

## GIS POD Analysis Workflow (Part II)

Part II of the GIS workflow uses the POD point layer created in Part I to run a regional analysis in an Area of Interest (AOI) (e.g., watershed). Once an AOI has been established, the workflow outlines a series of steps to identify and correct erroneous POD locations, resulting in a more accurate POD dataset for the AOI.

For Part II you will need to add the following layers to the GIS map template in addition to those added for Part 1:

- NHD watershed Boundaries (HUC 8) or whichever HUC size makes sense for your analysis.
- NHDplusCatchment from you AOI region (usually downloaded by HUC 4)
- NHDplusEROMMA table

All the layers should be included in one geodatabase download from USGS [TNM Download v2 \(nationalmap.gov\)](https://nationalmap.gov). The example below is for the NHDPlus HR layer associated with Northern California (1801); use the map in link to determine what download covers your area of interest.



1 through 2 of 2 results

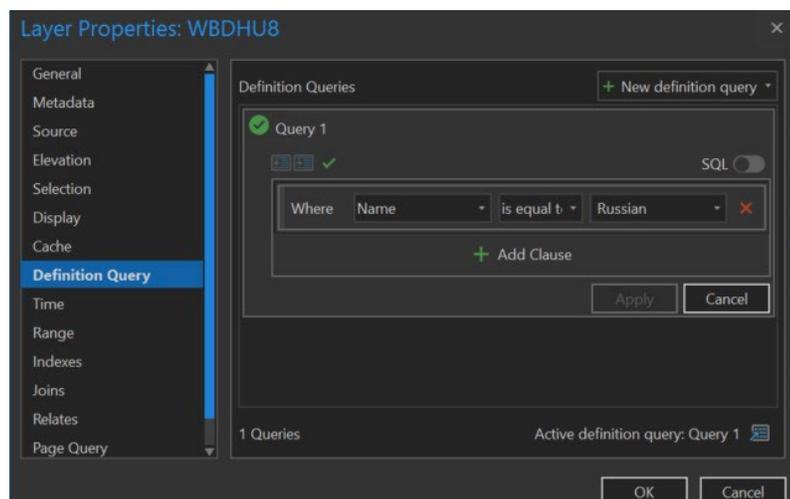
USGS National Hydrography Dataset Plus High Resolution (NHDPlus HR) for 4-digit Hydrologic Unit - 1801 (published 20180504)

**Published Date:** 2018-05-04  
**Metadata Updated:** 2019-07-18  
**Format:** FileGDB, NHDPlus HR Rasters  
**Extent:** HU-4 Subregion

Footprint  
Thumbnail  
Zoom To  
Info/Metadata  
Vendor Metadata  
**Download Link (ZIP)**  
Other Format (7Z)

### 1. Designate your Area of Interest (AOI)

As an example, we chose the 'Russian River Watershed' by right clicking on the HUC 8 layer > properties > definition query > new definition query:



Alternatively, you could define the definition query as: WHERE 'HUC8' = 18010110

The next steps will focus on selecting all the PODs in our AOI. Because both MTRS (Meridian, Township, Range, Section) and Latitude/Longitude (FFMTRS) are known to occasionally be entered incorrectly in eWRIMS, we will plot the PODS using both fields, and identify all POD points that are associated with our AOI using the following conditions:

- a) WHERE the FFMTRS field in the Statewide POD layer matches the MTRS field in the RR\_Section\_Intersect layer (The concatenated MTRS field listed in the flat file matches the MTRS field of the PLSS Section layer.)

