

## Examples of how to use the Fisheries Resource Database

### Scenario 3:

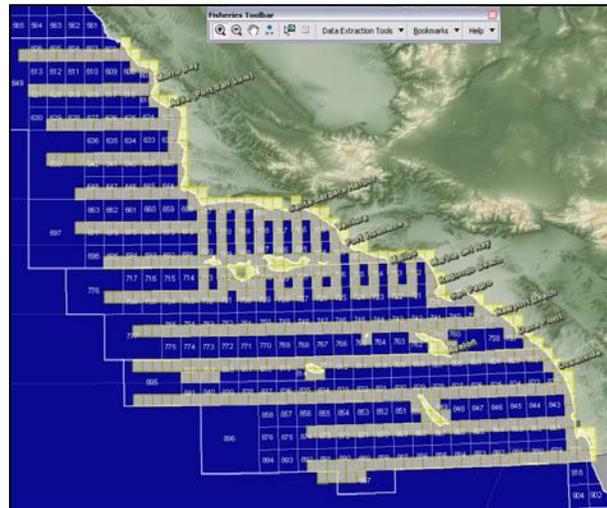
*Western and Clark's Grebe populations have been declining in wintering counts along the Pacific coast for over a decade. Is this a result of changes in resource availability? The database will provide estimates of densities of grebes off southern California from 1999-2002, as well as an index to the abundance of their prey fish based on commercial fishing records. Grebes are associated with near-shore areas, so these searches will be limited to coastal mainland transects.*

1. With the fisheries ArcMap™ document open, look at the table of contents and click on the empty checkbox next to “Seabird\_Grid” to turn on this layer (expand the directory tree if necessary).
2. Right-click on the “Seabird Grid” layer in the table of contents and choose “Zoom to Layer.”
3. Right-click on the “Seabird Grid” layer again and choose “Open Attribute Table.”
4. In the attribute table window of the Seabird Grid, click on “Options” and choose “Select by Attributes...”
5. In the “Select by Attributes” window, double-click on “Class” in the field name list. Click the “=” button, then the “Get Unique Values” button. Double-click on “Coastal, Mainland” in the list that populates.

You should have created a query that looks like this:

"Class" = 'Coastal, Mainland'

Click “Apply.” All of the coastal blocks in the Seabird Grid should now appear



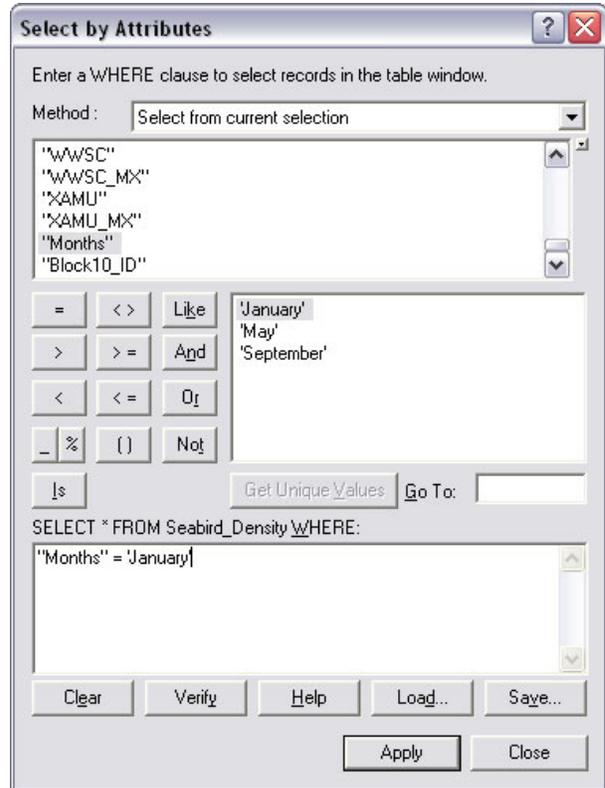
highlighted.

6. In the attribute table window of the Seabird Grid, click on “Options” and choose “Related Tables” > “Seabird\_Grid\_to\_Seabird\_Density : Seabird Density data.”

An attribute table for the Seabird Density data table should appear with 285 records associated with the coastal blocks selected. We are only interested in Western/Clark’s Grebe data for January, so we will refine the table selection.

7. In the Seabird Density attribute window, click on the “Selected” button to only display the 285 selected records. Click on “Options” and choose “Select by Attributes.” (We can perform further queries on the resulting selection set in this example because we are working with the actual data tables rather than the virtual tables used in previous tutorials.)

