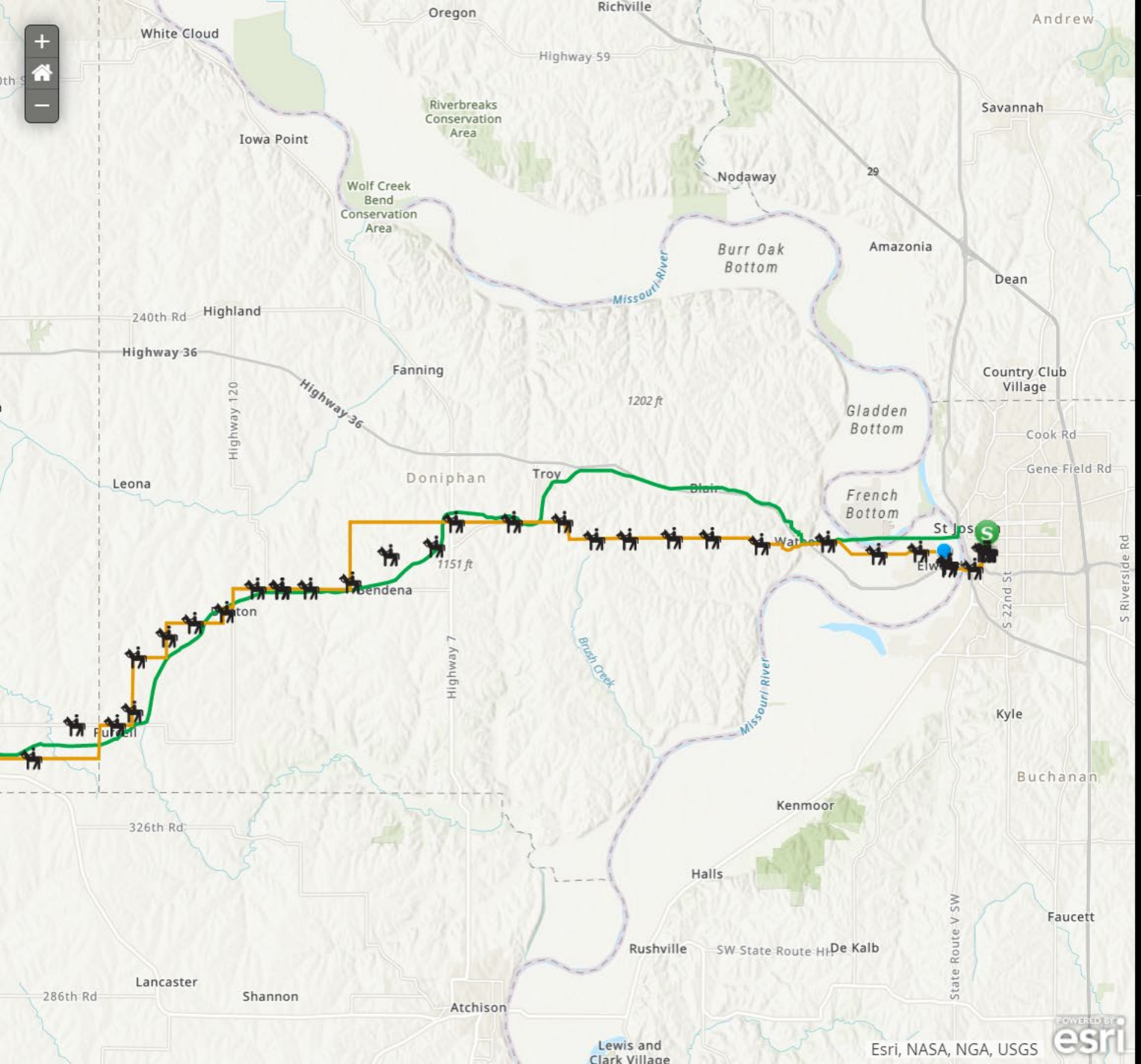

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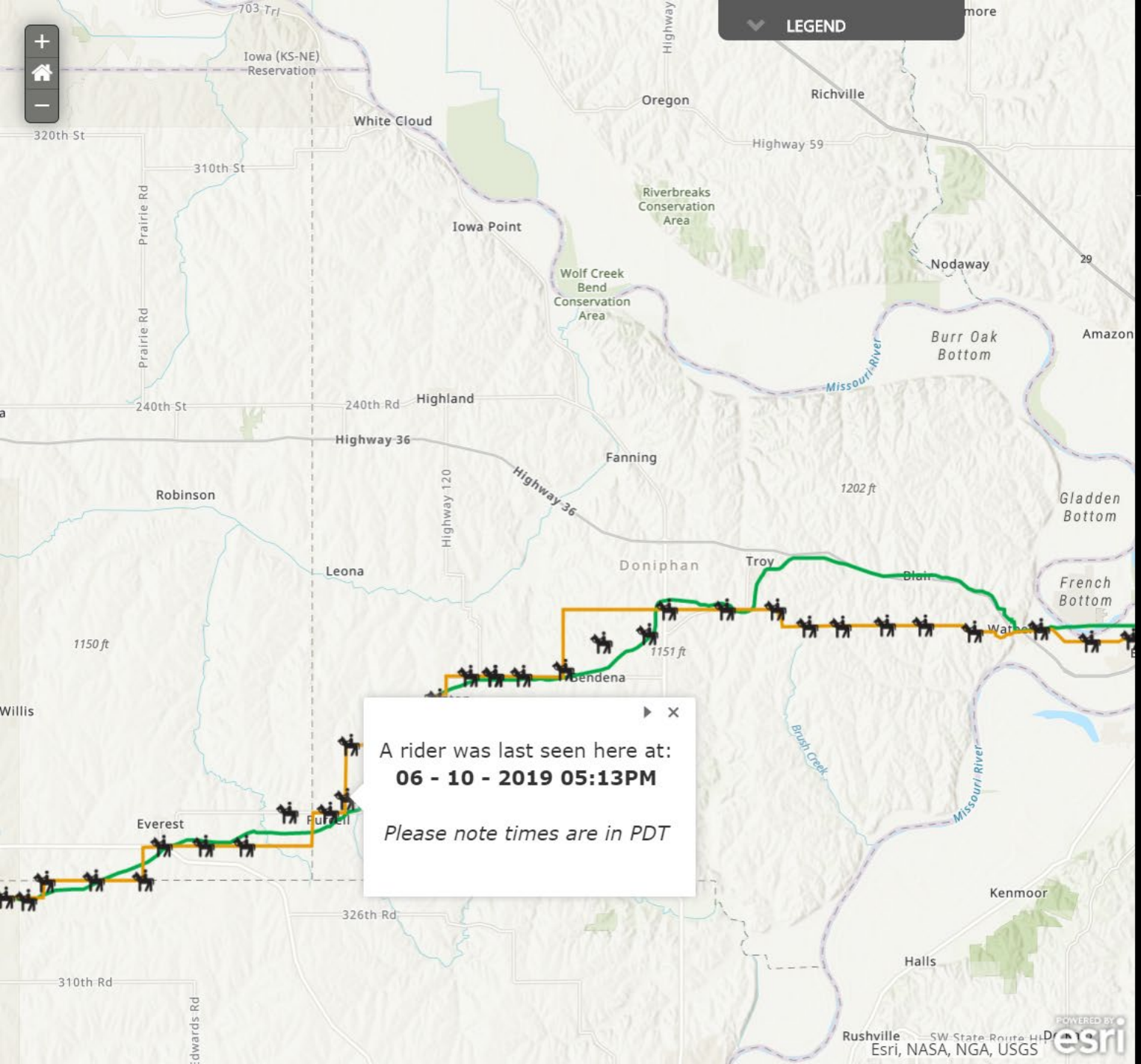
dateTime	id	latitude	longitude
12:26PM			
06 - 10 - 2019 12:45PM	1,214,488,530	39.75638	-94.84769
06 - 10 - 2019 12:35PM	1,214,488,601	39.75651	-94.84623
06 - 10 - 2019 01:04PM	1,214,499,586	39.75012	-94.86789

Web Mapping Application

Develop the web map for the application. Set up the various options for the look and feel of the web map:

- Feature Service Layers
  - XML Feed feature service
  - Rider Location feature service
  - Exchange Station Locations
  - Expected Re-Ride Route

16-20



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  - Rider Location feature service
  - Exchange Station Locations
  - Expected Re-Ride Route
  - Pony Express NHT
- Set the symbology and configure the pop up windows for the displayed features.

