A. BIOS bookmark: use ds515 to identify veg layer, how to turn on vegetation layers, see legend, see metadata, download
B. BIOS tools: filters, queries, exports—apply these to the question of rarity for an AOI
C. Arcmap: subset an area of interest and check for rare communities
D. Arcmap: use the frequency tool to summarize vegetation type

Exercise A: Task: You want to determine if there is a vegetation map and vegetation surveys within in the Modoc Plateau ecoregion, download the relevant vegetation map if so, and understand what the attributes of the vegetation map mean.
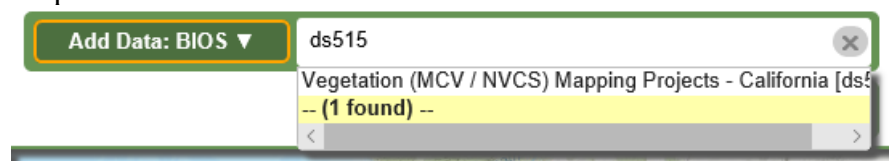
BIOS bookmark: use ds515 to identify veg layer, how to turn on vegetation layers, see legend, see metadata, download
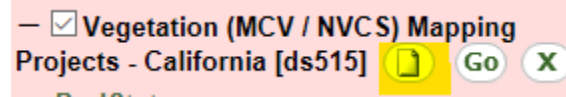
Concepts

- Adding data
- Active Layer (pink highlight in Layer List)
- Zooming to the spatial extent of a layer
- Legend
- Metadata
- Surveys-related records photos

Exercise

1. First, let's determine if a vegetation map exists for the Modoc Plateau ecoregion.
   a. Go to https://wildlife.ca.gov/Data/BIOS and click on the button "BIOS Viewer (Public & Secure)"
   b. Find the Table of Contents (TOC) on the left side of the map.
      i. At the top of the TOC, note that the active layer is "Counties" and that right now, the only layers on the map are reference layers.
   c. Add the BIOS layer **ds515**, our mapping footprints layer of all existing and in progress vegetation map projects, to the map.
      i. Find the 'Add Data: BIOS' field at the top of the screen and type in "ds515". A drop-down menu will appear of layers that meet this keyword description. Add the ds515 layer to the map by double clicking it in the drop down menu.
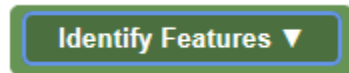
      ii. In the TOC, in the heading for ds515, click the metadata icon (the 'paper' button).

A description of the layer as well as options to download the layer and more detailed meta data of attributes are displayed in a dialogue box on the right of the map.

      iii. In the TOC, turn the layer on by checking the box to the left of the layer name. Expand the layer symbology by clicking the '+' button.

      iv. Zoom to the Modoc region and utilize the map cartography to locate the completed vegetation maps for the Modoc ecoregion on the map.

2. Add vegetation map layers to the map viewer and download vegetation maps and meta data. Two approaches are presented.

    a. In the TOC click on the ds515 layer to make it the active layer (turns pink).

    b. Locate the drop down menu of basic tools to interact with the data in BIOS. Make sure your selected tool is "Identify Features" (this is the default).

    c. Click on the green polygons (ie completed maps) in the Modoc Plateau ecoregion with your identify tool. The attributes for these polygons should appear in the attribute table at the bottom of the map. Note the "area name" in the attribute table. Currently there are two completed maps in the Modoc ecoregion. Note the area name for each Modoc Plateau map below
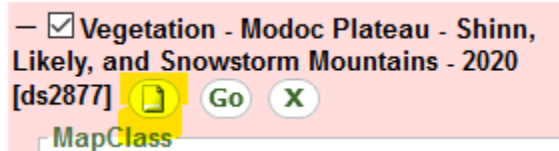
Area Name:_____

Area Name:_____

    d. One of the vegetation maps should have the following Area Name: Modoc Plateau: Likely, Shinn, and Snowstorm Mountain Areas. When you click on the green polygon for this map, attributes describing the project and its status should appear in the attribute table at the bottom of the map. One way to download the vegetation map data and view reports associated with the project is via the links seen in the attribute table.

    e. Utilize the word "Vegetation" (a key word that will pull up all our vegetation maps) and "Modoc Plateau" in the Add Data: BIOS field to search for the Modoc vegetation map layer. The Modoc Plateau: Likely, Shinn, and Snowstorm Mountain Areas vegetation nap should be the first map that appears in the drop down menu.

    f. Add this layer to the map viewer by double clicking it in the drop-down menu.

g. Locate the Modoc Plateau: Likely, Shinn, and Snowstorm Mountain Areas layer in the TOC and click on the title of the layer. This will simultaneously make it the active layer (the layer in the TOC will be highlighted pink) and cause the layer to be displayed in the map viewer (the box to the right of the layer title will be checked).

h. Another way to access downloadable meta data and the Modoc Plateau vegetation map is by hitting the 'paper' button for this layer in the TOC.

   i. From the small metadata screen on the right of the map you can click to see the full metadata. You can also download the vegetation map data, which will have the metadata and an ArcMap compatible layer file. Of note: the best metadata for the graphic definition of map disturbance attributes is in the mapping report for the Desert Renewable Energy Conservation Plan (DRECP) project: (https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=62826&inline)

   ii. Download the Modoc Plateau: Likely, Shinn, and Snowstorm Mountain Areas. vegetation map for ArcMap Exercise 3 below.