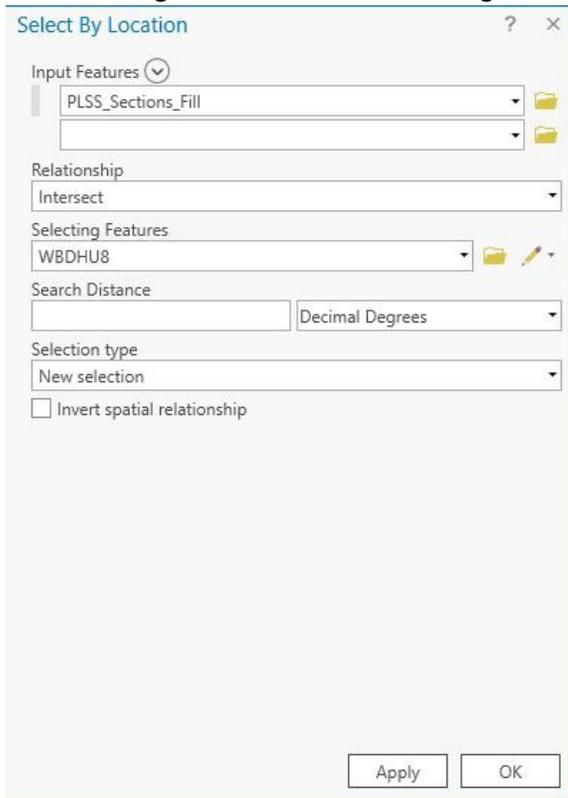
OR

WHERE the MTRS field in the Statewide POD layer matches the MTRS field in the RR\_Section\_Intersect layer. (The MTRS Field the POD point falls on matches the MTRS field of the PLSS Section layer.)

We can then identify and correct all erroneous POD points for our AOI

## 2. Create a Subset of PLSS Sections that intersect the HUC8

Select the PLSS Section layer by location as shown below. Create a new layer from this selection and name it *RR\_Section\_Intersect* (Note, in this example RR stands for Russian River. Choose a naming convention that distinguishes your AOI.)



Select By Location

Input Features  
PLSS\_Sections\_Fill

Relationship  
Intersect

Selecting Features  
WBDHU8

Search Distance  
Decimal Degrees

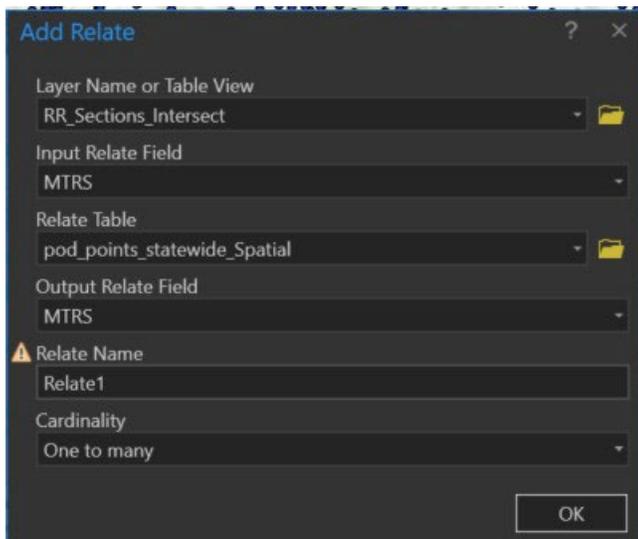
Selection type  
New selection

Invert spatial relationship

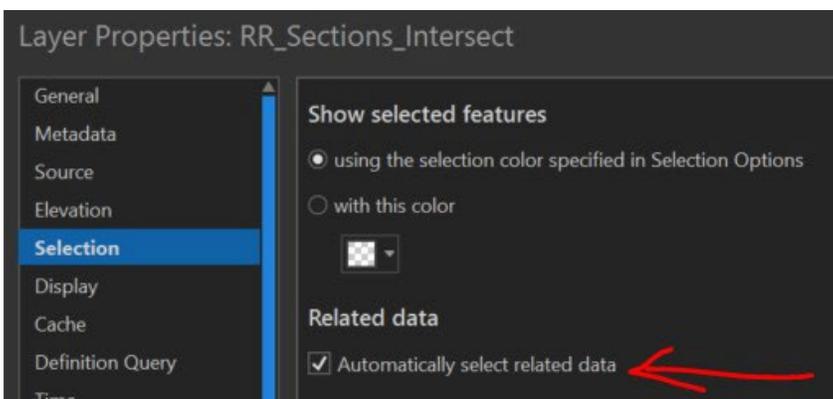
Apply OK

## 3. Create a “Relate” between the PLSS Subset and the pod\_points\_statewide\_Spatial Layer

Right click the *RR\_Section\_Intersect* layer in the contents pane > Joins and Relates > Add Relate. Assign the related tables and fields as shown below. Make sure the cardinality is set to “One to Many.”



One of the powers of the “Relate” tool in ArcGIS is the ability to select features in other layers based upon the relationship defined in the related tables. Right click on the *RR\_Section\_Intersect* layer in the contents pane > properties > Selection > Check the box to Automatically Select Related data.