Customize the Web App

Build and Configure:

- Branding
- Style
- Widgets

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Home | Web AppBuilder for ArcGIS | 2019 Pony Express Annual Re-Ride Map | New App | RIM

Theme | Map | Widget | Attribute

Billboard Theme | Box Theme | Dart Theme

Foldable Theme | Dashboard Theme | Launchpad Theme

Jewelry Box Theme | Plateau Theme | Tab Theme

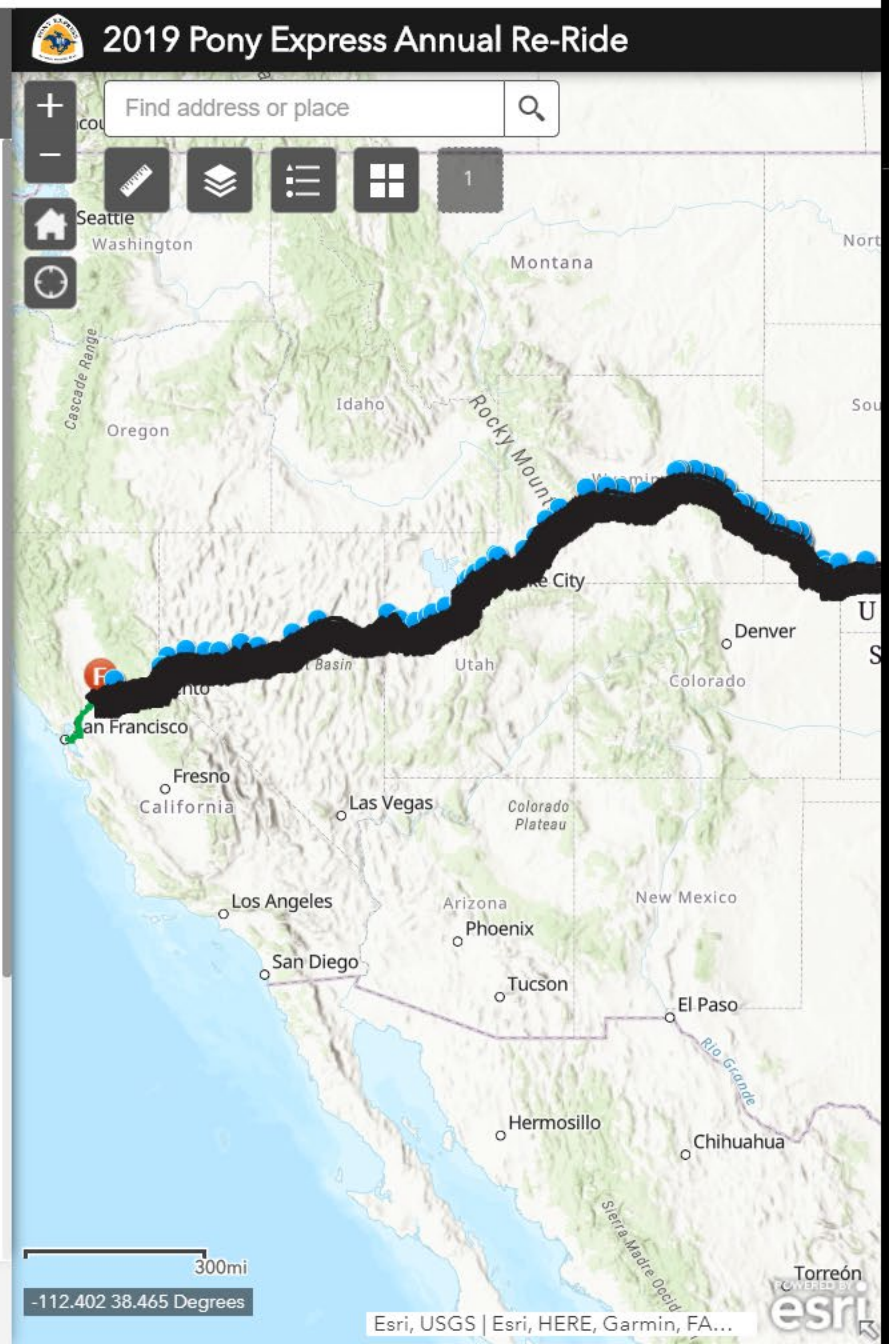