3. View the vegetation layer in BIOS map viewer and view layer attributes.

a. In the TOC click the "Go" button for the Modoc Plateau: Likely, Shinn, and Snowstorm Mountain Areas to zoom to the layer. Zoom in closer to a particular area of interest, or just far enough to see the vegetation polygons clearly.

b. Expose the legend by hitting the plus button on the TOC

c. Click on a vegetation polygon from the Modoc layer to display vegetation polygon attributes in the table below and explore the different data associated with each vegetation polygon. These attributes are described in the full meta data available for download from the step 2.h above. Note the "Size_CATEG" field. This is the size class for trees, we'll use this in an upcoming exercise.

d. The definition of what a field means, can be accessed in two ways, (1) reviewing the whole metadata which we've shown you how to view and (2) clicking on the field heading in the attribute table within BIOS, which will return the attribute

definition from the metadata. Try this for "Size_CATEG"

4. Determine if any survey points from releves and rapid assessments exist within the Modoc Plateau.

   a. In the **BIOS Add data** search field type in 'vegetation survey points'. The search will bring up the survey points collected for CDFW and collaborator mapping projects in California, "Vegetation Survey Points – CDFW [ds1020]". Add this layer to the map.

   b. Display Vegetation Survey Points - CDFW [ds1020] layer in the map viewer. Because it is a points layer, it is at the top of the TOC. Make sure it is the active layer by clicking on the item in the TOC until it is pink.

   c. Pan and zoom to the Modoc Plateau: Likely, Shinn, and Snowstorm Mountain map. Visually inspect the map and observe if there are survey points that exist within the vegetation map footprint.

   d. Click on a point. Even though one point is clicked, multiple records come up because the related plant data is joined. Plant info is all the way to the right. You can also see the photos for the point by clicking the photos button. When you open an individual photo, remember to hit the "close window" button, or you can lose track of where the photos for your next point are.

Vegetation Survey Points - CDFW [ds1020] Identified features: 1 Related reco

	Zoom	PHOTO	WyptID	SurveyType	SurveyDate	NVCS_Name	NVCS_Level
1	Go	Open	CVRP1820	Rapid Assessment	7/6/2011 12:00:00 AM	Mediterranean California naturalized	Group

e. .

Exercise B: Now that you know that a vegetation map exists in your management area and have downloaded the vegetation map, metadata and reports, you have some particular questions you would like to answer.

- **To direct and prioritize future bird survey locations, you want to know (a) what vegetation stands are dominated by large diameter or multi-layered tree vegetation and (b) what rare plant communities occur in your management area.**
- **To inform a weed management plan, you want to know if and where the invasive grass, *Ventenata dubia* has been identified in releve and rapid assessment surveys in your management area.**

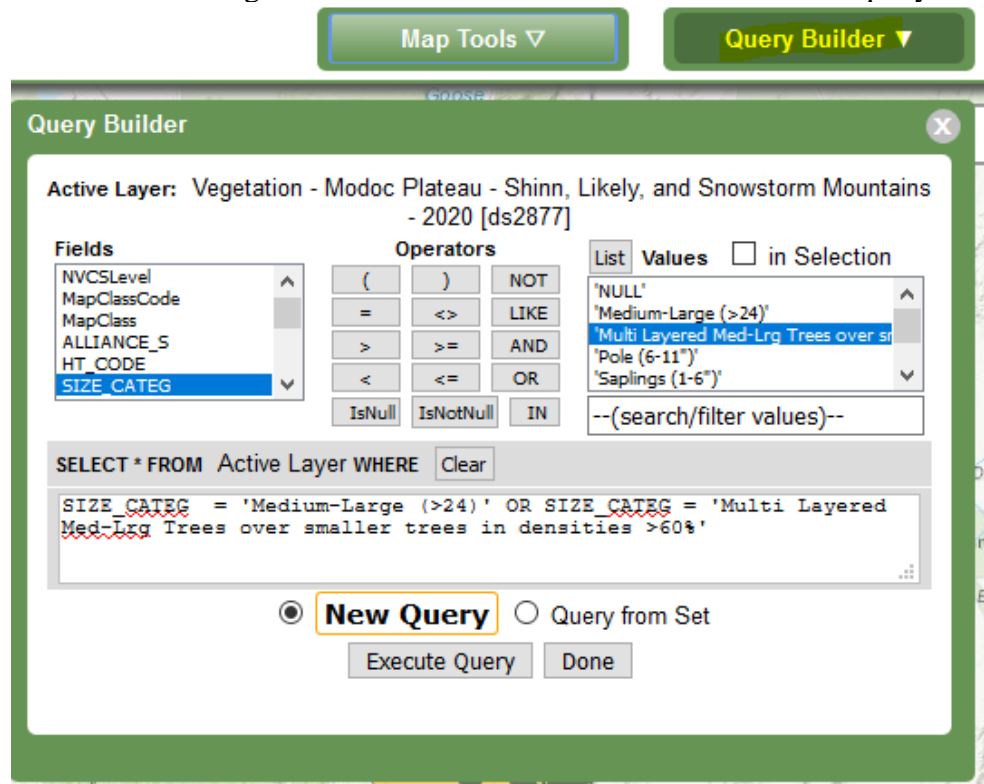**BIOS tools: filters, exports—apply these to the question of rarity for an AOI**

Concepts

- Querying a layer
- Filtering a layer
- Selecting a layer
- Export

Exercise

1. From https://wildlife.ca.gov/Data/VegCAMP/Reports-and-Maps . Hit the button that says "Available Vegetation Maps". In the first exercise you learned how to search and customize the map on your own. This link takes you to CDFW's BIOS viewer and opens a map already customized to display all of CDFW's and partner's vegetation maps.
2. Find Vegetation - Modoc Plateau - Shinn, Likely, and Snowstorm Mountains - 2020 [ds2877] in the table of contents (TOC). Make it the active layer and zoom to it by hitting the "Go" button

3. Use the advanced tools button and select Query Builder. We want to know where the stands with the largest diameter trees are. This is how to write the query:

4. Visually inspect the map viewer and observe the distribution of multi-layered tree stands and stands of trees with the largest overall diameter.
5. To remove this selection, got to the top of the TOC, and hit the X button on the selection layer for ds2877.

