Tutorial for using the CNDDB layer in the BIOS 5
“CNDDB & Spotted Owl Data Viewer”

California Department of Fish and Wildlife
California Natural Diversity Database
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The CNDDB & Spotted Owl Data Viewer is another option for accessing the California Natural Diversity Database (CNDDB) information available in RareFind. With the viewer you can view data spatially, add labels, and print maps without the need to have GIS software installed on your computer. More complex spatial analysis and data manipulation will still require the use of a full GIS in conjunction with RareFind.

Updates to the new BIOS 5 data viewer released in 2013 include updated base maps and aerial imagery, and more robust tools to filter and view CNDDB data (Instant Filter and Layer Filter), in addition to a new streamlined map interface.

Additional BIOS data viewer support is also available in the BIOS User Guide and the BIOS Frequently Asked Questions.

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Standard BIOS 5 Tools
The new BIOS 5 map and data viewer still maintains the tools that were available in BIOS 4:

- Add Data
- Search Layers
- Identify features
- Query Builder
- Select
- Point Info
- GeoFind
- Bookmark
- Measure
- Add Label
- Print/PDF
- Metadata

Additionally, BIOS 5 has a suite of new features and tools for interacting with spatial data:

- Basemaps/imagery
- Add KML layer
- Add Map Service
- Locate Address
- Layer Filter
- Waypoints Tool

The use of these tools is covered in the BIOS 5 Data Viewer User Guide which can be viewed under the “Help” icon in the upper right of the BIOS 5 map viewer.

Adding Layers
The CNDDB & Spotted Owl Data Viewer comes preloaded with the following data sets in the BIOS Layers portion of the Table of Contents (TOC) [1]:

- CNDDB (ds45 or ds85)
- Spotted Owl Observations (ds704)
- SPOW Observations Spider Diagram (ds705)
- N. Spotted Owl - Critical Habitat (ds156)
Additionally, the BIOS viewer has several Reference Layers [2] preloaded in the TOC. The viewer also allows the use of additional biogeographic data layers in conjunction with the CNDDB data layer. The “Add Data: BIOS” button [3] can be used to add other BIOS data layers, such as Critical Habitat layers, vegetation, and other species data layers. More information about the BIOS tools is available under the “Help” button [4].

Displaying Layers
Click the checkbox of each layer that you want displayed [5]. It helps to zoom in when displaying the CNDDB data to avoid long drawing times. The symbology associated with a data set can be expanded in the TOC by clicking the “+” to the left of the layer title [6].
Activating a Layer

Click on the name of a layer to make it the “Active Layer” [7]. The Active Layer will become highlighted in pink and the top of the TOC will state the Active Layer [8]. Only one layer at a time can be active. Some layers have added functionality. Access to this added functionality is through an additional button next to the data set title in the TOC. For the CNDDB and Spotted Owl data layers, when an appropriate data selection is made, extended functionality buttons [9] appear next to the data set title in the TOC and allow access to special reports.
Navigating

Navigation in the new BIOS 5 viewer is achieved with the mouse or keyboard. To zoom in or out:

- Scroll the mouse wheel
- Use the vertical Zoom Slider [10] to the right in the viewer
- Use Shift + click-and-drag to form a box and zoom to that box’s area (Ctrl + Shift + click-and-drag zooms out)
- Use the “+” and “-” keys on the keyboard

You can pan the map in any direction by a simple click and drag. If there is a particular reference scale you prefer, you can quickly select a scale from the Map Scale pick list [11]. When the scale is below 1:100,000 (zoom level 13 or greater) the CNDDB Element Occurrences are labeled with scientific name.
Identifying Features
Click on the layer name you are interested in to make it the Active Layer. From the Map Tools menu [12], select “Identify Features” to get additional information about occurrences by activating (clicking) the tool and then clicking the feature of interest (layer must be Active Layer). A call-out window will return the attributes of the identified feature. If more than one feature is identified, the call-out window will identify how many records are returned [13] and they can be viewed by scrolling down with the vertical scroll bar.
Filtering Element Occurrences