**4. Select POD Points WHERE the MTRS field in the pod\_points\_statewide\_Spatial layer matches the MTRS field in the RR\_Section\_Intersect layer.**

Open the attribute table and Select all Polygons in the *RR\_Section\_Intersect* layer. Because we opted to automatically select related data in step 3, all the related POD points will also be selected. Right click on the *POD\_Points\_Statewide\_Spatial* Layer > Selection > Make Layer from Selected.

Name this new layer *RR\_pod\_points\_MTRS\_relate*. **CLEAR ALL SELECTIONS!**

\*\*Note: we could have just plotted all the points that intersect *RR\_Section\_Intersect* layer but it would return the same subset of POD Points as this method.

**5. Select POD Points WHERE the FFMTRS field in the POD\_Points\_Statewide\_Spatial layer matches the MTRS field in the RR\_Section\_Intersect layer.**

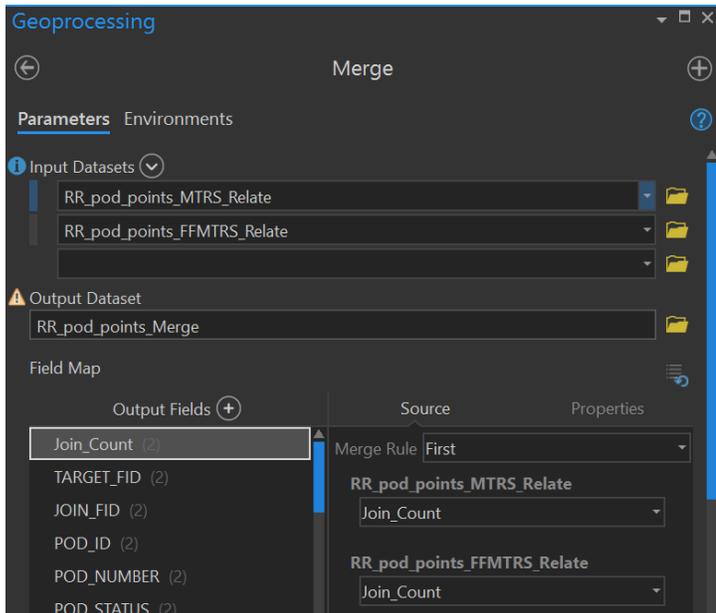
Right click on the *RR\_Section\_Intersect* > Joins and Relates > Remove all Relates  
 Right click again on the *RR\_Section\_Intersect* layer > Joins and Relates > Add Relates, Create a Relate just as we did in Step 3. However, this time choose the “FFMTRS” field as the Output Related Field.

Open the attribute table and Select all Polygons in the *RR\_Section\_Intersect* layer. Because we opted to automatically select related data in step 3, all the related POD points will also be selected. Right click on the Statewide POD Layer > Selection > make new layer from selection.

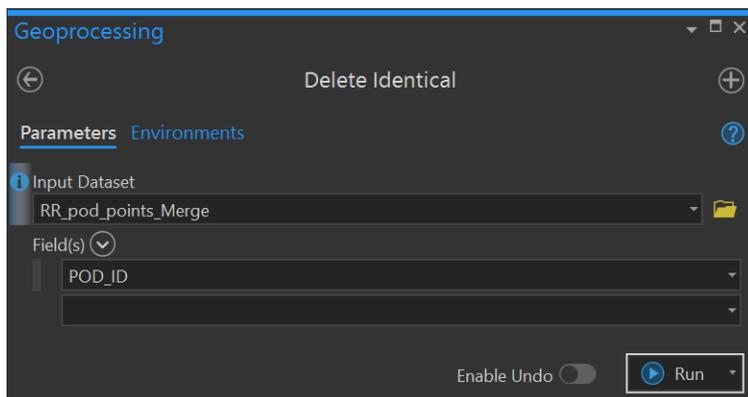
Name this new layer *RR\_pod\_points\_FFMTS\_Relate* **CLEAR ALL SELECTIONS!**

## 6. Merge both Layers created in steps 4&5 and delete duplicate records

Click on the Analysis Tab > Tools > Merge. Perform a Merge as shown below.



Click on the Analysis Tab > Tools >Delete Identical. Perform a delete as shown below. Note: The 'Delete Identical' tool requires an ArcGIS Pro Advanced license.