6. Now we want to filter for rare vegetation polygons. To filter the polygons, go to advanced tools and select Layer Filter. The interface is very similar to the Query Builder. Remember that polygons that are mapped at the alliance or higher level (group, macrogroup) may contain rare communities, that aren't represented. For those, use the report and natural community lists to see what communities may be present

Layer Filter

Active Layer: Vegetation - Modoc Plateau - Shinn, Likely, and Snowstorm Mountains - 2020 [ds2877]

Fields
- OBJECTID
- NVCSName
- NVCSLevel
- MapClassCode
- MapClass
- ALLIANCE_S

Operators
(	)	NOT
=	<>	LIKE
>	>=	AND
<	<=	OR
IsNull	IsNotNull	IN

List Values
- 'NULL'
- 'Alliance'
- 'Association'
- 'Group'
- 'Semi-Natural Alliance'

--(search/filter values)--

SELECT * FROM Active Layer **WHERE** Clear
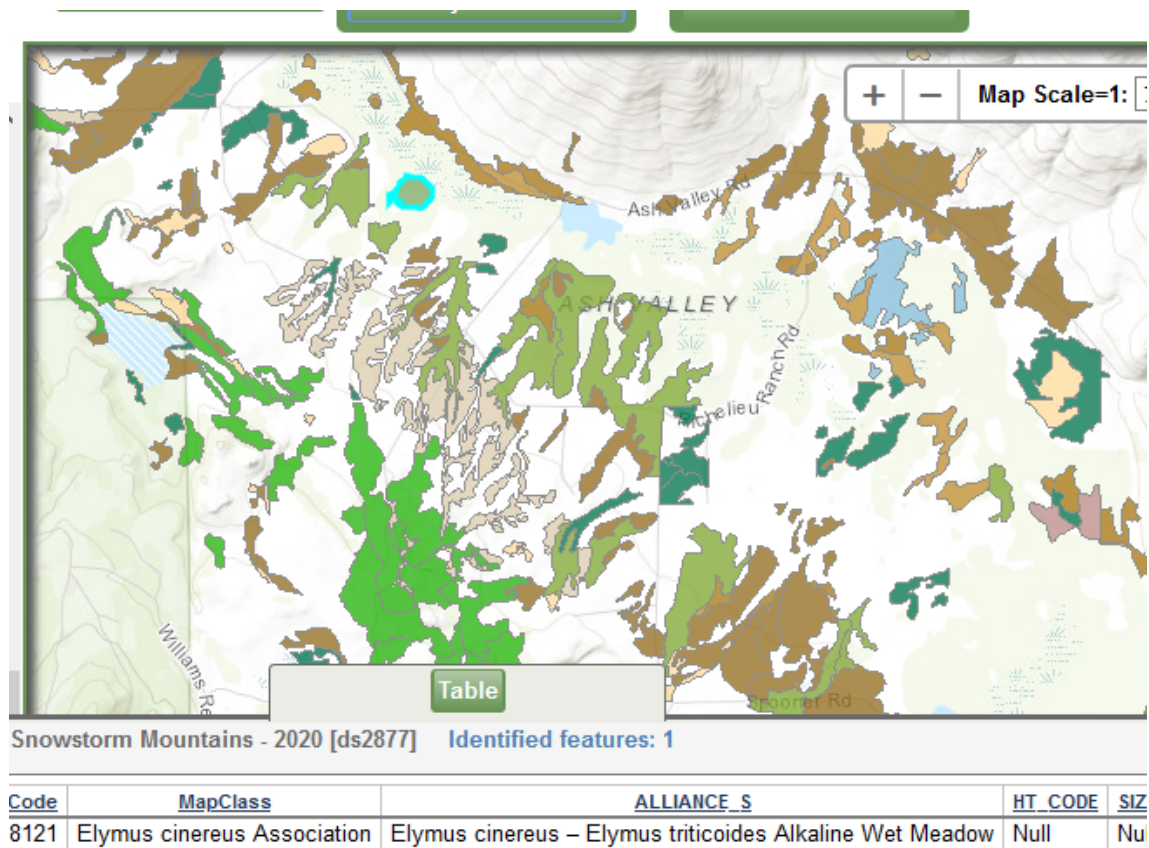
```
Rare  = 'Yes'  OR ( NVCSLevel = 'Group' OR NVCSLevel = 'Alliance')
```
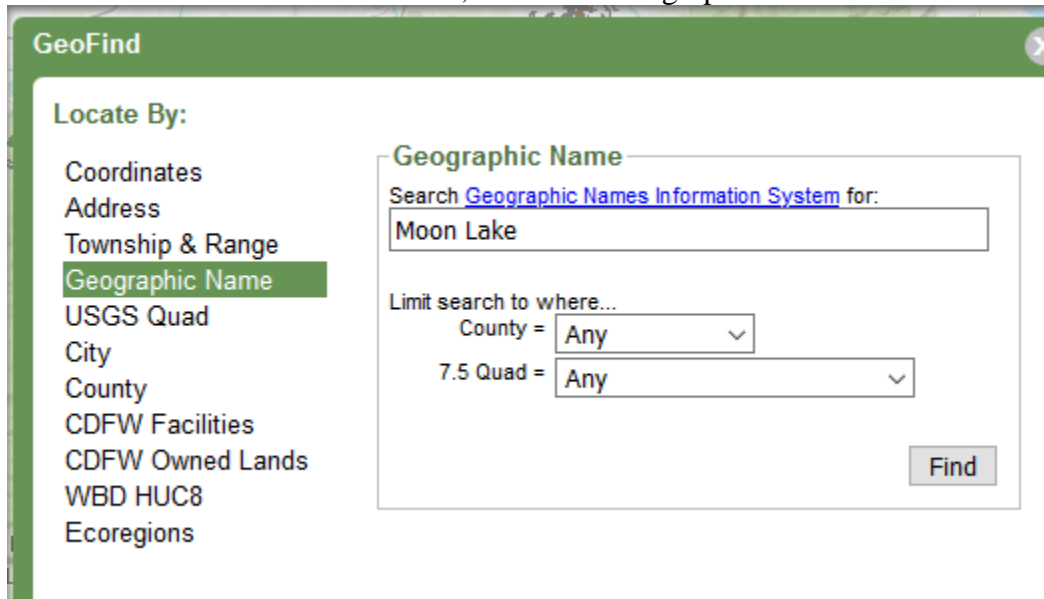
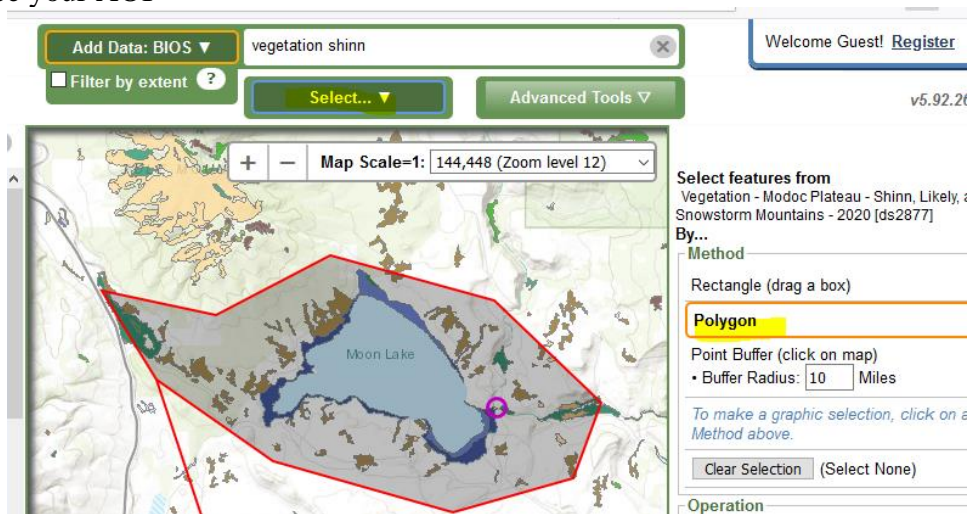Apply Filter   Remove Filter   Done