One of the most requested feature enhancements by CNDDB subscribers using BIOS to view the CNDDB Element Occurrences has been the ability to view subsets or only a specific portion of the CNDDB data. This may be helpful to make maps clearer to understand where there are many CNDDB occurrences. For example, one map may be filtered to show only plants, and another map to show only animals for the same location. This ability is now available in the Layer Filter tools under the Advanced Tools menu. Currently there is the easy-to-use Instant Filter and the more advanced Layer Filter.

**Instant Filter**

With the CNDDB layer set as the Active Layer, expand the Advanced Tools menu [14] and then select Layer Filter. By default, the Layer Filter window will open to the Instant Filter. Here you can easily select to filter the CNDDB occurrences to view a particular suite of species. The “DEF” next to the predefined filter expands and displays the definition query to filter the data layer. Understanding the syntax of these definition queries may be helpful in creating a more custom filter under the Layer Filter tab of the Layer Filter window. Note that a filter icon [15] shows up next to the filtered layer in the TOC. Hovering over the filter icon displays the filter definition query; clicking the filter icon removes the filter.

![Image of BIOS Viewer with Instant Filter and Layer Filter features highlighted](14: Advanced Tools menu: Layer Filter, 15: Filter icon)
Layer Filter

With the CNDDB layer set as the Active Layer, navigate to the Layer Filter window (Advanced Tools -> Layer Filter) and click the Layer Filter tab [16]. Here you can create a custom filter based on the attribute fields of the CNDDB data layer. The “Fields” window [17] shows all of the fields in the Active Layer. These are the fields that you can choose from to build a query. Double-click on a field name in the list to add that field to the Filter Request box at the bottom [18] where you will build the query command. A single click on one of the “Operators” [19] will add it to the Filter Request box. It may be useful to review the Operator definitions and descriptions in Appendix 1. Clicking the “List Unique” button will list the Values [20] for a Field. Double-click on a field value to add it to the Filter Request box. You can also manually enter a value in the Filter Request by typing it into the “Enter Value” box [21] and pressing the Enter key on your keyboard. The “Filter Request” box [18] shows the query that will execute when you click on the "Apply Filter" button. This filter is defined by clicking on items in the Fields, Operators, and Values areas above.
A filter can be constructed to show a specific subset of the CNDDB data layer, or can be constructed to exclude a portion of the data for display purposes (note: CNDDB recommends that all CNDDB tracked species be considered during environmental review and not excluded from analysis). So, the Layer Filter only limits what occurrences are displayed in the BIOS 5 data viewer. The next section covers Selecting occurrences, which provides additional reporting and exporting tools.

**Selecting Element Occurrences**

CNDDB Element Occurrence features can be selected either spatially in the map viewer or through a specific query selection. The spatial selection is useful for selecting all the occurrences in a particular area, whereas the query selection may be more specific like all the bird occurrences on a particular quad or county. To select occurrence records from the CNDDB layer, please make sure the CNDDB layer is set as the Active Layer.

**Selecting EOs – spatial selection**

If you want information on a group of occurrences in the same general area, click the Map Tools menu and select “Select…” Two spatial selection methods are available: the standard click-and-drag rectangular box selection, and a new point buffer selection. The rectangle spatial selection will select any Element Occurrence that the box touches; the box does not have to completely enclose the occurrence.
Once the selection is made, the selected occurrence will be highlighted [25] in the BIOS map viewer and a table at the bottom of the map viewer will display the details of the selected records [26].
Selecting EOs – query selection
You can also select features based upon their attributes by using the Query Builder. Expand the Advanced Tools menu [27] and then select Query Builder. When you click on this tool, the Query Builder window opens.