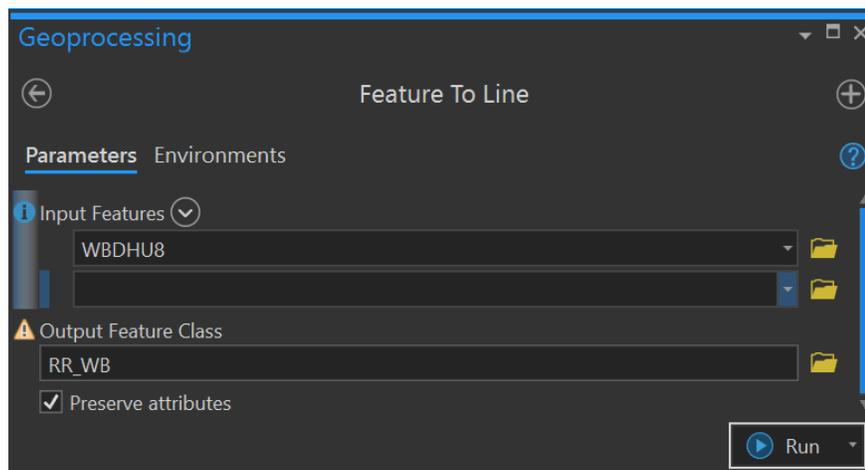


We now have all the POD points associated with our AOI using both the Lat/Long and MTRS fields in the POD Flat file. Our next step will be to systematically identify points we want to include or exclude from the dataset.

#### 7. Create an AOI PLSS section edge layer for use in Cases 1 & 2 in step 8

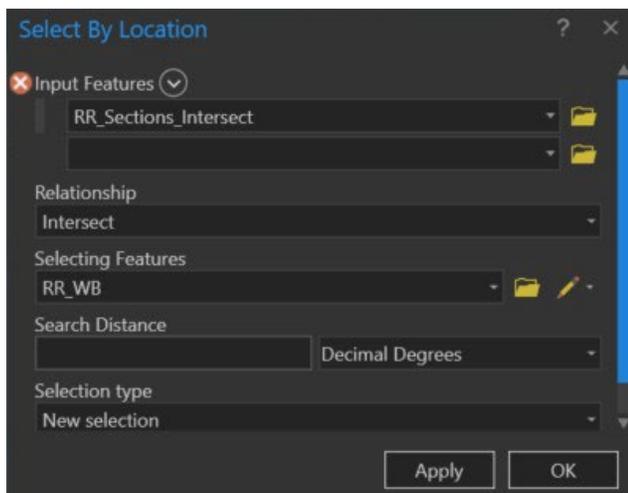
To check the edge case scenarios (Cases 1 & 2 below) we need to select only the POD points that fall on the PLSS Sections that intersect the boundary of the AOI.

Click on the Analysis Tab > Tools > 'Feature to Line' and complete a feature conversion as shown below, naming the line representing the Russian River Watershed Boundary as "RR\_WB" or after the watershed name you are working on.



Select all PLSS Sections that intersect the RR\_WB line.

Click the Map Tab > Select by Location and complete the selection as shown below:



Create a new layer from this selection and name it, “RR\_Sections\_RR\_WB\_Intersect”

In this workflow, A Resolution field will be used to identify records that will be included or excluded. For convenience, a field domain with the option to select “Include” or “exclude” from a drop down menu can be used.

Right click on the “RR\_pod\_points\_Merge” table > Design > Domains, and create a domain as shown below:

Domain Name	Description	Field Type	Domain Type	Split Policy	Merge Policy	Code	Description
Resolution	choice	Text	Coded Value Domain	Default	Default	Include	Include the POD
						Exclude	Exclude the POD

Add new columns to the “RR\_pod\_points\_Merge” Table To track location corrections to the POD Points in step 8.