Once you have hit 'Apply Filter", close the Layer Filter screen, and you should see only the polygons that are sensitive natural communities or are groups and alliances that might contain them. .

Snowstorm Mountains - 2020 [ds2877]   Identified features: 1

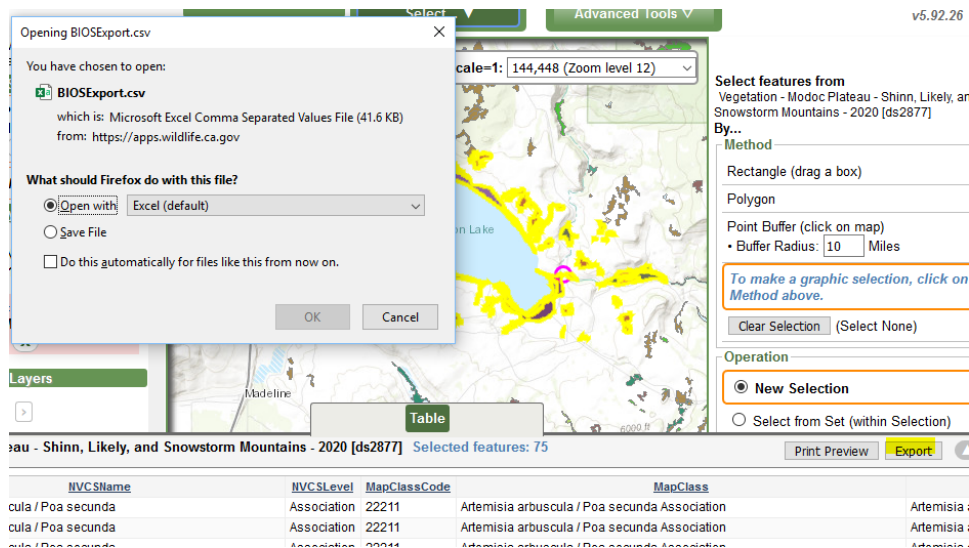| Code	MapClass	ALLIANCE_S	HT_CODE	SIZ
8121	Elymus cinereus Association	Elymus cinereus – Elymus triticoides Alkaline Wet Meadow	Null	Nu

7. Navigate to an area of interest. BIOS has a number of ways to navigate to an area of interest. Goto Advanced Tools and select GEOFIND. In this case we have a site near Moon Lake we are interested in, so we use Geographic Name
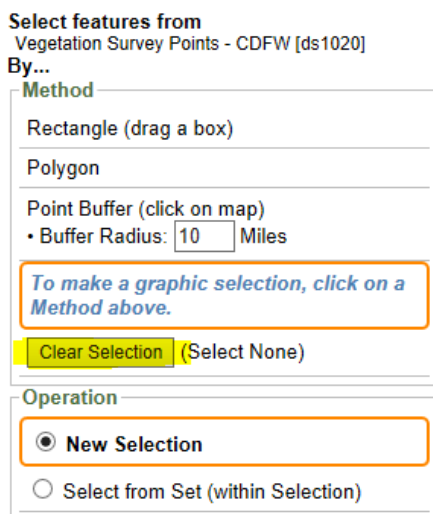

