The Range-Wide Bull Trout eDNA Project ArcGIS Online Map Guide

USDA Forest Service
Research & Development
Rocky Mountain Research Station
Air, Water, & Aquatic Environments Program and the
National Genomics Center for Wildlife and Conservation

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General map notes:

The sample points may not line up with the chosen basemap. The points are aligned with the NHD Plus version 2 NHDFlowline streams. Actual field sample locations may differ slightly depending on the ground situation and personnel collecting the samples.

Overview

There are tabs available along the left under the map name and tools available in the upper left-hand corner of the map under the search bar.   Navigating the Map

Legend Tab | Resources | Sample Site Maps | Add Layer from ArcGIS Online, a URL, or a File | Change Base Map

Filter Points | Select Points by circle, rectangle, or polygon | Geoprocessing - download points by area of interest | Search Bar
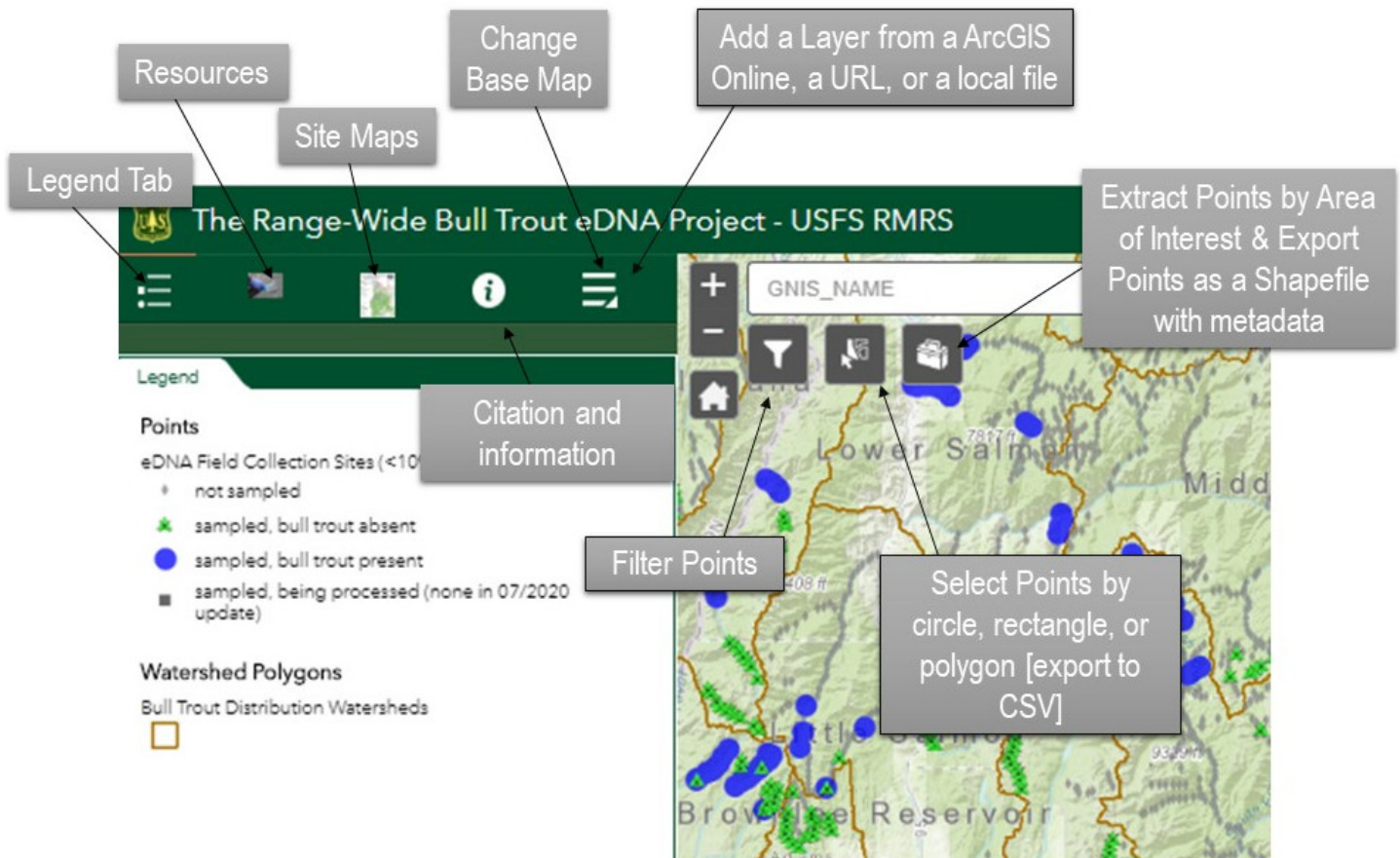
The attribute table is available by selecting the arrow at the bottom of the map. You can filter by HUC or other attributes. Note that the Filter Points button also allows you to specifically filter by HUC name or bull trout presence/absence. Y b W
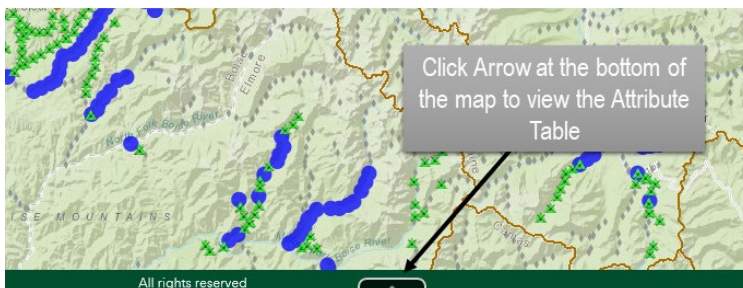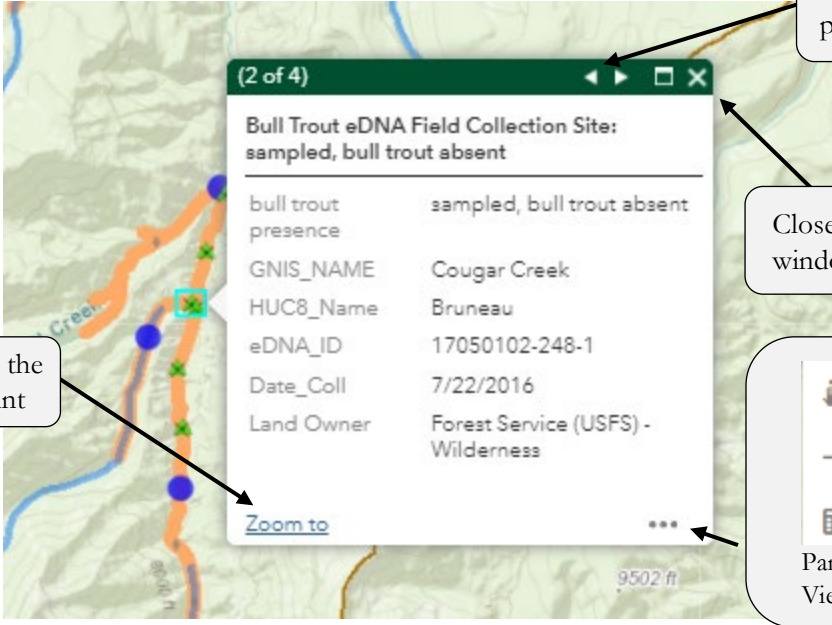