Pocket Theme

Style

#1a1a1a

Layout

Launch | Previews | Saved



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Customize the Web App

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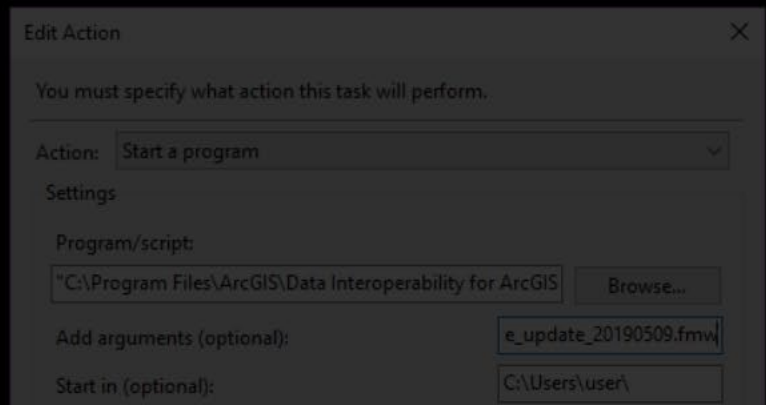
Task Scheduler Automation

Task Scheduler Setup:

- Setting Action and Schedule



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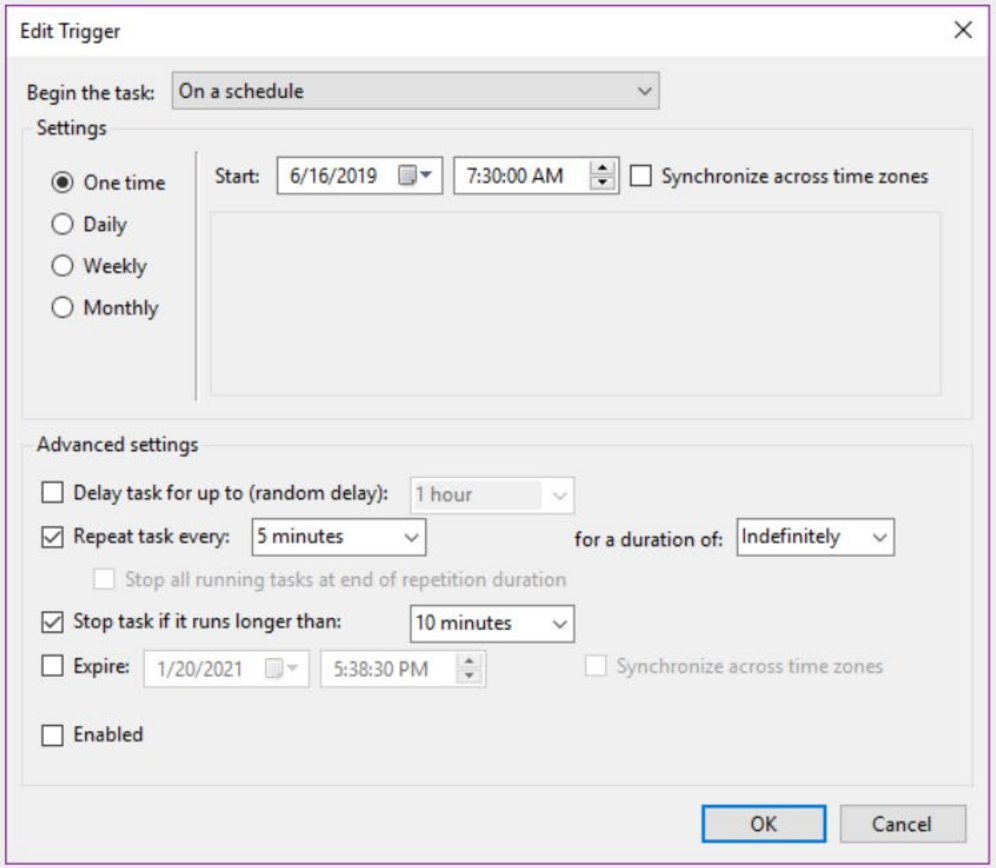

