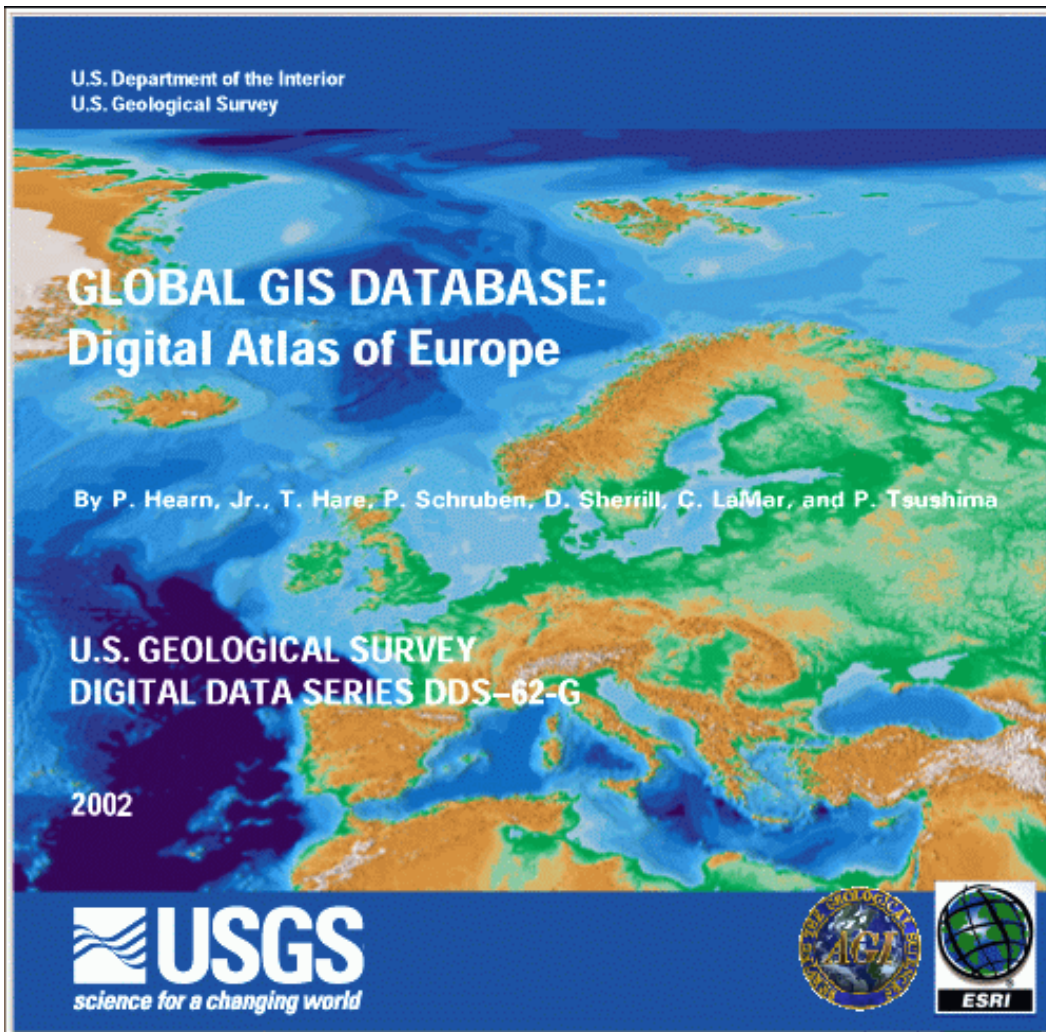# Global GIS Education:

Exploring Water Resources in Europe

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Global GIS Education: *Exploring Water Resources in Europe*

Description

In these lessons, students use Geographic Information Systems (GIS) together with the tools and data from the Europe Global GIS CD to investigate the relationships between water resources--rivers, seas, and oceans--to landforms, cities, and countries from a local to global scale.   The lessons can be used with other data in the Global GIS project to investigate water resources on other continents. Furthermore, the methods used here can be applied to other map themes contained within the Europe GIS dataset.

The lesson is organized into 2 parts:

Part 1—Water Bodies
Part 2—River Systems

Problem Setting

Water is the essential element to life. Without it, nothing can exist. Water resources include rivers, lakes, underground aquifers, oceans, seas, wetlands, precipitation, and much more. Water resources influence where we live, what crops we can grow, and impose growth constraints on cities. Water resources are influenced by such variables as climate, latitude, and landforms. As population expands, increased demand is placed on the water supply, and it becomes more difficult to maintain safe water quality in the face of water pollution.