8. In the “Select by Attributes window, **make sure “Select from current selection” is selected from the “Method” drop-down list.** Double-click on “Months” in the field name list. Click the “=” button, then the “Get Unique Values” button. Double-click on “January” in the list that populates.



You should have created a query that looks like this:

```
"Months" = 'January'
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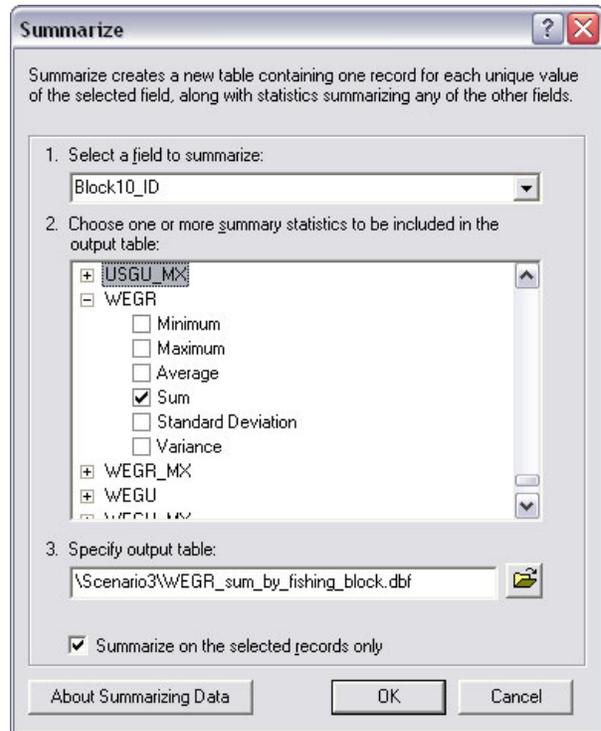
Click “Apply.” The selected records are now limited to the 95 that occurred in January.

9. We want to compare these densities to the commercial fishing records in the same areas. The fishing blocks used to designate catch areas are larger than the seabird grid blocks, so more than one seabird grid block can occur inside of a fishing block (this also makes direct comparative analysis difficult). In order to evaluate any kind of comparison between grebe density and fishing activity, we will need to summarize the seabird data by fishing block.

With the 95 January seabird density records still selected, right-click on the “Block10\_ID” column and choose “Summarize...”

10. In the “Summarize” window, scroll down to “WEGR” (the species code for Western and Clark’s Grebes\*) in the field name list and click on the plus sign next to it to expand the available choices. Put a check next to “Sum.”

Choose a name and location to save the output summary table to and make sure that “Summarize on the selected records only” is checked. Click “OK” and “Yes” to add the result table to the map.

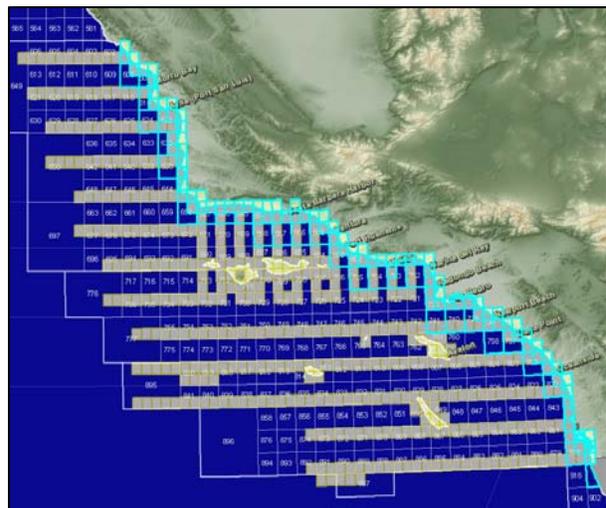


11. Minimize the Seabird Density table and click the “Source” tab at the bottom of ArcMap’s table of contents. Find the table you just created, right-click on it and choose “Open.” Your summary table should consist of 46 records of summed densities by fishing block. Close this table (we will return to it later).

12. If the coastal seabird grid blocks are still selected, we will use these to select fisheries blocks that intersect them (if the seabird grid coastal blocks are not still selected, go back to steps 3-5).

13. From ArcMap’s main menu, choose “Selection” > “Select by Location...”

14. In the “Select By Location” window, select features from the CA\_Blks layer that intersect the Seabird\_Grid layer. **Make sure “Use selected features” is checked** and click “OK.” All of the fisheries blocks that intersect the selected seabird grid coastal blocks should be selected.



\* Both birds are included in one category because they were indistinguishable in the aerial survey.