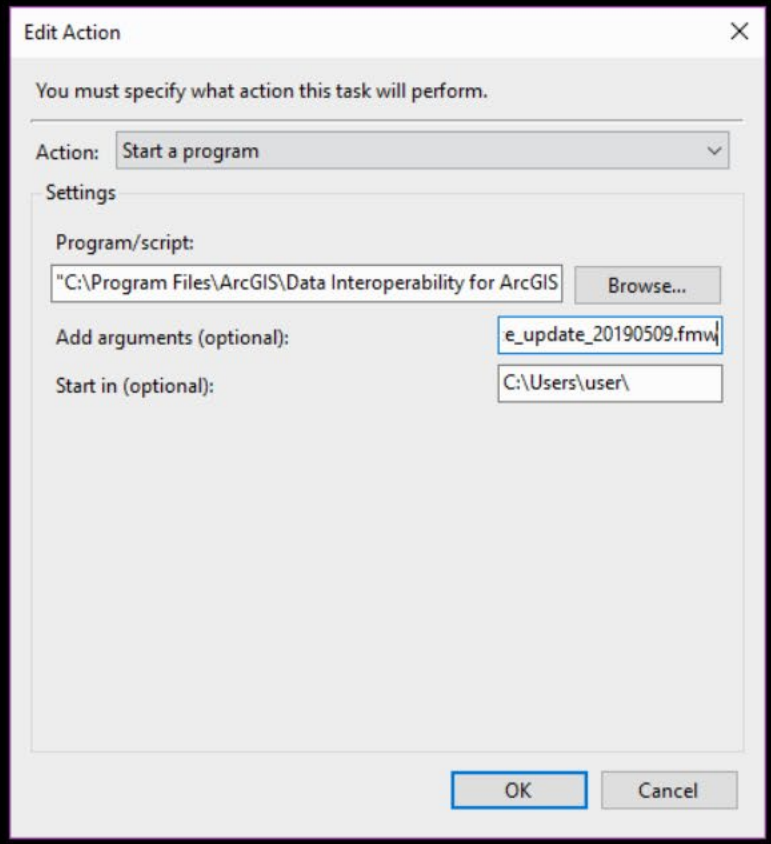

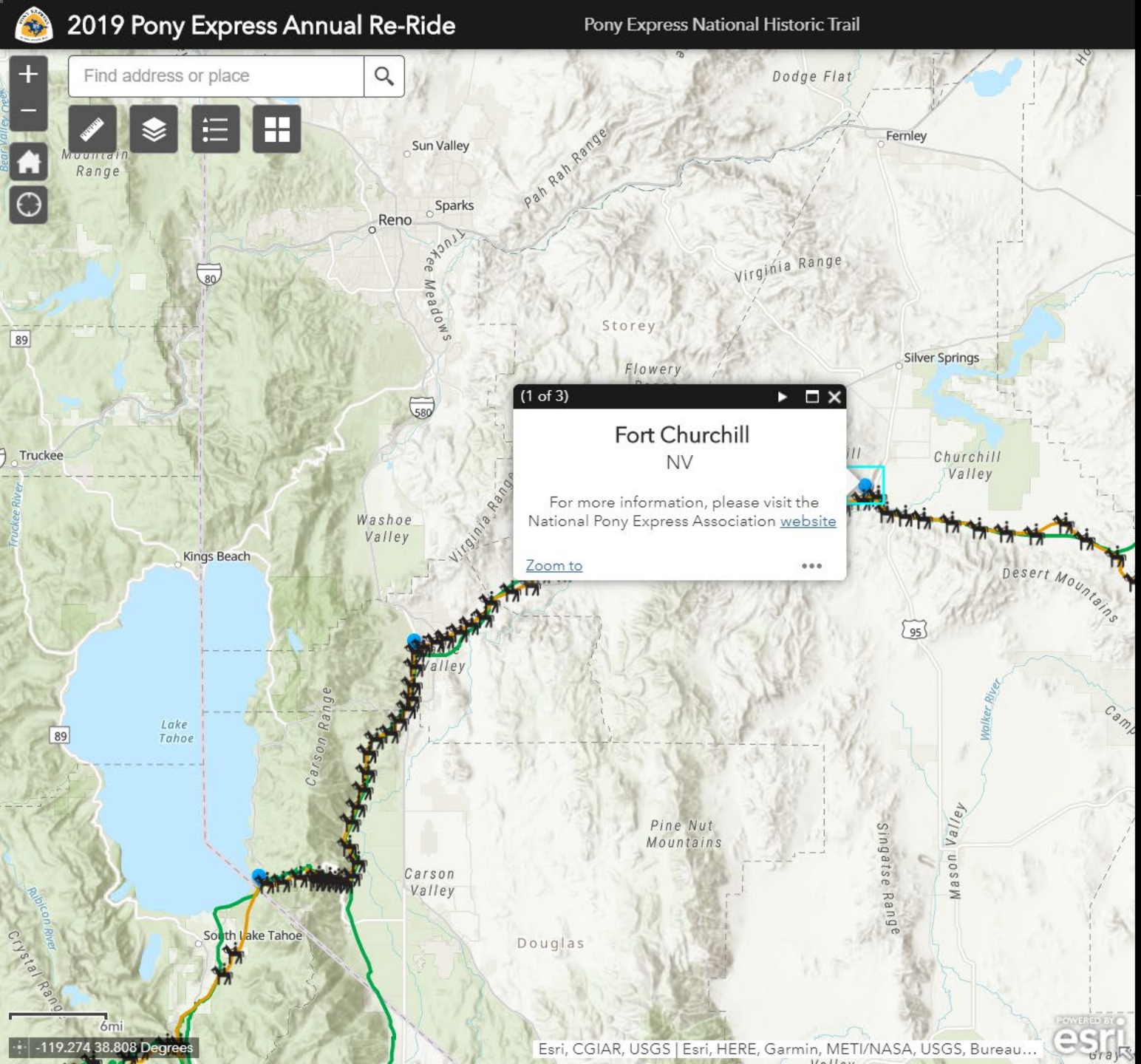

Pony Express National Historic Trail

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Finalized Web App

The finalized web app has updated locations of the Pony Express Re-Ride rider approximately every 10 minutes.

External Embedded Content

External website embedding of content enables our office to engage with even more of the public and association members. Here is the NPEA website for the Re-Ride: **https://nationalponyexpress.org/annual-re-ride/follow-the-ride/**

Success of the Web App

- Over 20,000 views
- 14,180 views from NPEA website with embedded web app
- Partner Usage/Public Usage
  - Following along with the Re-Ride
  - Estimating Time to Arrival for City/Town ride throughs and station exchanges

NATIONAL PONY EXPRESS ASSOCIATION

ABOUT | ANNUAL RE-RIDE | NPEA EVENTS | PONY EXPRESS | STATES | RESOURCES

FOLLOW THE RIDE

The Re-Ride is Coming Soon on June 3rd–13th 2020 from California to Missouri!

Mobile Device Users/Full Screen – please click here

Recent Locations of the Pony Rider:

2019 Re-Ride Map

Use this map to find out where the riders have been during the 2019 Re-Ride

Best viewed on Desktop or Mobile Device (Landscape Mode)

Please click here to view the full map in a new window

(You will need to accept the conditions in order to view the map – all times are in PDT)

Recent Status Updates

Bridgeport-Scotts Bluff, Nebraska

FROM: Hanah Roach, High Hats Photography
June 20th, 2019 PST

FROM: Cindy KM6BUY
SENT: June 20th, 2019 | 1:06pm PST
STATUS: At 12:30p MDT the rider(s) departed Sunrise (CA).