Once you click Find, you will be presented with a list, and we select the one in Lassen County. If you are working in an area of interest and want to download a list of these communities, you can select them using the select tool and export them. The select tool gives you options to use a radius, rectangle or polygon. If you select polygon, you can trace your AOI
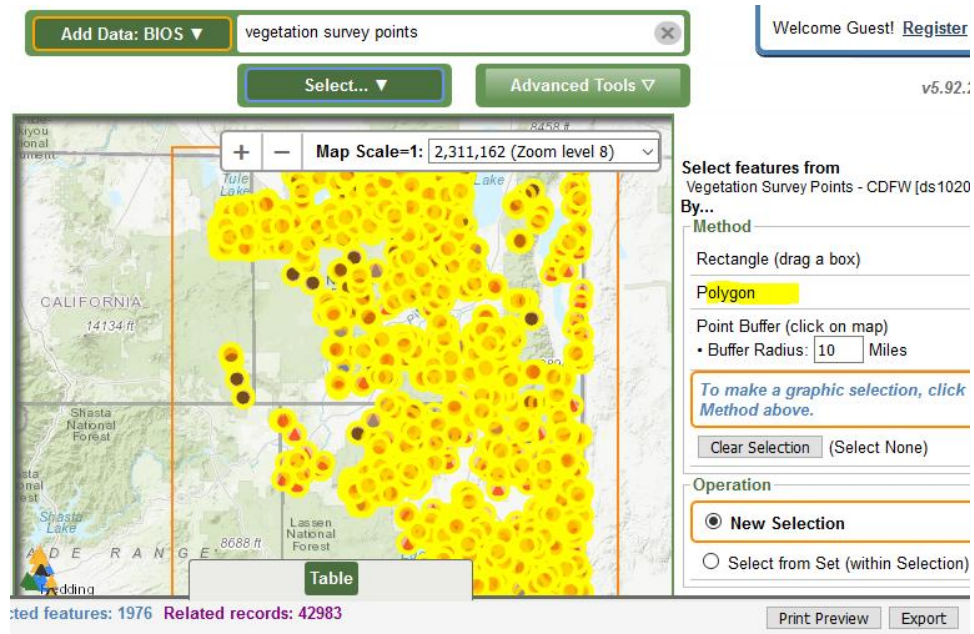

8. Once you have the features selected, you can export them to csv. There is a button to export on the table part of the screen. **Note**: this downloads the attribute data table and is not geospatially referenced. To save a subset of the spatial and attribute data at the same time, you will need to pull the downloaded vegetation map into a GIS software, like ArcMap.

NVCSName	NVCSLevel	MapClassCode	MapClass	
cula / Poa secunda	Association	22211	Artemisia arbuscula / Poa secunda Association	Artemisia a
cula / Poa secunda	Association	22211	Artemisia arbuscula / Poa secunda Association	Artemisia a
cula / Poa secunda	Association	22211	Artemisia arbuscula / Poa secunda Association	Artemisia a

9. Open the Select tool and press the button "Clear selection" to remove previous selections before moving on to the next step.
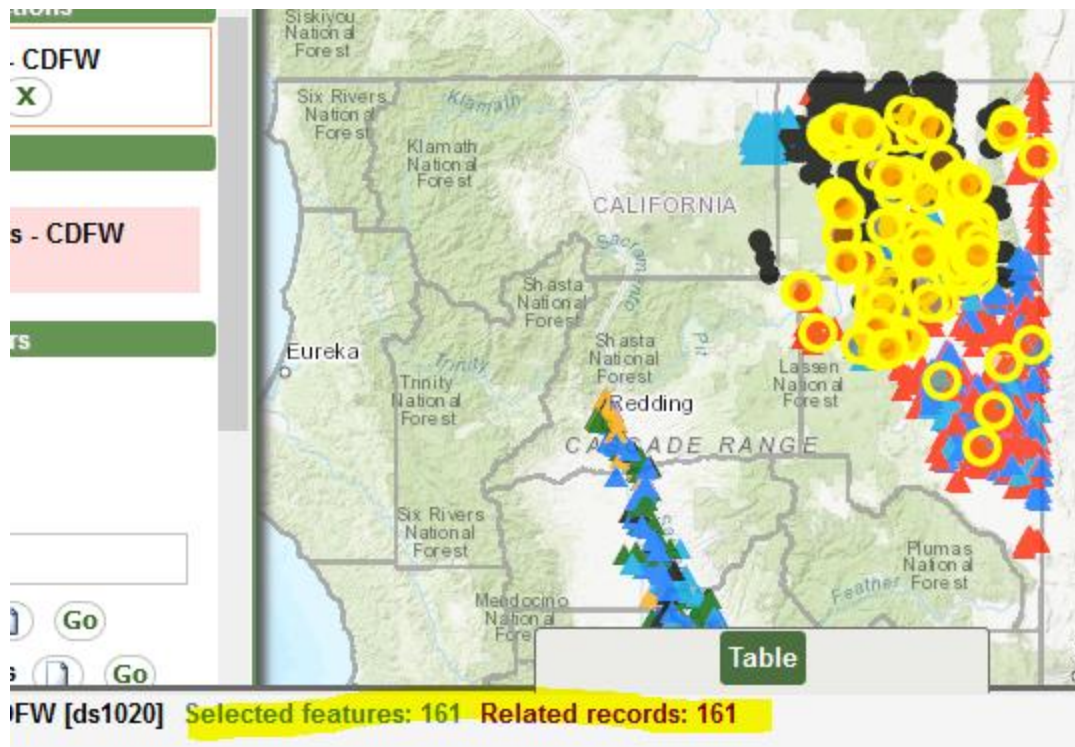

10. For our next task we want to determine in which vegetation surveys *Ventenata dubia* occurs within our area of interest. Zoom to Vegetation - Modoc Plateau - Shinn, Likely, and Snowstorm Mountains - 2020 [ds2877] by pressing the "Go" button in the TOC.