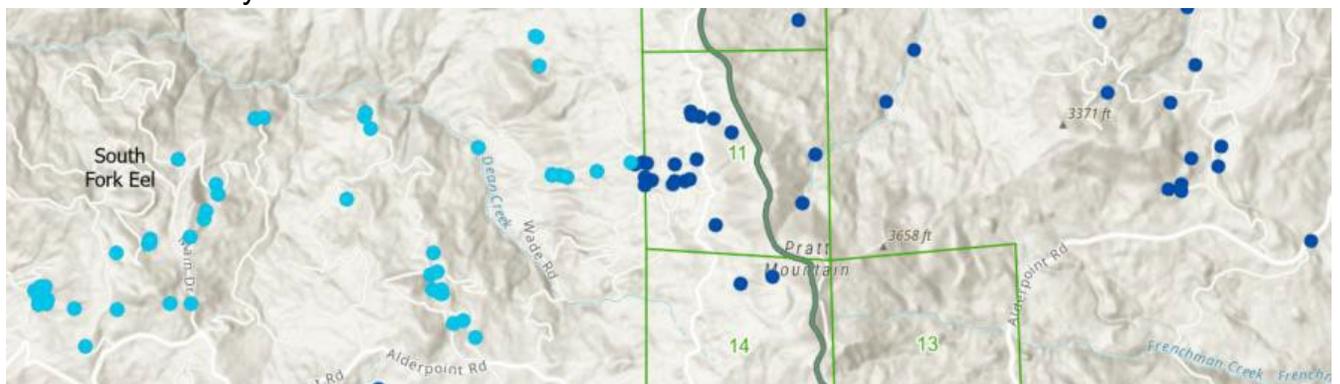
Right click on the “RR\_pod\_points\_Merge” table > Design > Fields and add 5 new fields as shown below. (Remember to select the Domain you just created for the resolution field.)

Visible	Read Only	Field Name	Alias	Data Type	Allow NULL	Highlight	Number Format	Domain	Default	Length
<input checked="" type="checkbox"/>	<input type="checkbox"/>	CASE	CASE	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				255
<input checked="" type="checkbox"/>	<input type="checkbox"/>	RESOLUTION	RESOLUTION	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>		Resolution		255
<input checked="" type="checkbox"/>	<input type="checkbox"/>	NEW_LAT	NEW_LAT	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	NEW_LONG	NEW_LONG	Double	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Numeric			
<input checked="" type="checkbox"/>	<input type="checkbox"/>	NEW_MTRS	NEW_MTRS	Text	<input checked="" type="checkbox"/>	<input type="checkbox"/>				255

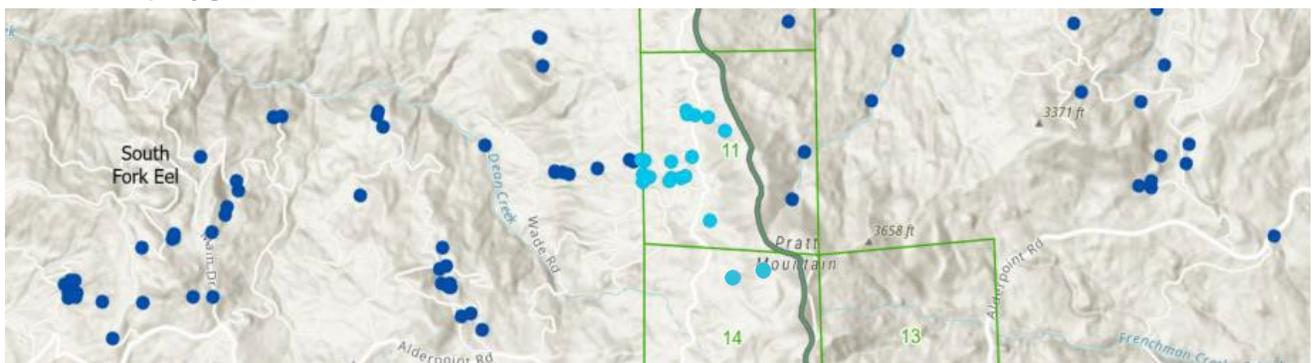
8. Correct erroneous POD points using the following Cases (see case examples from the SF Eel below.)