15. Right-click on the "CA\_Blks" layer in the table of contents and choose "Open Attribute Table." You should see that 58 blocks are selected. Click on "Options" and choose "Related Tables" > "CA\_Blks\_to\_CA\_Commercial\_data : CA Commercial data" (it may take several minutes for the selected commercial fishing data to appear due to the large size of this dataset).
16. The attribute table for California commercial fishing data should appear with 268,148 records selected. These are the records for all the fishing activity in the selected blocks. Since we are only interested in fish that would be prey for grebes during the same time period as the seabird records, we will refine our selection.
17. In the CA commercial fishing data table, click on "Options" and choose "Select by Attributes..."

18. In the "Select by Attributes" window, **make sure "Select from current selection" is selected from the "Method" drop-down list.** Create the following query to select records within the same time range as the seabird data:

"Year" >= 2000 AND "Year" <= 2002  
AND "Month" = 1

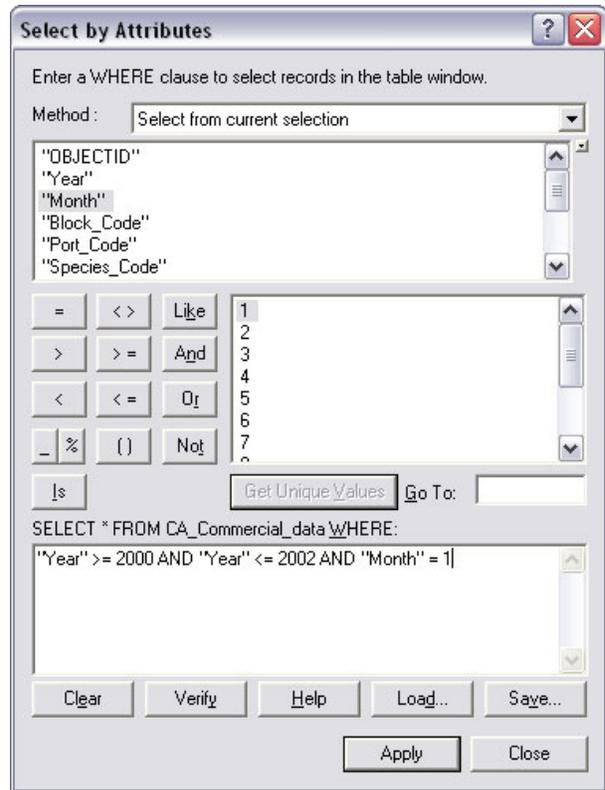
Click "Apply." This should reduce the selected records to 2,321.

19. In CA commercial fishing data table, click on "Options" > "Select by Attributes..." again to narrow our selection set down further.

20. In the "Select by Attributes" window, **make sure "Select from the current selection" still chosen from the "Method" drop-down list.** Now we want to get to only the Sardine and Anchovy catch information for our selected area and time period. Create the following query:

"Species\_Name" = 'Anchovy, deepbody' OR "Species\_Name" = 'Anchovy, northern' OR  
"Species\_Name" = 'Sardine, Pacific' OR "Species\_Name" = 'Sardine, juvenile'

Click "Apply."



21. You should now have 80 records selected in the commercial fishing data table which correspond to Sardines/Anchovies caught between 2000 and 2002, during the month of January, for roughly the same locations as the Western and Clark's Grebe records. However, these records are for multiple years in these blocks and need to be summarized in the same way that we summarized the grebe records.

Right-click on the "Block\_Code" column in the commercial fishing data table and choose "Summarize..."

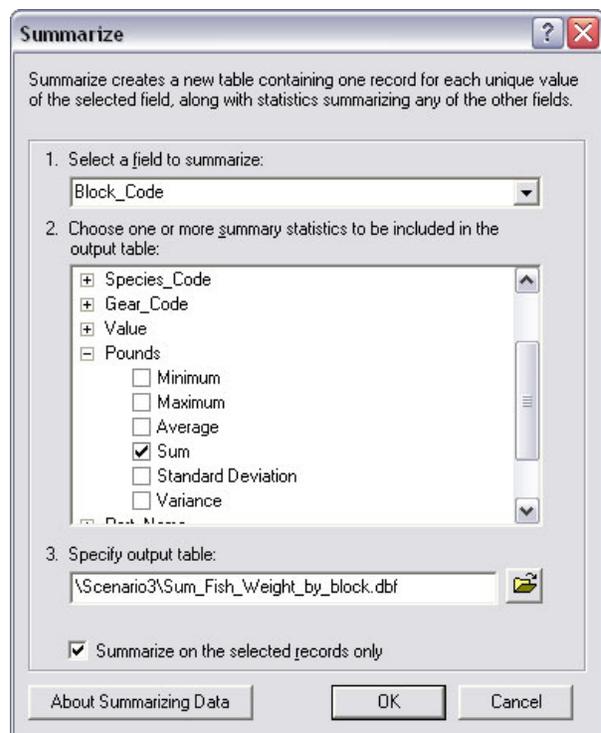
22. In the "Summarize" window, scroll down to "Pounds" (we only have catch weights, not total numbers of fish caught) in the column list and click on the plus sign next to it to expand the available choices. Put a check next to "Sum."

Choose a name and location for the output summary table and **make sure that "Summarize on the selected records only" is checked.** Click "OK" and "Yes" to add the result table to the map.