Occasionally the arrow will not be available even after refreshing your browser. You can open the attribute table by opening the Select tool to select points and using the ellipsis to select "View in Attribute Table."

Navigating the Map – general tips

To zoom in and out, use the + or – buttons in the upper-left hand corner of the map ⊞ or use the scroll on your mouse.

To immediately zoom out to the initial extent, click the "home" button in the upper-left hand corner of the map 🏠

To see the attributes of specific points on the map, use your mouse to click that point. A box will pop up with those available attributes. If more than one point is selected, or there are line data under the point, you can use the navigation to see the next attribute.

Legend Tab (ESRI help document for this tool)

The Legend tab loads with the map as a default. It shows the visible map layers and their symbols. To minimize this (or any) tab, click the arrow in the bottom right section of the tab.

eDNA Field Collection Sites – Points represent the sample site locations. Colors help users find those points that were sampled and where bull trout was absent (green triangle with an X;, points that were sampled and where bull trout were present (blue circle), points that are being processed (black square) and those point locations that are not yet sampled (gray diamond). If you would like to participate, the gray diamond sites would be ideal. Visible at all scales, but symbology changes as you zoom in past 1:555,000 (scale bar at 3 miles). Note that previous versions displayed a green circle with an X for sample results with bull trout absent. This was modified to a green triangle while the blue circle indicating samples where bull trout eDNA was present were made slightly larger. This allows users to see multiple samples at the same location.
https://apps.fs.usda.gov/fsgisx02/rest/services/rmrs/RMRSAWAE_eDNAFieldCollectionSites_21/MapServer
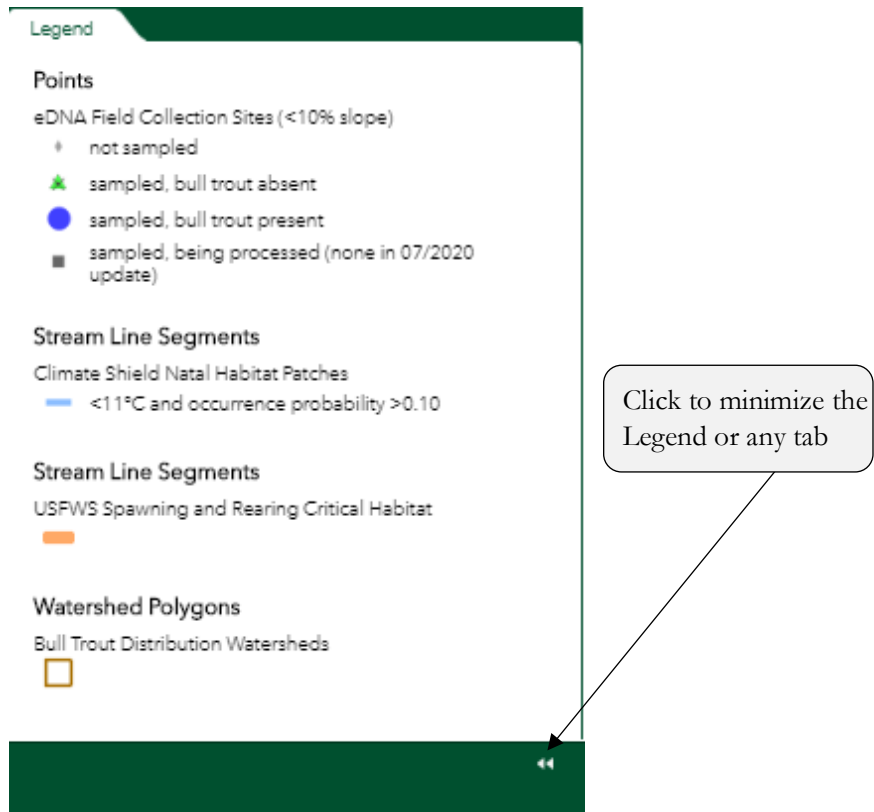
Climate Shield Patches – Light blue stream lines from the Cold Water Climate Shield project that denote streams at less than 11° C and a bull trout probability of greater than 10%. This layer is visible only as you zoom in beyond 1:500,000 (scale bar at 3 miles) and has a slight transparency.
https://apps.fs.usda.gov/fsgisx02/rest/services/rmrs/RMRSAWAE_eDNA_ClimateShieldPatches_01/MapServer

USFWS Bull Trout Spawning and Rearing Critical Habitat – thicker light orange stream lines from the US Fish and Wildlife service as queried "H_USE_TYPE" = 'SR'. This layer is visible only as you zoom in beyond 1:500,000 (scale bar at 3 miles).
https://apps.fs.usda.gov/fsgisx02/rest/services/rmrs/RMRSAWAE_eDNADistributionSR_01/MapServer
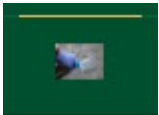
Bull Trout Distribution Watersheds – Polygons noting the watersheds for bull trout distribution from the WDB. The layer is always visible, but watershed names (HUC8_NAME) are shown between 1:3,500,000 & 1:1,150,000. https://apps.fs.usda.gov/fsgisx02/rest/services/rmrs/RMRSAWAE_eDNAWatersheds_01/MapServer

Resources

The Resources tab contains links to the Range-wide bull trout eDNA project website, including supporting science. Click this button to see those resources and links.