FROM: CIndy Gansereit, KM6BUY
SENT: June 20th, 2019 | 12:23pm PST
STATUS: At 12:00 pm PDT, the Pony left Willow Creek on schedule.

FROM: Media Team
SENT: June 20th, 2019 | 11:07am PST
STATUS: At 11:00a PDT the mail arrived in Folsom, CA. (Folsom History Museum). The mail is approximately 30 minutes ahead of schedule and 30 miles from Old Sacramento (terminus). Go Pony!

FROM: CIndy Gansereit, KM6BUY
SENT: June 20th, 2019 | 9:58am PST
STATUS: At 9:46 am PDT, the Pony was through Malcolm Dixon/ Red School, running approximately 35 minutes ahead of schedule.

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  - Increasing safety along the Re-Ride

Issues Identified during the 2019 Re-Ride

1-15

Set a Custom Date Range

Start Date: 6/10/2019

End Date: 6/20/2019

Update Report

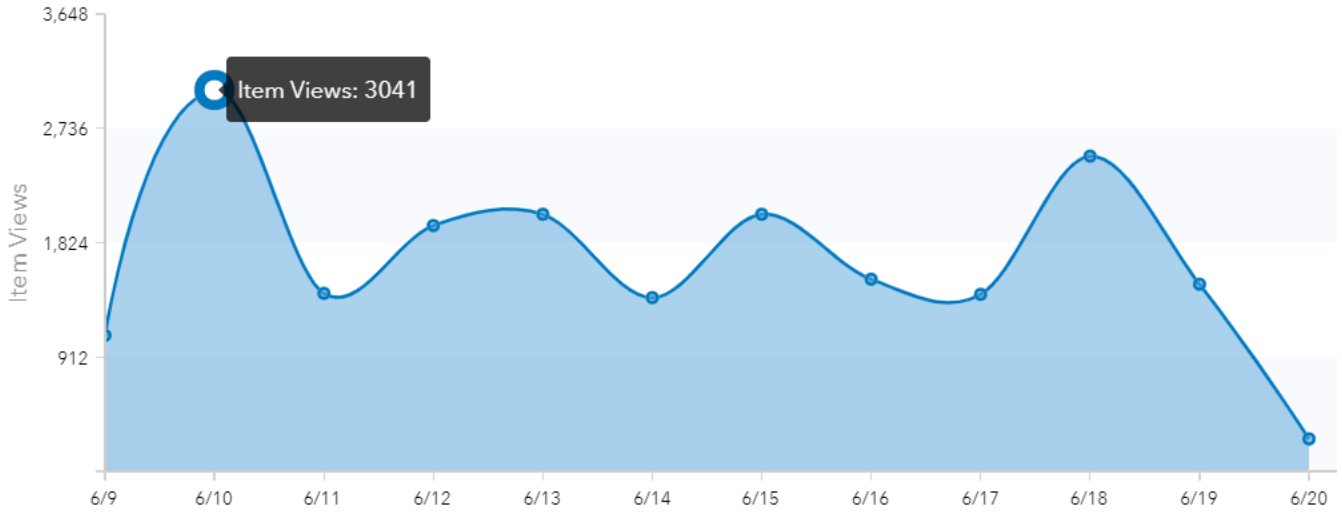
Item Views this Period

20,196

Avg Item Views Per Day

2,019.60

Usage Time Series



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- Loss of SPOT signal in a few locations
- Duplication of Rider Locations