23. Minimize the commercial fishing table and click the "Source" tab at the bottom of ArcMap's table of contents. Find the table you just created, right-click on it and choose "Open." Your summary table should consist of 19 records of summed catch weight by fishing block.

24. Minimize or close all windows but the fish weight summary and the WEGR density summary tables that you created. You should see that there are more records with associated fishing blocks in the grebe density table than there are records associated with fishing blocks in the sardine/anchovy catch weight table. For this exercise, we just want to compare records from roughly the same locations (i.e. the same fishing blocks) to see if there is any correlation between fishing activity and grebe densities. In order to this, we'll need to join the matching results from each of the summary tables together.

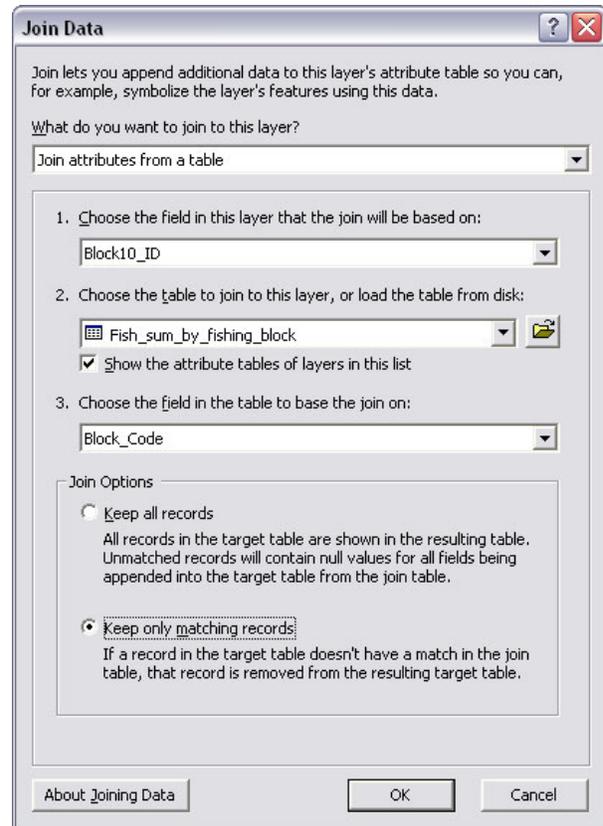
Right-click on WEGR summary table you created and choose "Joins and Relates" > "Join..."



25. In the “Join Data” window, you want to join attributes from a table based on “Block10\_ID.” Choose the fish summary table as the table to join to this layer, and “Block\_Code” as the field in the table to base the join on. For the “Join Options,” select “Keep only matching records” and click “OK.” You may be prompted to add an index, but this is not necessary.

26. Now when you look at the WEGR densities summary table, you should only see 16 records displayed that include the columns of data from both the WEGR densities summary and the fish catch weight summary. This is the data from both tables that have matching fishing blocks.

Click on “Options” > “Export...” and save the joined table as a .dbf file.



27. Open the joined .dbf file in Microsoft Excel<sup>®</sup> (these instructions are for Excel<sup>®</sup> 2003). You will need to select “dBase Files (\*.dbf)” as the file type. Once the file is open, you may want to format the data columns to display whole numbers for the block IDs and pounds.

28. We would like to see a relative comparison between fish catch weights and grebe densities for these blocks. To make this easier to visualize, we will need to scale the values for pounds of fish down. Create a new column heading for the scaled fish pounds. In that column, create a formula for each cell that will give you each record’s pounds divided by 10,000. The formula should look something like this:  
=G2/10000

(You could also just type each value out, moving the decimal to the left four places.)

	A	B	C	D	E	F	G	H
1	Block10_ID	Cnt_Block1	Sum WEGR Density	OID_1	Block_Code	Cnt_Block	Sum_Pounds	Sum Pounds Scaled