11. Make Vegetation Survey Points DS1020 the active layer in the TOC, Then use the select tool from the map tools drop down menu. Specify "polygon" and "new selection" to select a set of survey points within the AOI footprint of the Vegetation - Modoc Plateau - Shinn, Likely, and Snowstorm Mountains - 2020 [ds2877] layer. Here, all the points from the Modoc area are selected.

12. Use the advanced tools button and select Query Builder. Build the Query such that it selects all surveys where *Ventenata dubia* occurs. Be sure to select "Query from set" so you will only be selecting within the current selection of survey points. The results will only include *Ventenata dubia* records, so other plants from those plots are not included.

13. Download your selection into a csv and open the newly created CSV. Note that UTM values are supplied. This table can be imported into a GIS software program and converted to points using these UTM fields.
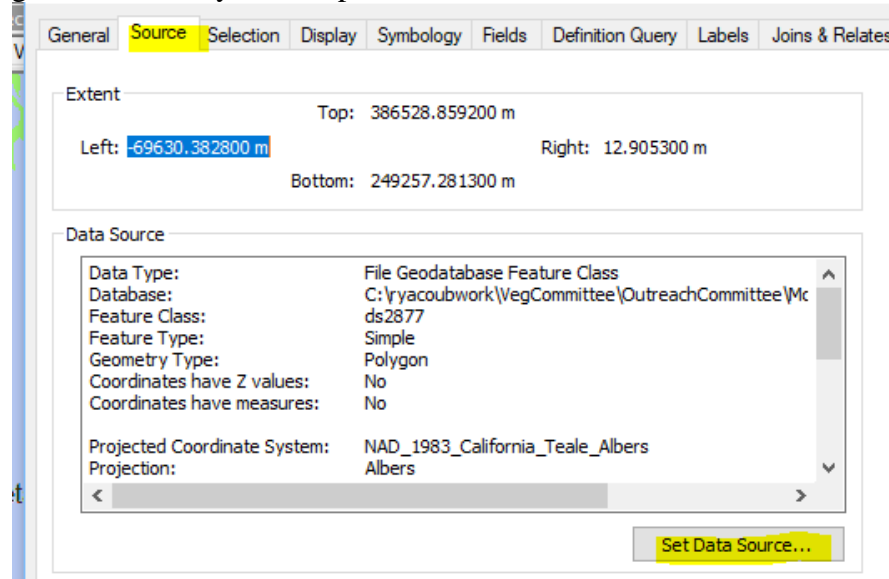
Exercise C: You want to do some initial investigation into the distribution of overall invasive species cover across your management areas and identify areas of concern to direct field reconnaissance for an invasive management plan. Within that area of concern you'd like to identify what natural and rare communities may be at risk from invasive species.
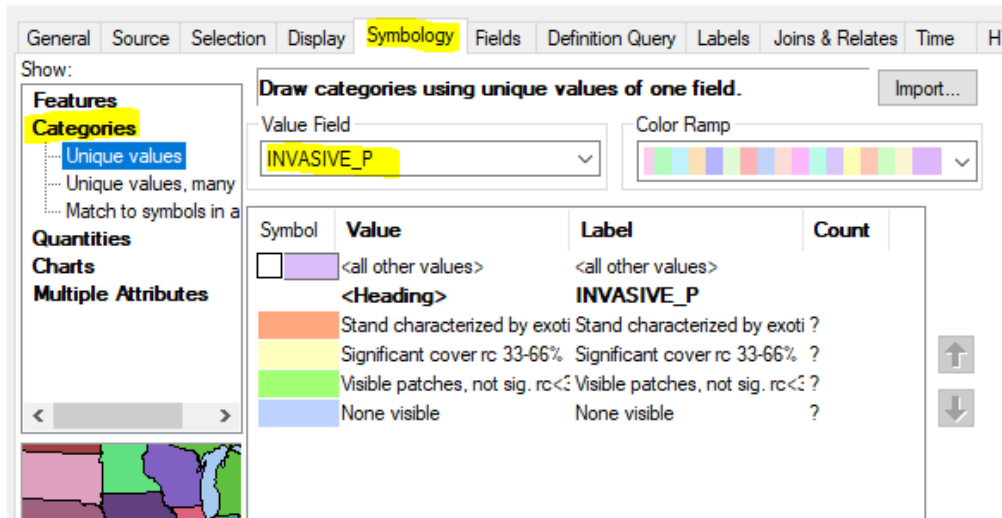
Concepts

- Visualizing a disturbance attribute to identify areas of concern
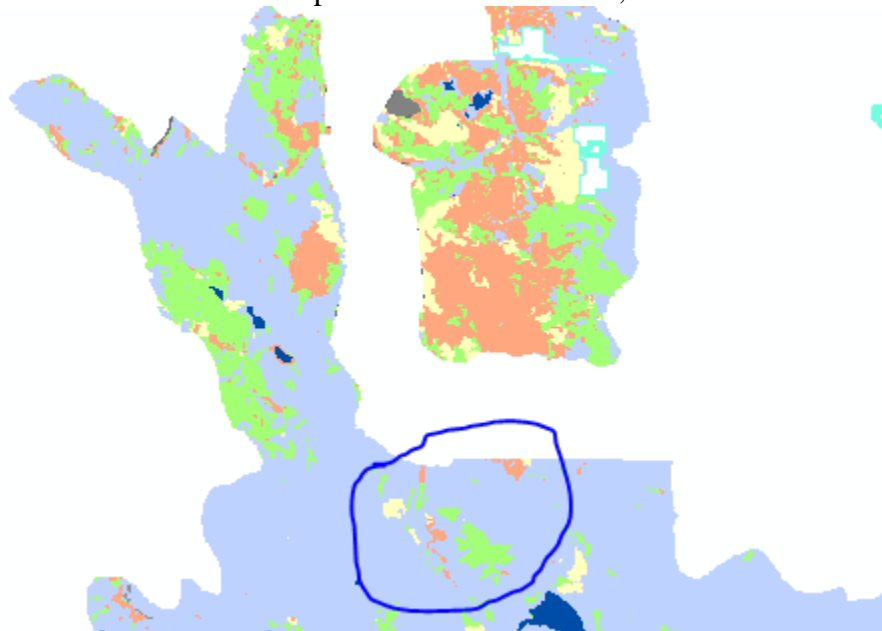- Using an on-screen spatial select
- Selecting from a set