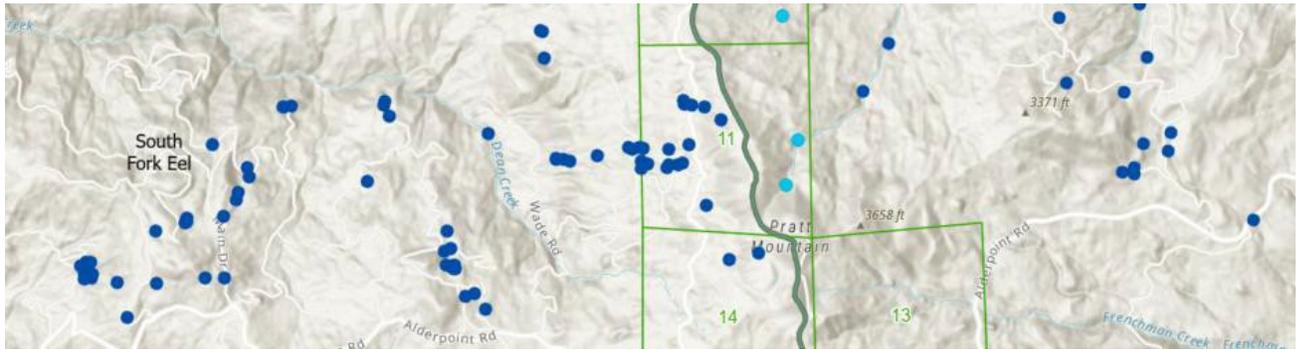
a. **Case 0:** If a POD point lies within our AOI And MTRS\_Match = Y and the POD is NOT near the edge (intersecting the “RR\_Sections\_RR\_WB\_Intersect” layer) of our AOI, then we can be reasonably certain we want to include it in our dataset.



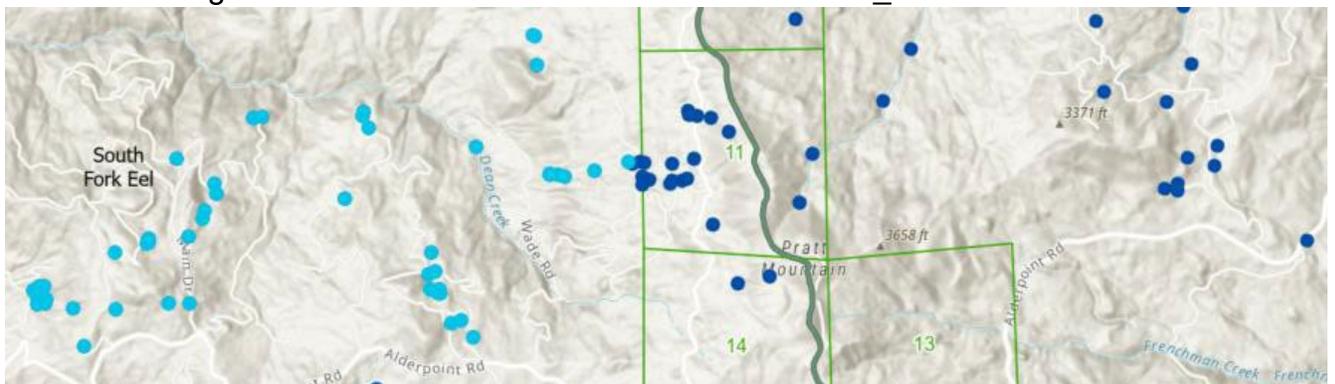
b. **Case 1:** If a POD point lies within our AOI AND MTRS\_Match = Y AND IS near the edge of our AOI, we must check the AOI edge case scenario where the POD was plotted on the correct PLSS Section but should be located in an adjacent watershed. If this scenario is discovered, the POD should be moved outside the AOI boundary but within the same PLSS Section polygon and excluded from the AOI dataset.



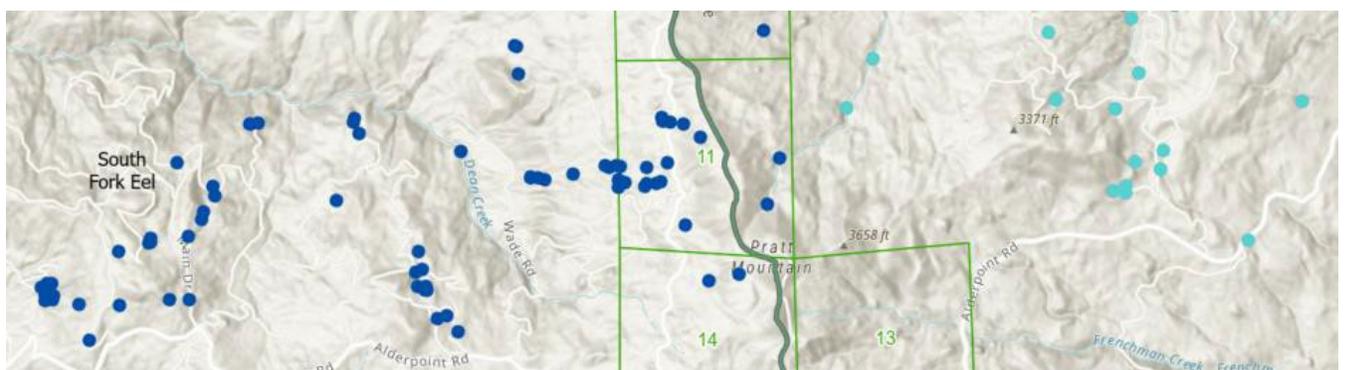
- c. **Case 2:** Similarly, we must check the edge case scenario where the MTRS\_Match=Y, the POD point was plotted in an adjacent watershed, but should be located within our AOI. If this scenario is discovered, the POD should be moved inside the AOI within the same PLSS Section and included in the AOI dataset.