In the Query Builder window, double-click on one of the attributes in the “Fields” column [28]. Choose (single click) an Operator [29], and then scroll to and double-click, or type in, a Value [30]. Note: typed values must exactly match the listed values. In the example here, the query will search for features that have a Scientific Name of *Plethodon asupak*. To run the query, click the “Execute Query” button [31].

It may be useful to review the Operator descriptions in Appendix 1.
Using Selected Features
Once you’ve made a selection, either spatially or with the Query Builder, all of the selected features will be highlighted [32]. To zoom to the selected features, click and expand the Graphics and Selections portion of the TOC [33] and click the “Go” button next to the layer selection. A limited amount of text data on each occurrence record is displayed at the bottom of the screen in the table; the table can be minimized or maximized either by clicking the buttons in the top right of the table [34] or directly from the “Table” button above the TOC [35]. For easier viewing of the tabular records, the “Print Preview” button [36] will open a new, larger window with all of the tabular information that is shown at the bottom of the main screen. If you want to clear the current selection, click the “X” button [37] next the layer selection under Graphics and Selections in the TOC (Note: clicking the “X” icon next to the CNDDB layer name under BIOS Layers will remove the CNDDB layer).

Reports
After Element Occurrence records are selected from the CNDDB layer, an Element Occurrence Report can be generated. To generate a report, go to the “+” button (Additional Options) next to the layer selection under the TOC’s Graphics and Selections or BIOS Layers sections [38]. A Special Functions window pane [39] in the right portion of the map viewer will open up. Click “Occurrence Report” [40]. A small window will pop-up [41] and
notify you that the report is being generated and to wait a little bit. Open your report and then close the pop-up window. Additional report formats and tabular data exports are available using RareFind 5.

**Export Selected Records From BIOS to RareFind**

For further analysis or reporting functions, a selected set of Element Occurrences from the CNDDB layer in BIOS can be exported to RareFind. Either from the Graphics and Selections portion of the TOC or the BIOS Layers section of the TOC, click the “RF” button next to the CNDDB layer title. This will open RareFind in a new browser window with the selected records loaded. If RareFind is already open in a different browser window, RareFind will reload with your current selection.
Export Selected Records From RareFind to BIOS

The previous demonstration showed how to make a selection of CNDDB records in the BIOS 5 viewer and then export the results to RareFind 5 (RF5 has more reporting and tabular export functions). Vice versa, a selection can also be made in RareFind 5 and exported to BIOS 5 for better map and data viewing. Further, a PDF map of the data and view displayed in BIOS 5 can be created and saved for printing, emailing, or adding to documents. In the following example, a selection was made in RareFind 5 for Federally Endangered plants and animals in Orange County [42]. The RareFind 5 query returned 14 Elements and 78 Element Occurrences [43] (August 2013 edition).
Once a query selection is made in RareFind 5, it is much easier than in RareFind 3 to export and view the records in the BIOS 5 data viewer. Simply click the RareFind BIOS tab [44] and make one of 4 selections:

- **Show map with no selection**: This option will simply open the BIOS 5 map viewer in a new window with the CNDDB layer loaded and turned on.

- **Show map with ALL returned occurrences (#)**: Opens BIOS 5, loads the CNDDB layer, and selects & zooms to all of the occurrences selected in your RareFind 5 query. The number of occurrences selected is shown in the parentheses.

- **Show map with current element’s occurrences (#)**: Opens BIOS 5, loads the CNDDB layer, and selects & zooms to the occurrences for the current Element highlighted on the RareFind 5 Results tab. The number of occurrences selected is shown in the parentheses. In the above example, this would be the 8 occurrences in Orange County for arroyo toad (*Anaxyrus californicus*).