Exercise

1. Unzip your downloaded dataset (Vegetation - Modoc Plateau - Shinn, Likely, and Snowstorm Mountains - 2020 [ds2877]. Open them in ArcMap by double clicking the layer file. You may need to repoint the layer at the geodatabase feature class. Double-click the layer in ArcMap to bring up its properties, then go to the sources tab and reset the data source to where you saved the geodatabase on your computer.
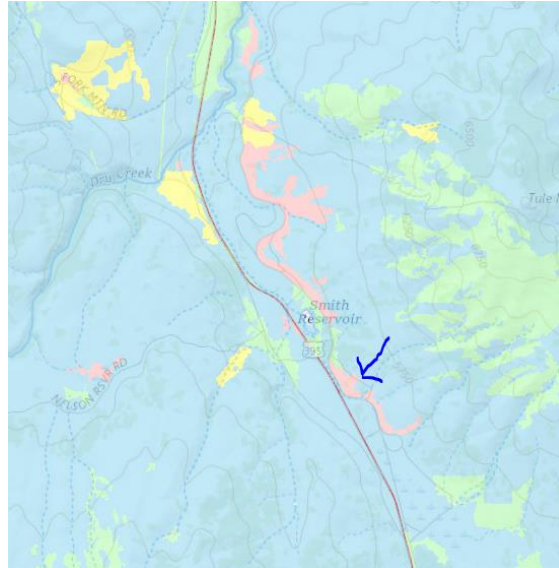

2. The cartography for ds2877 is set on MapClass (and is gorgeous). But we are curious about invasive plant species. Make a copy of the layer by copying and pasting it in the TOC. Rename your copy in the TOC to "Veg_Invasives".
3. Turn off the original Vegetation - Modoc Plateau Likely, Shinn, and Snowstorm Mountain Areas - 2020 [ds2877] layer by unchecking it in the TOC
4. Double-click the Veg_Invasives layer and click on the Symbology tab. Symbolize using Categories: Unique values and use the INVASIVE_P attribute. Add any nulls to all other values by highlighting and hitting Remove. You should have the following categories visible in the symbology tab. Press OK.

Symbolizing the map this way presents a different story for the data. From an invasive species management perspective it might be good to direct some attention to an area where invasive species are not extensive, like the area circled below.

5. Zoom into the area circled above. It will be helpful to give the map some context by adding a base layer and making the map transparent.

    i.   Find to the Add Data button and hit the arrow on the side . From the drop down menu select Add Base Layer. USA_Topo_Maps. Then double click the Veg_Invasives layer to bring up its properties. Go to the display tab. Set the transparency to 40%.

    ii.   Looks like there is a stand of invasive species (Stand characterized by exotics rc>66%) right by a road that would be a potential target for control. Utilize the identify tool to determine the vegetation type of this stand.

6. Now to find out what vegetation types surround your polygon targeted for treatment, you can zoom in and do a spatial selection. Use the select by polygon tool and draw around your area of interest

7. Open up the attribute table for Veg_Invasives to see which vegetation types you've selected. Right click Veg_Invasives in the TOC and select "Attribute Table." The attribute table should open and in the bottom left corner of the table you should see a tab where you can view only selected polygons. Select this tab and review the vegetation types selected within your area of interest. What communities in your area of concern have visible but not significant patches of invasive species?

<blockquote>
<ol type="i">
Hint: try an advanced sort on Invasive_P and Alliance_S to answer this question more clearly.
This table of selected polygons can be exported to Excel or Access for further examination. Close the table.

</blockquote>

8. (Bonus exercise—may not occur during meeting) You want to determine if any of the selected polygons are herbaceous communities, because they could be affected by your treatment plan. Use the Select by Attributes, specifying that you want to select from the current selection within your AOI. Select the CWHRType attribute, click the "Get Unique Values" button and select all potentially herbaceous types, building the query as it appears below.

9. Click OK.
10. Open up the attribute table for Veg_Invasives and view selected features to see what herbaceous vegetation types occur in your area of concern.
11. If desired, this map can be exported and printed for use in the field.

Exercise D: You have a completed vegetation map that covers your Area of Interest (AOI). You'd like to summarize the vegetation types that occur in your AOI as well as the total acreage of each type, in preparation for a site assessment

Concepts

- Using Clip to create a boundary
- Use Frequency to summarize spatial data
- Preparing for site check by using report and natural community list

Exercise

1. Your particular area of interest is Silver Creek Wildlife Area***. Download CDFW lands at ftp://ftp.wildlife.ca.gov/BDB/GIS/CDFW_Lands/CDFW_Owned_and_Operated_Lands_and_Conservation_Easements.zip , the footprint of Silver Creek Wildlife area can be found in this shapefile. Unzip the file and store it in a location of your choice.