Improvements

- Changing Python Script to run independently of the SPOT Feed translation

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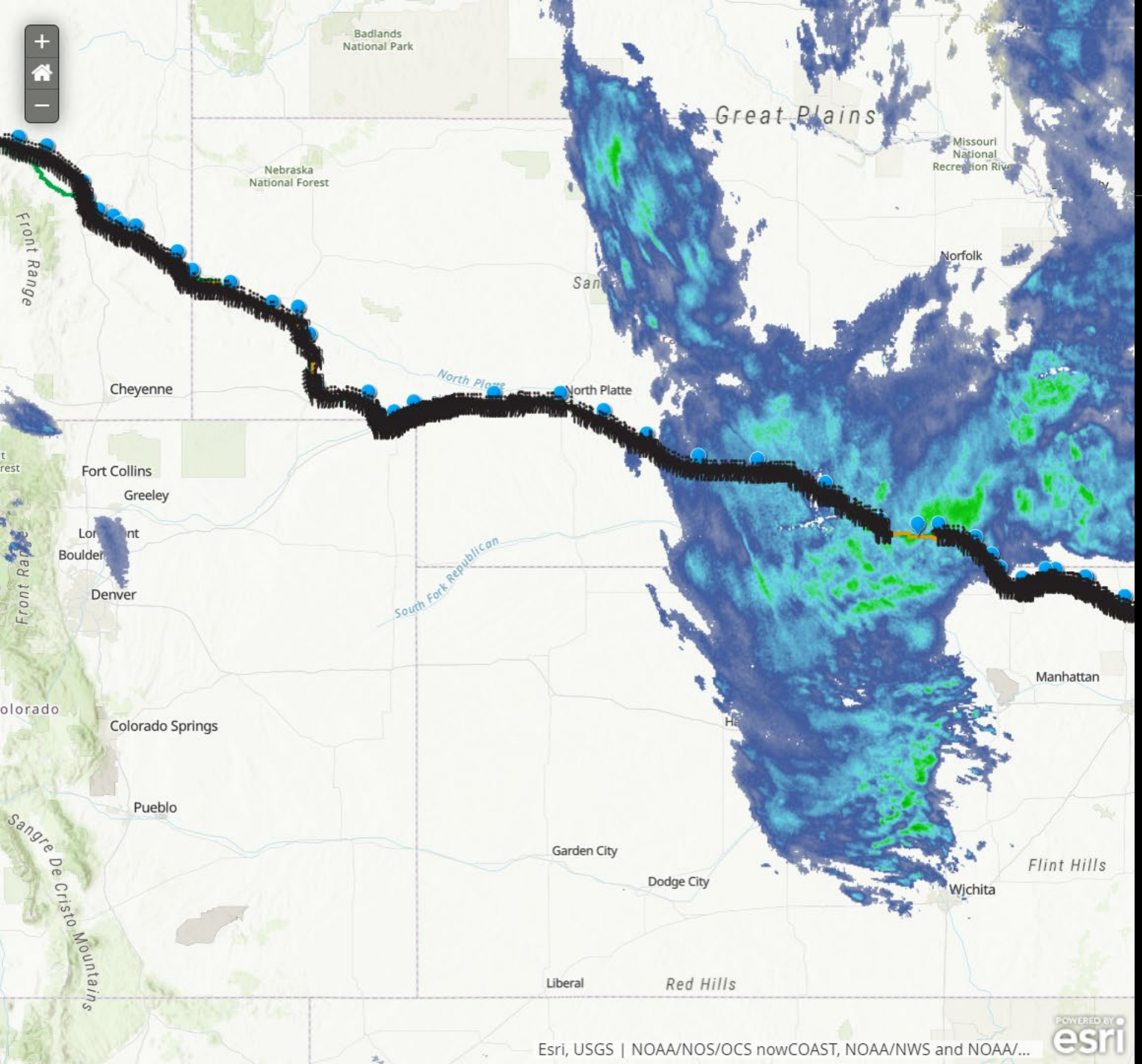
- Adding NOAA time-enabled weather radar data
- Enabling the App to zoom to the newest Rider location upon web app loading
- Adding GPS Coordinates for exchange locations
- Utilizing Arcade expressions for symbology and pop up windows



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Questions

Contact Information:

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GIS Specialist
505-988-6012
brian_deaton@nps.gov

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Sarah Rivera
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801-741-1012 ext107
sarah_rivera@nps.gov