- **Show map with current element’s selected occurrences (#)**: Opens BIOS 5, loads the CNDDB layer, and selects & zooms to the selected occurrences of the current Element. In the above example, this would be the 3 “checked” occurrences for arroyo toad (*Anaxyrus californicus*) from the query results.
I suspect that users typically will be interested in the second option that shows all the records from their RareFind query. Here’s what you’ll see when the BIOS 5 window pops-up:

Create PDF of Map & Data
First, navigate to your area of interest, select an appropriate basemap, have the layers turned on that you are interested in showing on your map, and add any labels to your map (Add Label is an option in the Map Tools menu; see the BIOS 5 User Guide under Help). Once you have the view and layers set up the way you like, go to the Advanced Tools menu and select Print (PDF). The Print/PDF window will pop-up where you can enter a Title for the map, the Author of the map, and additional notes in a comment box. Once you have these fields filled-out to your liking, click Set Map Text. The Print/Create PDF button will become activated and you can chose to create a PDF in either landscape or portrait orientation. Just like any other PDF, the map can then be saved and emailed, printed, or added to a document. Below is an example of a map with the CNDDB filtered for invertebrates and Critical Habitat layers added for vernal pool fairy & tadpole shrimp with a Color Infrared (CIR)
basemap. (Note: at the time of writing, a legend was not included in the map tool; this is being fixed, or is now fixed by the BIOS team.)
## Appendix 1: Operator Descriptions for Query Builder & Layer Filter

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
<th>Example Query</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>Equals</td>
<td>Name = 'mount whitney'</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Not equal to</td>
<td>Name &lt;&gt; 'mount whitney'</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
<td>Elevation &gt; 14000</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Greater than or equal to</td>
<td>Elevation &gt;= 14000</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
<td>Elevation &lt; 400</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Less than or equal to</td>
<td>Elevation &lt;= 400</td>
</tr>
<tr>
<td>%</td>
<td>Wildcard. Allows for any character(s) at this point in a string of text</td>
<td>Name Like ‘%whit%’</td>
</tr>
<tr>
<td>AND</td>
<td>Joins expressions. Returns records where both are true.</td>
<td>Elevation &gt; 14000 and Name = 'mount whitney'</td>
</tr>
<tr>
<td>OR</td>
<td>Joins expressions. Returns records where either is true.</td>
<td>Elevation &lt; 100 or Name = 'mount whitney'</td>
</tr>
<tr>
<td>LIKE</td>
<td>Used to find a portion of text, with a wildcard '%'</td>
<td>Name like '%whit%'</td>
</tr>
<tr>
<td>NOT</td>
<td>Used to find records without a portion of text</td>
<td>Name not like 'whit%'</td>
</tr>
<tr>
<td>IsNull</td>
<td>Returns records with a null (blank) value</td>
<td>Name IsNull</td>
</tr>
<tr>
<td>IsNotNull</td>
<td>Returns all records except those with a null (blank) value</td>
<td>Name IsNotNull</td>
</tr>
<tr>
<td>IN</td>
<td>Returns records that match a specified list of values in the specified field.</td>
<td>Name IN ('mount whitney', 'mount tam', 'mount shasta')</td>
</tr>
</tbody>
</table>
Appendix 2: Layer Filter examples

Here are a few of examples:

- Filter to view State Threatened or Endangered species occurrences in Sonoma County. The filter query string: `(CALLIST = 'Endangered' OR CALLIST = 'Threatened') AND KEY_COUNTY_CODE = 'SON'`
Filter to view gray wolf occurrences in California in the past 5 years. Here’s the way the filter query will look: SCIENTIFIC_NAME = 'Canis lupus' AND ELM_DATE > '2008%'. The map will show one occurrence, a single male gray wolf wandering NE California from Oregon (OR7).
Because this occurrence is so big, some people may wish to exclude it from their map view to better see other occurrences. So, if we wish to filter out this single gray wolf occurrence:

- After identifying the wolf occurrence to get the unique record ID (EONDX), the filter query string will look like: EONDX <> 87716.
- The map below shows the Chalk Mountain quad without the OR7 wolf occurrence, but all other CNDDB occurrences.