In these lessons, students have the opportunity to study the above issues involving water availability and quality. They will analyze how water resources affect human populations, and how human populations affect water resources.

Investigation

The U.S. Geological Survey was created in 1879 to help understand the geologic, biologic, hydrologic, and geographic characteristics and phenomena of the planet. Included in this mission is a thorough understanding of water resources. To help assess water resources in Europe, the U.S. Geological Survey has hired you as an earth systems scientist to analyze the spatial data.

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••• Part 1: Water Bodies

In this part, you will examine oceans, seas, and lakes throughout Europe.

After accessing the Global GIS interface, you will be viewing the "G" part of GIS with the map on the right side and a set of tools across the left and the top.

Turn off (uncheck) all themes except for the following:

- shaded relief base (at bottom of table of contents)
- political boundaries
- political boundaries labels

1) Parts of other continents besides Europe are shown on the map. What are they?

2) Describe at least three characteristics of the land surface in Europe, including areas where mountain ranges exist.

3) What major seas and oceans surround and exist within Europe?

4) What parts of the ocean are the deepest?

5) What parts of the seas are the deepest?

6) Which are deeper--the seas or the ocean?

7) Why?

8) Name 10 countries that have coastlines.

9) Name 10 countries that are landlocked.

10) What countries have the longest coastlines?

Use the measure tool ⬚ and click along Norway's coastline, recording the distance measured in the lower left, to answer the following question:

11) How long is the Norwegian coastline? Be sure to include the units of measure.

Conduct additional investigation using the measure tool.

12) Name the three countries that you believe have the longest coastlines, and indicate the distance. Be sure to include the units of measure.

Turn on the Major Cities by checking the box to the left of the theme name.

Each city has the same symbol. You need to change it so that larger cities have a larger symbol.

To do this, double-click on the Major Cities theme to access the legend editor.

Change the legend to a "Graduated Symbol" type, and change the classification field to "Pop_rank."

To the right of the NULL sign is an invert symbols button. Click on the "invert symbols" button so that the largest cities (with a population rank of 1-2) have the largest symbol, as follows:
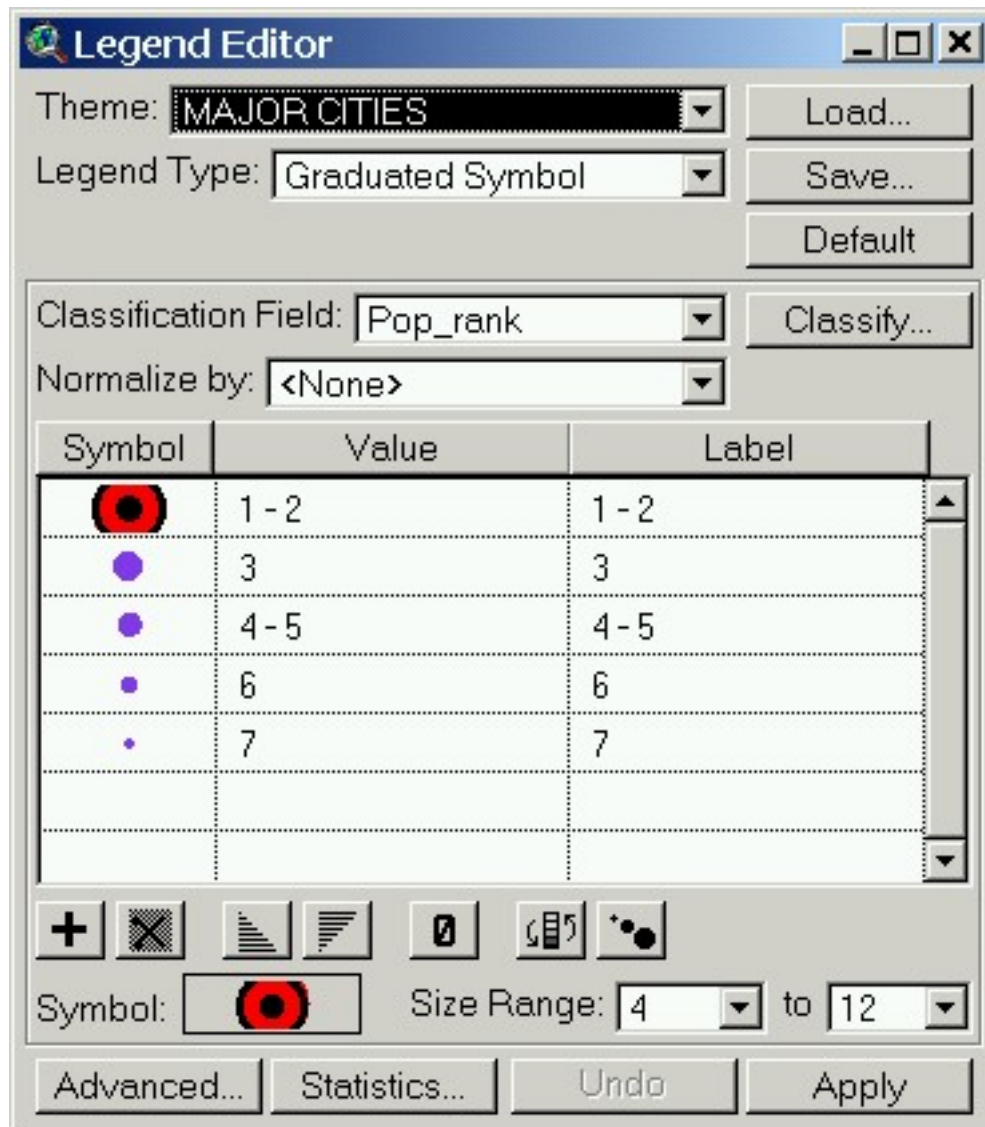
Apply the legend and examine your map.