2. Add ds2877 and CDFW_Owned_and_Operated_Lands_and_Conservation_Easements to your map in ArcMap. Go to Selection > Select by Attributes and select from CDFW lands where "NAME" = 'Silver Creek Wildlife Area'

Select By Attributes

Layer: CDFW_Owned_and_Operated_Lands_and_Cons ▼
☐ Only show selectable layers in this list

Method: Create a new selection ▼

"FID"
"PROP_TYPE"
"NAME"
"YR_RECORD"
"REV_DATE"

=	< >	Like
>	> =	And
<	< =	Or
_ %	( )	Not
Is	In	Null

'Sheepy Ridge Wildlife Area'
'Silver Creek Wildlife Area'
'Sky Valley Ecological Reserve'
'Slinkard / Little Antelope Wildlife Area'
'Slinkard Conservation Easement'

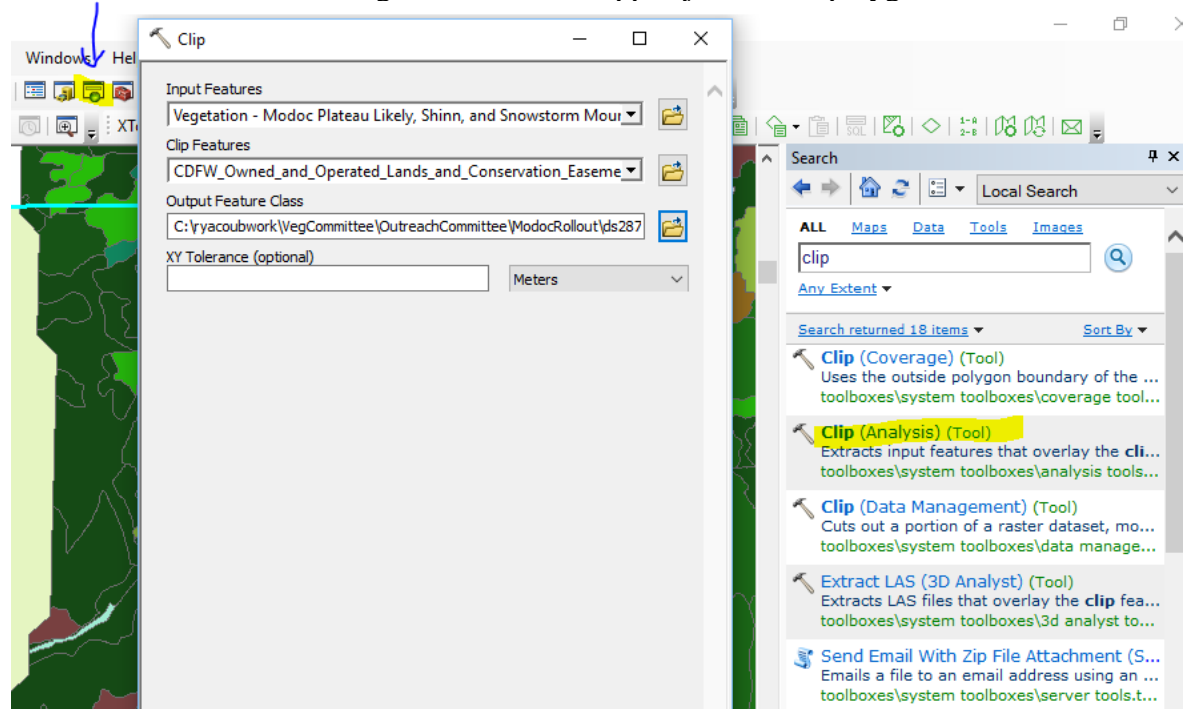Get Unique Values   Go To:

SELECT * FROM

"NAME" = 'Silver Creek Wildlife Area'

Clear   Verify   Help   Load...   Save...

OK   Apply   Close

3. To zoom to the selected feature, right-click on the layer and select Selection > zoom to selected features. You will see that most of the area is covered by the map (we hope to finish that mapping with the same imagery in the near future).
To clip by that area, use the Search tool, type in Clip and select the Clip (analysis) tool. The picture below shows how to customize the inputs for that tool. In the Output Feature Class field, make sure to save the output somewhere you can find it and name the output feature class: ds2877_clip. Because you ran the tool with the desired

wildlife area selected, the vegetation will be clipped just to that polygon.

4. Now to summarize the vegetation for that area, go back to the search tool and type in Frequency. Select the Frequency tool. The Input Table should be from the feature class ds2877_clip, and the output table should ideally be stored in the same location as the the feature class ds2877_clip. Here we are asking for a summary of each mapped vegetation type by acres. For the Frequency Fields you should add NVCS_Name, NVCS_Level, GlobalRank, StateRank, Rare, and CaCode.

5. Add the table to your map and open it.

FRE	NVCSName	NVCSLevel	Global	StateRa	Rar	CaCode	Acres
8	Cercocarpus ledifolius - Artemisia tridentata ssp. vaseyana	Association	<Null>	<Null>	Yes	76.200.04	73.323
3	Vancouverian – Rocky Mountain Montane Wet Meadow and Marsh	Group					40.462
3	Juniperus occidentalis / (Poa secunda - Festuca idahoensis - Pseudoroe	Association	<Null>	<Null>	No	89.400.05	38.017
3	Populus tremuloides / Symphoricarpos rotundifolius	Association	<Null>	<Null>	Yes	61.111.16	24.099
2	Salix lasiolepis - Rosa woodsii / Mixed Herbs	Association	<Null>	<Null>	Yes	61.201.10	7.0597

This shows how many polygons there are, community name, level, and rarity ranks. NVCS groups are not assessed for rarity, so for the site assessment, it would be good to see which alliances and associations are present in those polygons. You can use the key in the report to help identify them in the field.

***You can always make an area of interest (AOI) using ArcCatalog in a location of your choice as a shapefile. With ArcCatalog open to the folder of your choosing, right click, select New > Shapefile. NAD83 Teale Albers was used as the spatial reference here, because it is one commonly used at CDFW.

Bonus tip: if you want to label your vegetation polygons with the cover information so you can see structure on your map

"T: " & [PER_TREE] & "%" & vbnewline & "S: " & [PER_SHRUB] & "%" & vbnewline & "H: " & [HERB_CODE]

Gets you