- d. **Case 3:** If a POD point lies within our AOI and MTRS\_Match = N, we must check if the POD should be included in our AOI. If it should be included, the FFMTRS or Latitude/Longitude field needs to be corrected so the MTRS\_Match = Y.

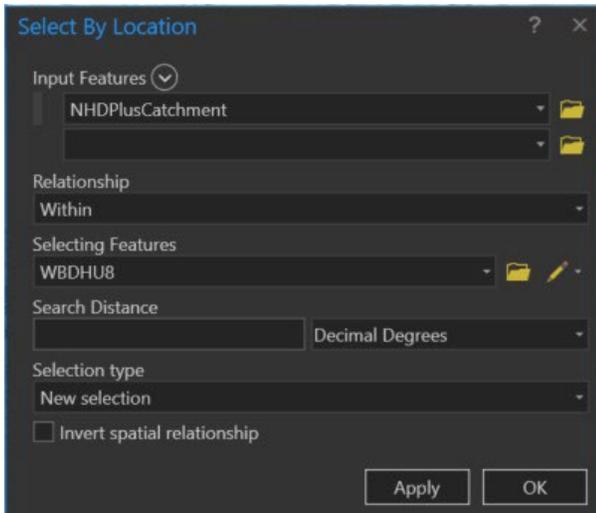


- e. **Case 4:** If a POD lies outside our AOI and the MTRS\_Match = N, check if the POD should be included in our AOI. If it should be included, correct the FFMTRS or Lat/Long field so the MTRS\_Match = Y.



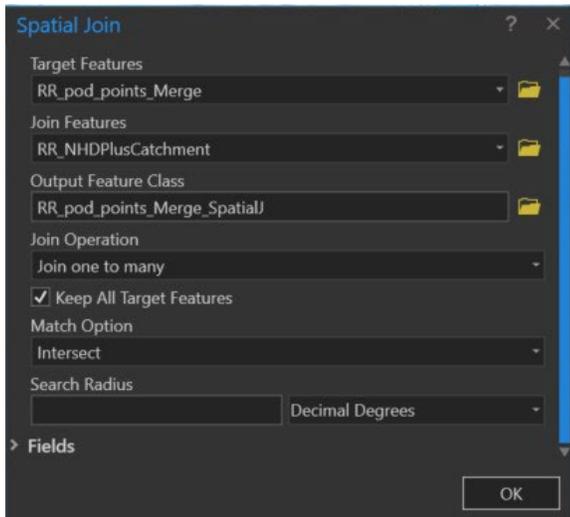
- 9. Relate each POD to its NHD catchment and assign it an estimated mean annual Flow** Now that we have corrected all the PODs associated with our AOI, we will add some attributes from its coincident NHD catchment. The NHD gauge adjusted mean annual flow estimate will be used in subsequent steps as a proxy for the relative amount of water available to a Water right. If a water right has multiple PODs located in different catchments, the POD with the Maximum amount of mean annual flow will be assigned as the Water right's representative POD.

First, we will create a subset of the NHD Catchments that are within the Russian River HUC8. Click on the Map tab > Select By Location and run the tool as shown below:

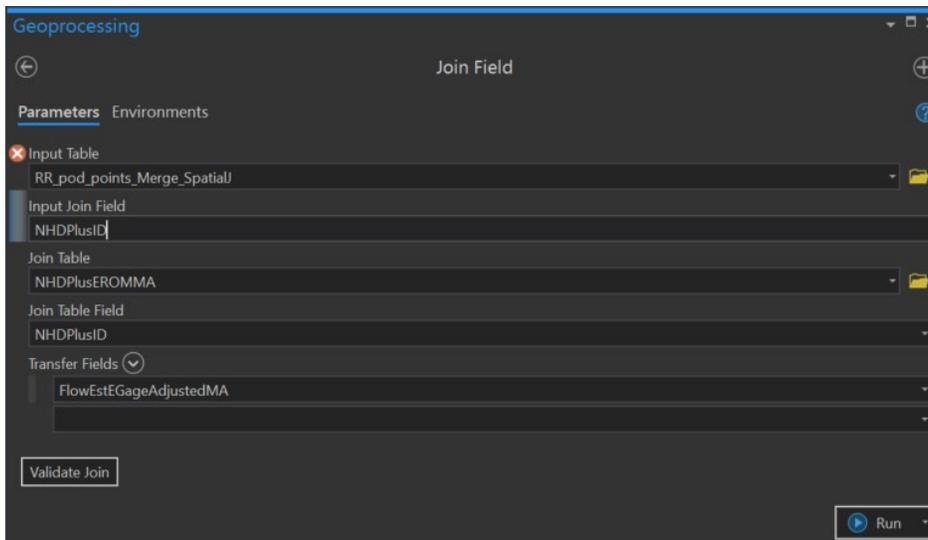


Save the selection as a new layer and name it: *RR\_NHDPlusCatchment*.

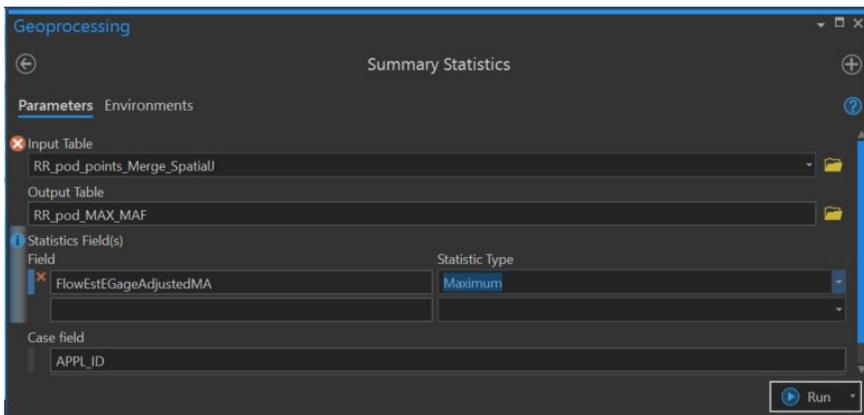
Now we can perform a spatial join between the *RR\_pod\_points\_Merge* layer and the catchments: Right click on the *RR\_pod\_point\_Merge* layer > Joins and Relates > Spatial Join and perform as Spatial Join as shown below.



Now join the “QEMA” field (alias: FlowEstEGageAdjustedMA) from the NHDPlusEROMMA table to the *RR\_pod\_point\_Merge\_SpatialJ* layer using the NHDPlusID field. Click on the Analysis tab > Tools > Join Field...



Now we have a gauge adjusted flow estimate appended for each POD record. In the case when there are multiple PODs associated with a Water Right, we want the POD with the maximum flow to represent that water right. Click the analysis tab > Tools > Summary Statistic.



Using the APPLICATION\_NUMBER as the Case field tells the geoprocessing tool to calculate the POD max flow statistic separately for each APPLICATION\_NUMBER value. This tool will then select the 'Maximum' 'FlowEstGageAdjustedMA' for each Water right and set that POD as the representative point.

Unfortunately, the POD\_ID is not carried over in the resulting table and there is no common field to allow us to append the max flow values back to an individual POD in the 'pod\_points\_merge\_spatialJ' table.

As a work around, we can create a new common field in the 'pod\_points\_merge\_spatialJ' and the '.....MAX\_MAF' tables by Combining both the APPLICATION\_NUMBER and the 'FlowEstGageAdjustedMA' fields.

Next relate the '.....MAX\_MAF' and the 'pod\_points\_merge\_spatialJ' tables using the new common field, ensuring the cardinality is set to "one to many".

Right click the '.....MAX\_MAF' table in the contents pane >properties >selection > and ensure the select all related records option is checked.

Select all records in the '.....MAX\_MAF' table. Open the 'pod\_points\_merge\_spatialJ' attribute table and you should see a subset of related records selected. Create a new layer from this subset and name it: "ProjectName\_POD\_Max\_MAF." Then, export the final table to excel using the "Table to Excel" tool.