Sample Site Maps

The Site Maps tab contains links to the Range-wide bull trout eDNA project static PDF maps and Excel spreadsheets by HUC 8 watershed. Click this button to see an example map and the link to the page containing those digital static maps and sample coordinates in excel spreadsheets.
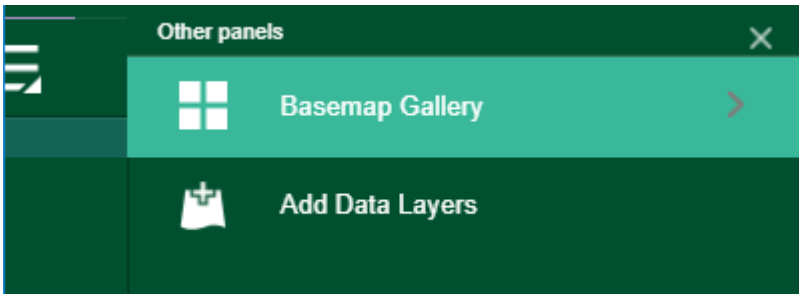
Citation

The citation if using the downloaded data or data in the map. This panel also includes a link to the Research Data Archive DOI, which includes very detailed GIS metadata. The citation is also at the end of this guide

More Panels

Choose this option to change your basemap or add a relevant data layer to this map.

Change Base Map

Clicking the Basemap Gallery button allows you to choose a different base map or background layer. This may be helpful as you zoom into your specific area of interest.

Add Data Layer from a URL or ArcGIS Online

Choosing the Add Data Layer button allows you to add other online layers to this map. You can 1) search the available data in ArcGIS online, or 2) enter a specific URL if you already have a web service link or a KML file, GeoRSS File or CSV file URL, or 3) upload a file from your computer. It supports shapefiles in Zip format, and CSV, GPX and GeoJSON files.
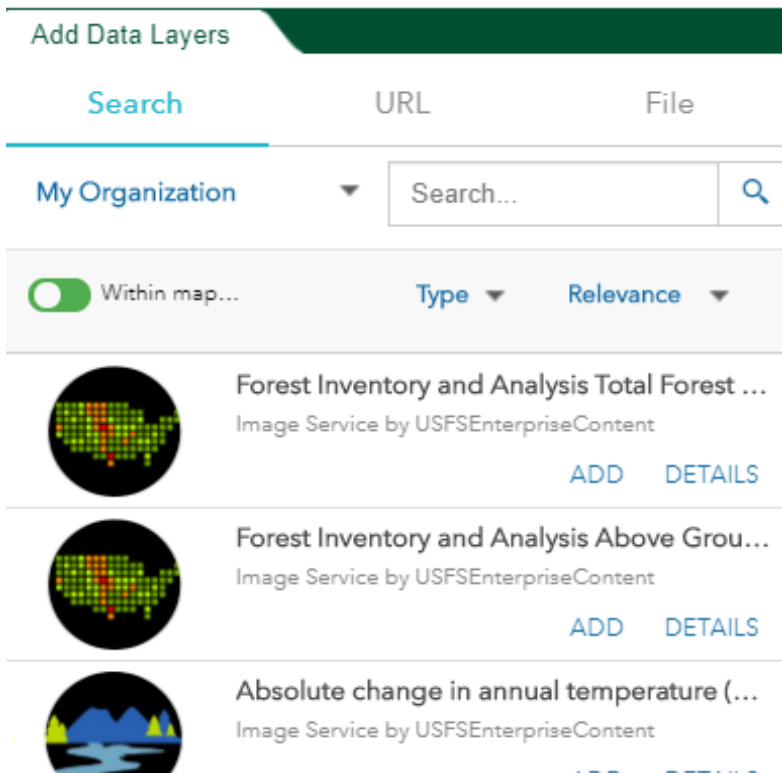
Click the icon to only search layers within the map area. Clicking it turns the icon red so you can search all layers in the scope.

Click the sort icon ≡ to refine the type of search layer and sort the items.

- Click the Type drop-down list to search layers based on map service, feature service, image service, vector tile service, KML, or WMS.
- Click the Sort By drop-down list to sort items by relevance, title, owner, rating, view, or date.
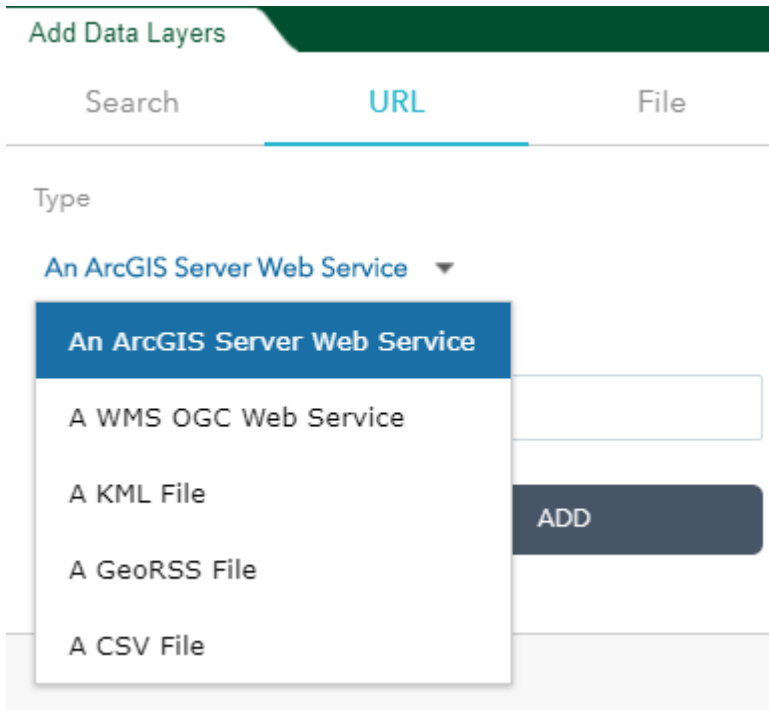
To add layers by URL, click the URL tab next to the Search tab. Choose a type and enter the URL. Click Add to add the data to the map. The added layer will appear in the Layer List widget as well. The following types are supported through the URL:

- ArcGIS Server web service
- WMS OGC web service
- KML
- GeoRSS
- CSV
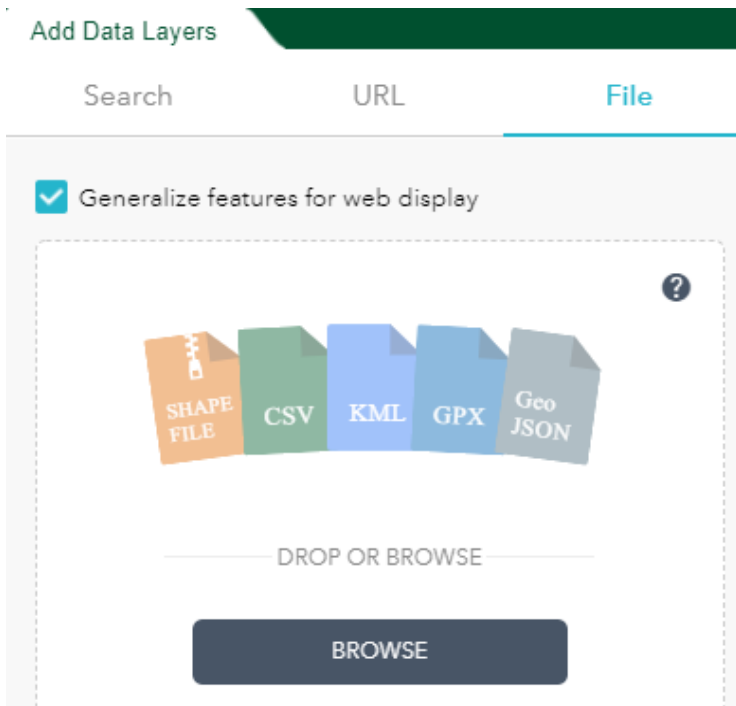
Click the File tab to upload files locally. You can either drag and drop the file or browse to it. It supports shapefiles in Zip format, and CSV, KML, GPX and GeoJSON files.

To remove layers added click LAYERS in the lower right corner of the Add Data window. In the Layers panel, click the trash can icon next to the layer to remove it.

Click BACK in the lower right corner to return to the main Add Data panel.

Note that you can't remove the added layer without refreshing the map, but you can turn that layer off in the Layer List tab.

Filter Points

The Filter Points button allows you to filter the points on the map and in the attribute table by bull trout sample results and/or HUC8 watershed boundary.

After clicking the button, use the drop-down boxes to make your choice(s). You can filter by one of these or by both.
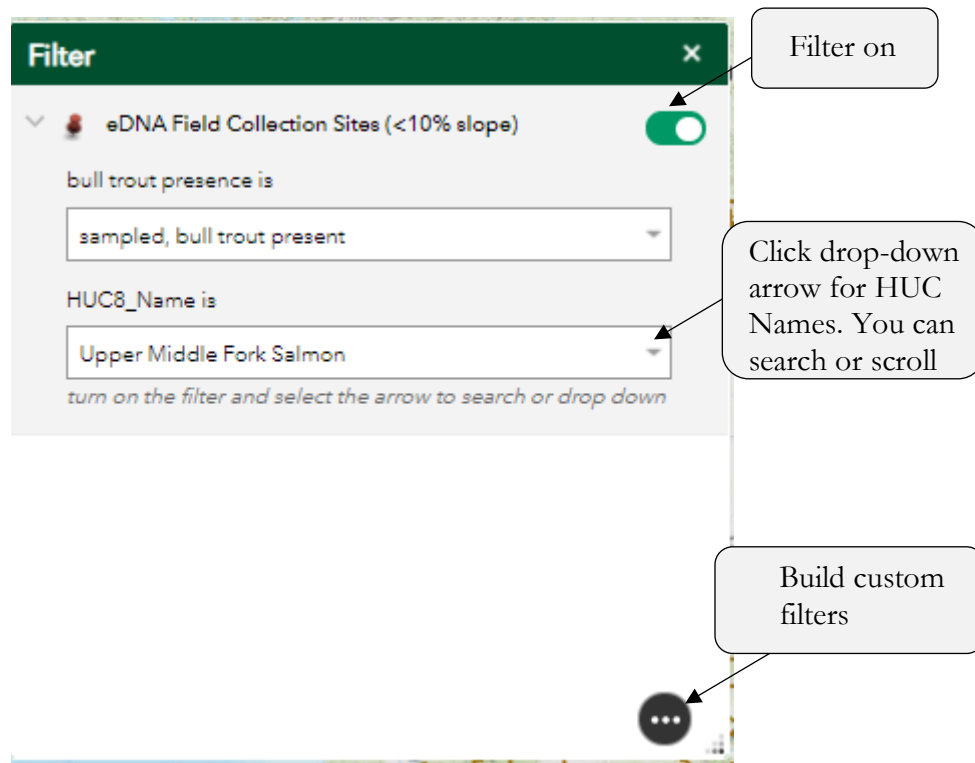
Once you've chosen how you want to filter, click the green toggle button to apply that filter.

To remove the filter, toggle the apply button off. It will turn from green/on to gray/off.

You can build custom filters using the Options in the attribute table. See example.

Select Points (ESRI help document for this tool)

Clicking this button and using the Select Points tool allows you to choose up to 1000 points on the map by rectangle, polygon, or circle. You can use it in conjunction with the Filter tool or you can zoom in and select points in a general area. You can view the selected points in the attribute table, and even export to a CSV file from there.

Please note that this selection tool doesn't allow export to a shapefile. It also does not allow for you to select more than one area. For those options, please see the Geoprocessing Tool to Extract Points by Area of Interest.
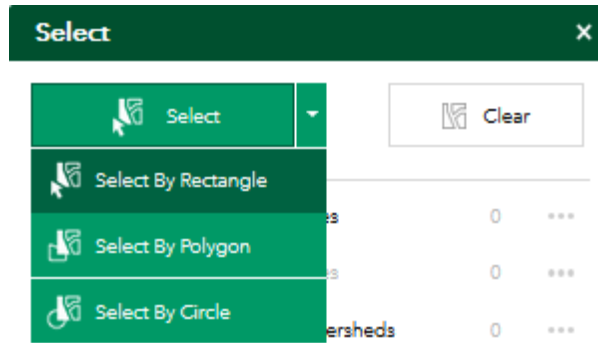
Select by Rectangle and Select by Circle draw those shapes for you. Select by Polygon requires that you draw your polygon boundary and you will need to click the map to start that polygon.

You can clear your selection by clicking the "Clear" button in the upper right-hand corner of the Select window. If you have already closed the window, you can click the Select button again to open the window and clear the selection.