2	623	2	29.0420	0	623	2	254508	25.4508
3	655	2	77.4030	1	655	1	81	0.0081
4	681	2	63.5180	3	681	1	89488	8.9488
5	682	3	196.9370	4	682	1	23435	2.3435
6	683	1	30.2060	5	683	10	3479100	347.91
7	718	2	218.8290	6	718	3	765306	76.5306
8	719	2	60.4100	7	719	7	2688276	268.8276
9	720	3	46.2760	8	720	13	2562191	256.2191
10	738	3	100.0360	9	738	11	6117853	611.7853
11	739	1	196.2930	10	739	9	4697310	469.731
12	756	3	59.7240	12	756	3	448342	44.8342
13	757	1	1.5740	13	757	4	606986	60.6986
14	801	3	246.2670	15	801	5	10491	1.0491
15	802	1	136.2220	16	802	2	241165	24.1165
16	822	1	283.7340	17	822	1	106044	10.6044
17	860	3	67.1160	18	860	1	94	0.0094

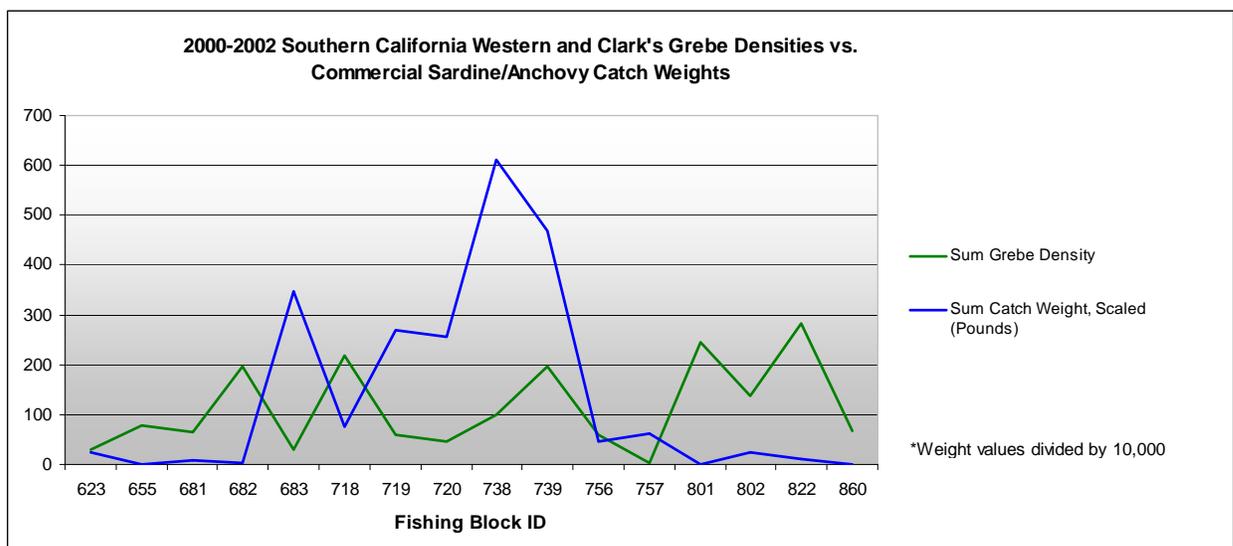
29. Once you have scaled the pounds of fish down, select the new column, hold down the “Ctrl” key on your keyboard, and select the grebe density column. On the main menu, click on “Insert” > “Chart...”

30. In the Chart Wizard, choose the type of chart you would like to create. For this example, we are going to create a “Line” chart. Click “Next.” On the next page of the chart wizard, click on the “Series” tab and click on the  button for “Category (X) axis labels:.” Highlight the values the Block10\_ID and click the  button to return to the Chart Wizard. The syntax for the category labels should look like this:

=YourTableName!\$A\$2:\$A\$17

Click “Next” and customize your chart to your liking. Click “Next” again, then “Finish.”

Your chart should look similar to this:



Higher sardine and anchovy capture rates would lead one to expect higher numbers of grebes at these locations as well (such as in block 739). However, our chart seems to show several blocks with an inverse relationship between fishing activity and grebe densities. A further analysis on trends in fishing activity and grebe populations over a longer period of time would be needed to understand this relationship better.

**Additional options:**

Using many of the same steps in this tutorial, you could also choose to examine trends in fishing activity for those areas with the lowest grebe densities to determine if there is a correlation. You would need to perform the following:

- View coastal seabird densities and find the areas of lowest grebe density. Then select only those blocks.
- Use the selected seabird grid blocks to select fishing blocks in the same area.
- View the related commercial fishing records for the selected blocks and refine the selection to only include Sardines and Anchovy records for January over the number of years you are interested in (such as the last 20 years).
- Summarize the selected fishing records by fishing block and create a chart in Excel<sup>®</sup>.