BIOS and ArcMap Vegetation Exercises

Introduction

We are going to lead you through a series of exercises using Survey of California Vegetation GIS datasets, using both CDFW's web-based mapping application BIOS and ESRI's ArcMap GIS software:

A. Exercise A: use BIOS ds515 to identify veg layer, how to turn on vegetation layers, see legend, see metadata, and download a dataset
B. Exercise B: Use BIOS filters, queries, exports and apply these to the question of rarity for an Area of Interest of AOI
C. Exercise C: In ArcMap, subset an area of interest and check for rare communities
D. Exercise D: use the frequency tool to summarize vegetation type

Exercise A: use BIOS ds515 to identify veg layer, how to turn on vegetation layers, see legend, see metadata, and download a dataset

Exercise A: For this exercise, you want to determine if there is a vegetation map and vegetation surveys within in the Modoc Plateau ecoregion, download the relevant vegetation map, 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

1. First, let's determine if a vegetation map exists for the Modoc Plateau ecoregion.
    a. Go to the BIOS website, 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. First, we are going to add and explore BIOS layer **ds515**, our mapping footprints layer of all existing and in progress vegetation map projects.
        i. To start, 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 table of contents (or TOC), in the heading for ds515, click the metadata icon, which looks like a piece of paper.

A description of the layer as well as options to download the layer and view more detailed metadata for the layer 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.
    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 "Go" button. This will simultaneously make it the active layer (the layer in the TOC will be highlighted pink) and zoom to the extent of the layer.
    h. Another way to access the metadata and download 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.

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

3. Now we'll take a closer look at the vegetation layer its attributes.
    a. First, we'll expose the legend by hitting the plus button on the TOC.
    b. Next, click on a vegetation polygon from the Modoc layer to display the attributes in a table at the bottom of the screen, and explore the information associated with each vegetation polygon. These attributes are described in the full metadata. Note the "Size_CATEG" field. We want to know what this field means.

c. The definition of what a field means, can be accessed in two ways, (1) reviewing the whole metadata OR (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. Next, we want to 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 "Vegetation Survey Points – CDFW [ds1020]". These survey points collected for CDFW and collaborator classification and mapping projects in California, 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. The plant information 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.

Exercise B: Use BIOS filters, queries, exports and apply these to the question of rarity for an Area of Interest of AOI

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

- **To direct and prioritize future bird survey locations, you want to know what vegetation stands are dominated by large diameter or multi-layered tree vegetation**
- **What rare plant communities occur in a specific 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.**

1. From the reports and maps page of the VegCAMP website, 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 the MCV-based 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, because we are surveying for raptors and owls that prefer habitat with large trees. 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

   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. .

7. Now we'll navigate to an area of interest. BIOS has a number of ways to navigate to an area of interest. Go to 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 'Find'is clicked, we see a list of potential matches, 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. We will select 'polygon' and trace our AOI

8. Once the features are selected, we 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 full, downloaded vegetation map into a GIS software, like ArcMap, and subset it there.

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. We'll make Vegetation Survey Points DS1020 the active layer in the TOC, and 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.

12. Again, we'll use the Query Builder, creating a query that selects all surveys where *Ventenata dubia* occurs. We select "Query from set" to select only 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. Finally, we download the 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: In ArcMap, subset an area of interest and check for rare communities

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.

1. Unzip your downloaded dataset (Vegetation - Modoc Plateau - Shinn, Likely, and Snowstorm Mountains - 2020 [ds2877]. Open them in ArcMap and then 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.

    1. 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".
    2. Turn off the original Vegetation - Modoc Plateau Likely, Shinn, and Snowstorm Mountain Areas - 2020 [ds2877] layer by unchecking it in the TOC
    3. 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.

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.

4. We'll zoom in to a specific area. It will be helpful to give the map some context by adding a base layer and making the map transparent.
    i. Find 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. We'll utilize the identify tool to determine the vegetation type of this stand.

5. Now to find out what vegetation types surround the polygons targeted for treatment, we'll use select by polygon tool and draw around the area of interest

6. Next, 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 button where you can view only selected polygons
7. This map can be exported and printed for use in the field.

There is a bonus exercise extending this study in the instructions linked from this video for you to try, along with a labelling tip.

Exercise D: use the frequency tool to summarize vegetation type

Exercise D: You have a completed vegetation map that covers a property you manage. You'd like to summarize the vegetation types that occur on the property by acreage.

Exercise

1. Your particular area of interest is Silver Creek Wildlife Area. You can download CDFW lands using BIOS. Here we will just add the layer to our map.

2. To select our property, go to Selection > Select by Attributes and select from CDFW lands where "NAME" = 'Silver Creek Wildlife Area'

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. 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 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 we add NVCS_Name, NVCS_Level, GlobalRank, StateRank, Rare, and CaCode, and the summary field is Acres.

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

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 classification report to help identify them in the field.

Hope you found this video useful.