After a moment, the points are selected. Once they are available, click the ellipsis (…) to see your options.
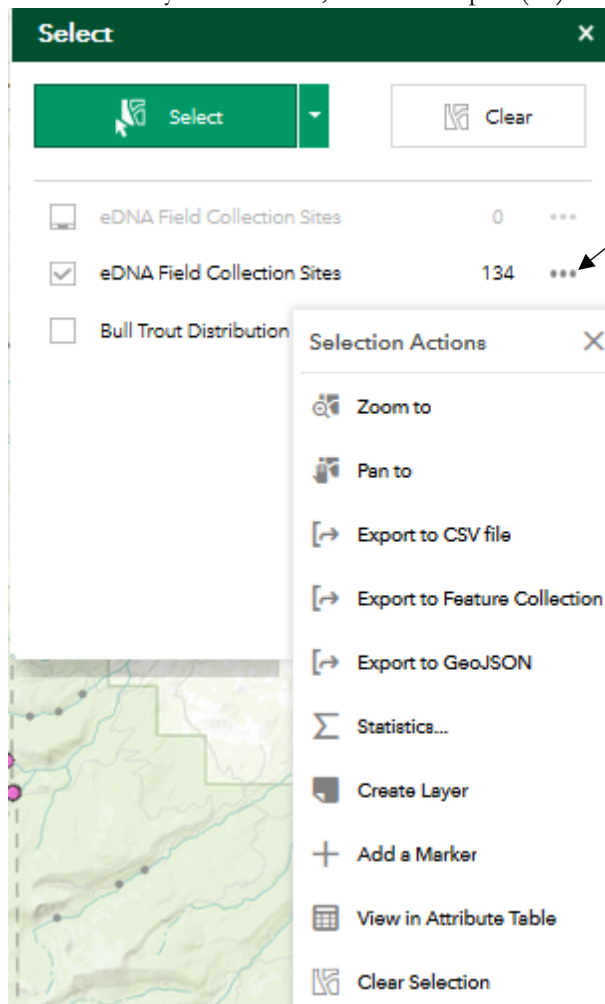
You can view only the selected points in the attribute table by clicking the arrow at the bottom of the map to open the attribute table and choosing Options/Show Selected Records.
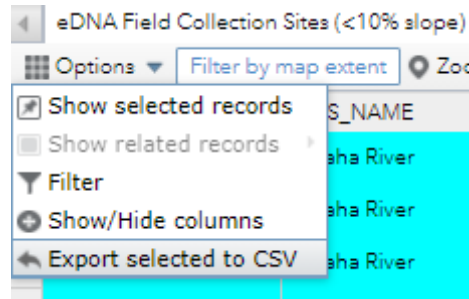
If you choose to view in the attribute table, you can export selected points to a CSV file for download. Note that the downloaded CSV file contains all the attributes for each point and not the small amount available in the AGOL map.

Geoprocessing - Extract and Download Points by Area of Interest (ESRI help document for this tool)

Clicking the Geoprocessing button brings up a tool that allows you to select an area of interest. Once you've made your selection, you can export the points within the area(s) of interest as a shapefile or geodatabase. Please note you will only be exporting the eDNA site locations. If you would like to download Climate Shield data, you can do that here - https://www.fs.fed.us/rm/boise/AWAE/projects/ClimateShield.html

Notes:
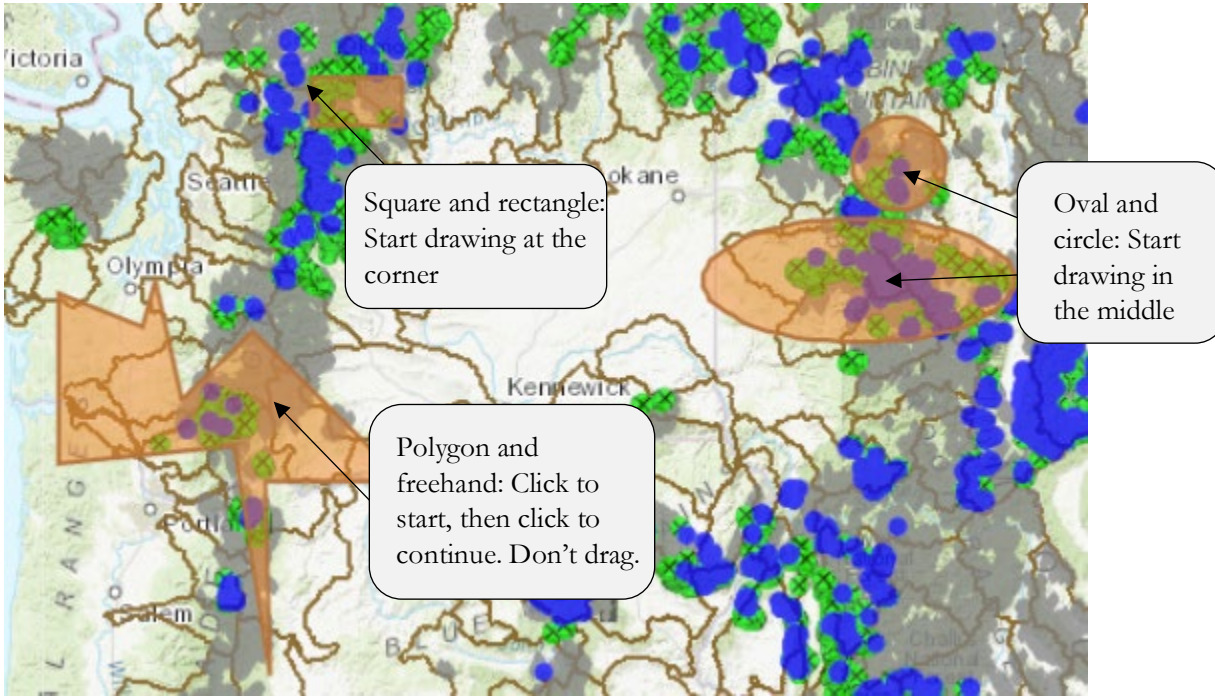- You can create more than one polygon to select different areas.
- If using a triangle, circle, or oval, the area you click and drag will be in the center of the drawn triangle, circle, or oval.
- If using a square or rectangle, the area you click and drag will be one side of the square or rectangle.
- This tool does not select points. Rather, it allows the points within your area(s) of interest to be exported to a shapefile. To select points to view in the attribute table, use the Select Point tool.

Once you've selected your area(s), click the "Run" button. Depending on the size of your browser window, you may need to scroll down to see the button. After a few moments, the Output tab will be a link to an output zip file containing a shapefile or geodatabase with your selected features. This shapefile includes the metadata in an XML file. Please note that the points in the map may need to be projected to match the data for your project.

Square and rectangle: Start drawing at the corner

Oval and circle: Start drawing in the middle

Polygon and freehand: Click to start, then click to continue. Don't drag.

To remove the polygons you've created, click the 'delete' red exclamation icon.

Search Bar

Search for a stream by NHD Plus version 2 GNIS_NAME. Type your search and hit 'enter' or click the magnifying glass.

Searches take a moment and return up to 50 results. You can use this tool if you are not certain geographically where a stream or watershed is located. It will automatically zoom to the first result, but the search bar will have a slider to search for other results. Click another result and the map will zoom or pan to that location.
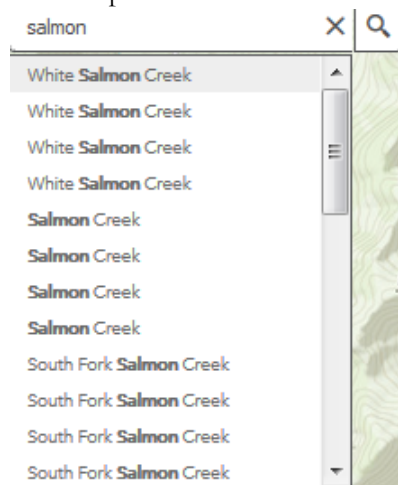
Tip: If you filter the available points to a specific HUC, the search results will be only those GNIS names within that specific HUC. Alternatively, turn off the filter before searching outside the filtered HUC.
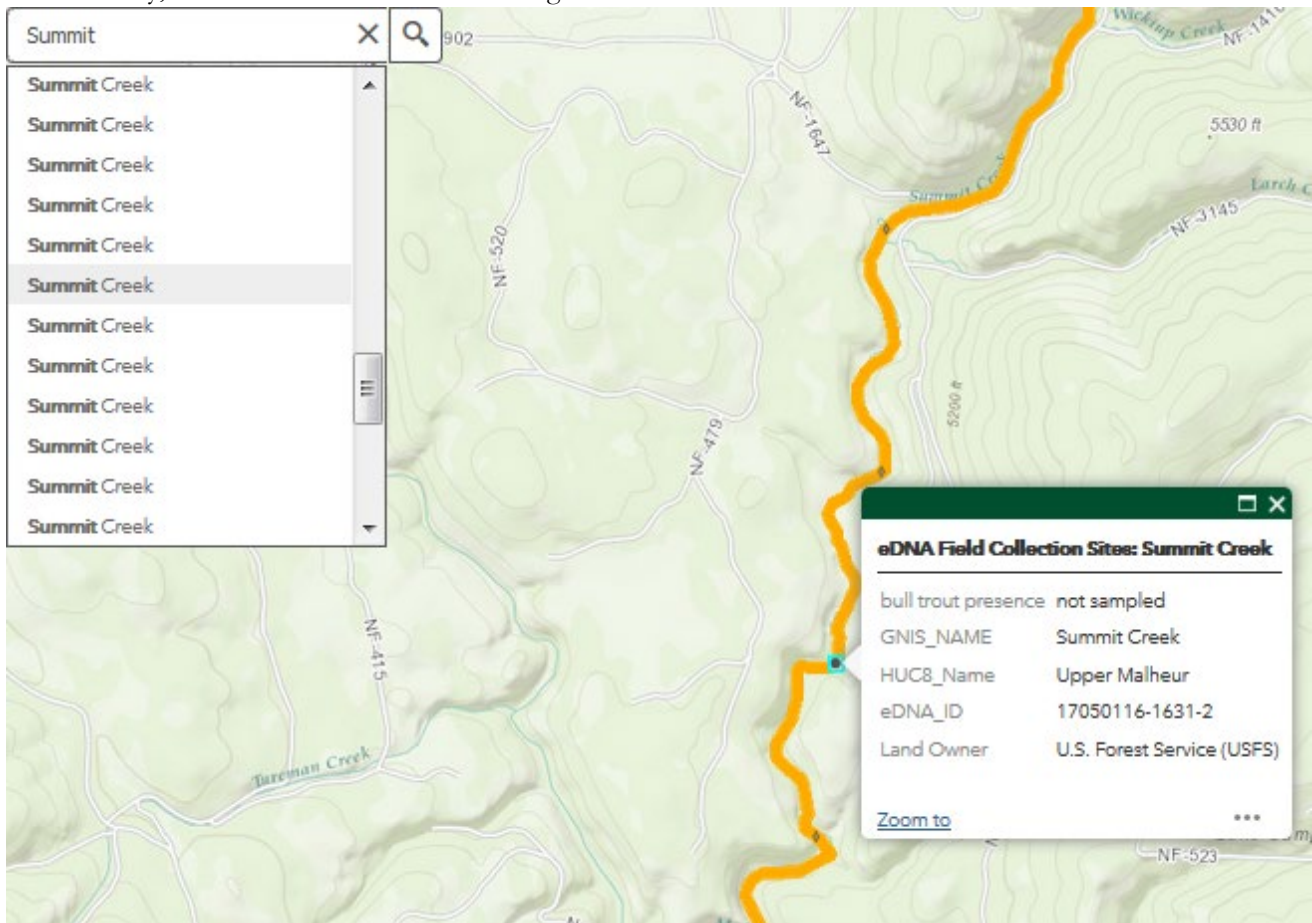
Attribute Table

The attribute tables can be opened and closed by clicking the arrow located at the bottom of the map. There are 4 tables available.

For any of these attribute tables, you can choose the Options link in the upper left-hand corner of the table to create a filter or to show different columns. As you zoom in on the map, the default is to filter the attribute table based on what is in the map view. Click that option to turn it off. You can filter and select point(s) and then zoom to that location.

The **eDNA Field Collection Sites point attribute table** shows the following attributes:

Detailed metadata here

| Location Attributes	
FID	Unique ID internal to shapefiles
Shape	ESRI generated; internal to shapefiles
eDNA_ID	Full eDNA Project ID number for the sample point derived from concatenating the HUC8 number and the unique eDNA sample Site_ID.
HUC8	Watershed Boundary Dataset 8-digit subbasin number
HUC8_Name	Watershed Boundary Dataset 8-digit subbasin name
Site_ID	eDNA Field sample point unique ID. This is a TEXT field and may need to be formatted in your CSV or Excel spreadsheet.
COMID	Common identifier (COMID) of the underlying NHDFlowline (version 2)
GNIS_NAME	Feature Name from the Geographic Names Information System (GNIS_NAME) NHD Plus version 2
REACHCODE	REACHCODE of the underlying NHD Plus version 2 NHDFlowline
TotDASqKM	Total Upstream Cumulative Drainage Area, in square kilometers, at the downstream end of the NHDFlowline
SummerQ	Mean summer flow (cfs) at the sample point from the VIC flow model
eDNA_Slope	Stream channel slope averaged to the next upstream field sample point or tributary.
Land Owner	(Ownership) - Land ownership at the field sample point from the Protected Areas Database of the United States
Date_Coll	Indicates the date the eDNA sample was collected. Null = Not sampled or date unknown.
Datasource	Agency or organization of the individual who collected the field sample.
ID_Tag	Unique ID assigned to each eDNA sample stored/processed at the National Genomics Center for Wildlife and Fish Conservation
BT_Present	Indicates if a site has had eDNA sampled and if bull trout is present. [Value = 1 (not sampled); Value = 2 (sampled, bull trout absent); Value = 3 (sampled, bull trout present); Value = 4 (sampled, being processed)]
S1_93_11	Mean August NorWeST Stream Temperature (C) at the sample point

bull trout presence	Pop-up text corresponding to the BT_Present field
Point Coordinate Attributes	
DD_X	Grid coordinate - x-coordinate in Decimal Degrees
DD_Y	Grid coordinate - y-coordinate in Decimal Degrees
UTM_Zone	Grid -UTM Zone based on eDNA point file (NAD 83)
UTM_X	Grid Coordinate - UTM x-coordinate generated from point file
UTM_Y	Grid Coordinate - UTM y-coordinate generated from point file
Field_Zone	UTM zone for the coordinates where the sample was collected in the field.
Field_East	UTM easting (X) coordinate where the sample was collected in the field.
Field_Nrth	UTM northing (Y) coordinate where the sample was collected in the field.
Field_Lat	Sample point y-coordinate in Decimal Degrees where the sample was collected in the field. Contributor field coordinates.
Field_Lon	Sample point x-coordinate in Decimal Degrees where the sample was collected in the field. Contributor field coordinates.
x	ESRI generated x coordinate when downloading from ArcGIS Online
y	ESRI generated y coordinate when downloading from ArcGIS Online

The default table view is to filter the attribute table based on what is in the map view. For example, if you are not seeing Bull Trout Distribution Watershed attributes, zoom in to turn on the layer. You could also toggle off the "Filter by map extent" option on the table view. Depending on how many records there are in your view, it may take several moments to populate the table.
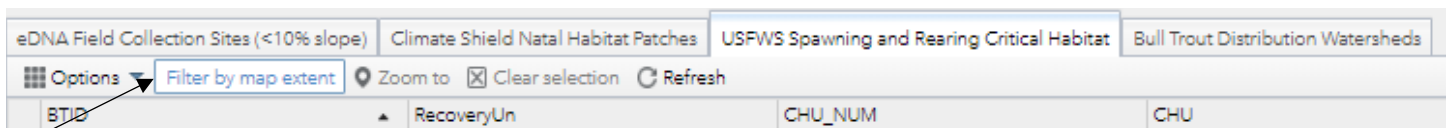
The **Climate Shield Natal Habitat Patches line attribute table** shows the following attributes:

NORWEST – NorWeST Production Unit name

PATCH_ID – Climate Shield Patch ID

BT_0BRK - probability of bull trout occurring somewhere within a patch assuming brook trout occur in none of the sites within that patch

The **USFWS Spawning and Rearing Critical Habitat** ["H_USE_TYPE" = 'SR'] **line attribute table** shows the following attributes:

BTID - Unique identifier for critical habitat - Originally was LLID value from StreamNet PNW Hydro data set (streams) or generated by USFWS (marine).

RecoveryUn - Bull Trout Recovery Unit

CHU_NUM - Critical Habitat Unit number

CHU - Name of Critical Habitat Unit

OCCUPANCY - Known status of Bull Trout occupancy [O = Known occupied; P = Presumed occupied; U = Unknown occupied]

The **Bull Trout Distribution Watersheds polygon attribute table** shows the following attributes:
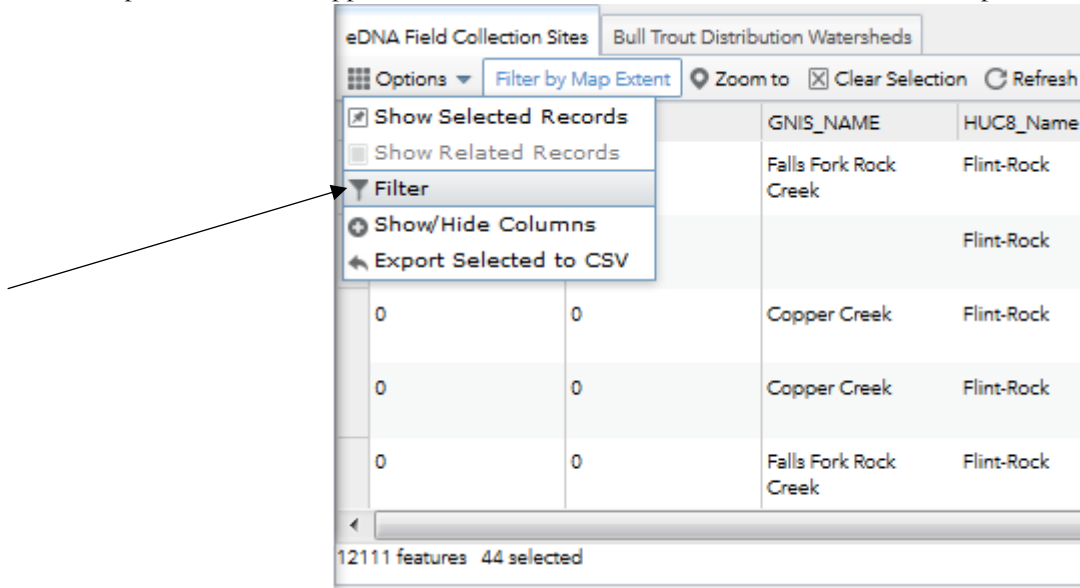
HUC_8 – Watershed Boundary Dataset HUC 8 number

HUC_NAME – Watershed Boundary Dataset HUC 8 Name

Filter Attribute Table by HUC example

Click on the arrow at the bottom of the map to open the attribute table

Click the Options tab in the upper left-hand corner of the table and choose the Filter option

In the Filter window, click "Add a filter expression" and then use the dropdown to choose HUC8_Name (String). Click the Unique radio button.
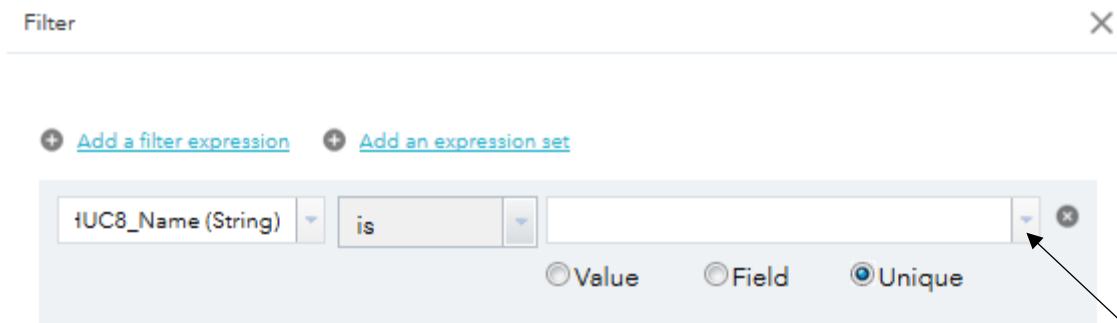
After a moment, click the dropdown. It will be populated with the available HUC8 watershed names. Choose your desired watershed and click "OK".

Both the map and the attribute table will show only the points within that watershed. You can click to the left of the first record in the table, move the slider bar along the right all the way to the bottom of the filtered attributes, and then **click the shift key** and select the last record. This will select all the points you have filtered.

Note that your mouse will change from an arrow to a pointing hand when selecting.

Once you have selected all the points you wish to export, Click the Options tab in the upper left-hand corner of the table and choose the Export Selected to CSV option.

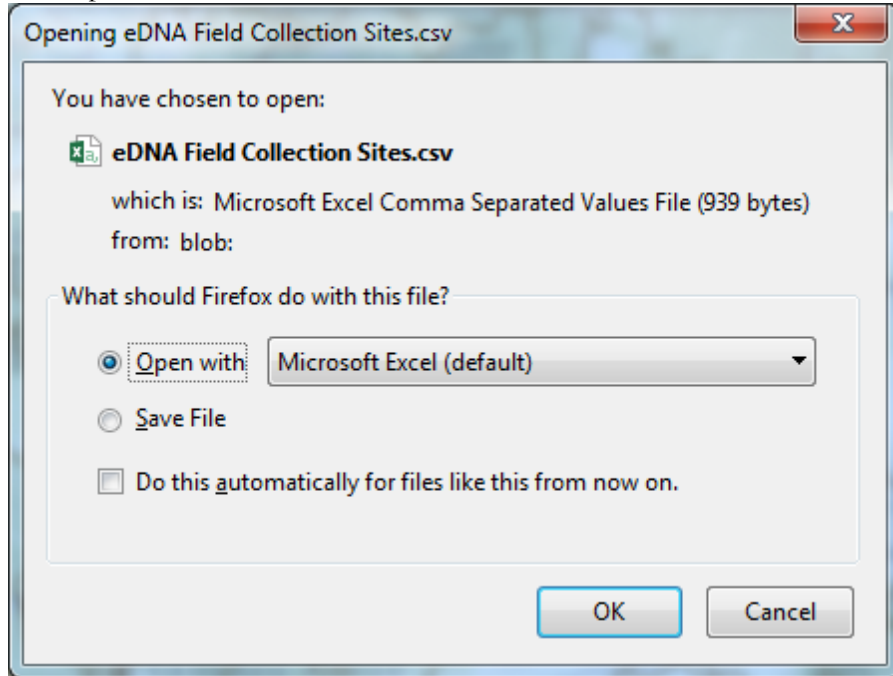You will be prompted to confirm that you want to export to a CSV file. Click OK.
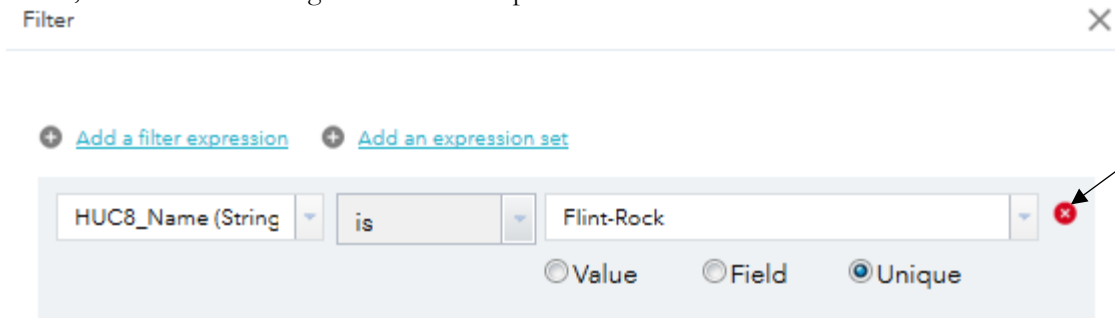
Export to CSV

Export data to CSV file?

OK   Cancel

You then have the option to Open or Save the file. Click OK.

Opening eDNA Field Collection Sites.csv

You have chosen to open:

📊 **eDNA Field Collection Sites.csv**

which is: Microsoft Excel Comma Separated Values File (939 bytes)
from: blob:

What should Firefox do with this file?

○ Open with   Microsoft Excel (default)   ▼

○ Save File

☐ Do this automatically for files like this from now on.

OK   Cancel

Please note that there is no automatic download of the metadata with the table as there is when you download using the area of interest geoprocessing tool and export as a shapefile. You can find a general metadata document on the bull trout eDNA website to add to any downloaded CSV files.

To remove the filter, click the X to the right of the filter expression

Filter   ✕

⊕ Add a filter expression   ⊕ Add an expression set

HUC8_Name (String ▼   is   ▼   Flint-Rock   ▼   ⊗

○ Value   ○ Field   ● Unique

Please cite downloaded data as:

Young, Michael K.; Isaak, Daniel J.; McKelvey, Kevin S.; Schwartz, Michael K.; Carim, Kellie J.; Fredenberg, W.; Wilcox, Taylor M.; Franklin, T.; Chandler, Gwynne L.; Nagel, David E.; Parkes-Payne, Sharon L.; Horan, Dona L.; Wollrab, Sherry P. 2017. Species occurrence data from the Range-Wide Bull Trout eDNA Project. Fort Collins, CO: Forest Service Research Data Archive. Updated 05 June 2021. https://doi.org/10.2737/RDS-2017-0038.

Link to ArcGIS Online Map