13) Describe in your own words the relationship of cities to coastlines.

14) What was the importance of being on an ocean or sea to a city in the past?

15) What is the importance of being on an ocean or sea a city today?

16) What percent of the largest cities (with a population rank of 1-2) are on coastlines?

Turn on the Large Perennial Water Bodies by checking the box to the left of the theme name.

17) Which countries have the most lakes?

18) Why?

Turn on the ecological regions.

19) What ecological region covers the areas with the most lakes?

20) What sort of vegetation would you expect to see on the shores of these lakes?

Make the lakes theme active by single-clicking on it, so it is raised up.

Access the table for the lakes theme by clicking on the left-most symbol below:
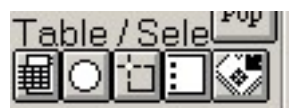
Examine the numbers in the upper left of the screen that indicate the number of records in the table, which corresponds to the number of lakes in the data set.

21) How many lakes exist in the data set?

Click on the perimeter field and sort it in descending order .

Select the record at the top, the record corresponding to the lake with the largest perimeter, by using the black arrow. .

22) What is the name of the lake with the largest perimeter?

Zoom to this lake on the map by clicking on the "zoom to selection" button, the right-most button below:

23) In what country is this lake located in?

Describe the shape of this lake.

24) Why is the perimeter of this lake so large?

Examine the lake's latitude and location in Europe.

25) How do you think this lake was formed?

26) Turn cities on. What major city is closest to this lake?

Access the table again, and this time, select the area field, sort descending, and select the field corresponding to the lake with the largest area.

Zoom to the lake with the largest area on the map.

27) In what country is this lake located in?

28) What major city is closest to this lake?

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●●●● **Part 2: River Systems**

In this part of the lesson, you have the opportunity to examine rivers and their relationship to river basins and population.

Turn off lakes and turn on the theme "Smaller Rivers and Streams."

29) Where are what you would say are the three longest rivers in Europe?

30) Through what countries do these longest rivers flow?

31) In what direction do each of these rivers flow?

Turn on Major Cities if it is not already visible.

32) What major cities (population rank 1-2) are along rivers?

33) What was the importance of a river to a city in the past?

34) What is the importance of a river to a city today?

Turn on the theme "River Basins" and single click on the theme name to make it active.

35) What is a river basin?

36) Describe the relationship of rivers to river basins.

Use the identify button and click in the river basin that occupies an area from Germany to Romania.

37) What is the name of this river basin?

38) What would you say are the three largest river basins in Europe?

Open the table for river basins. Click on the field "Area" and sort it in descending order .

Select the three largest river basins with the black arrow and shift-clicking on the three basins.

39) What are the names of the three largest river basins?

Go back and examine your map.

40) Where are the three largest river basins?

41) In which directions do the major rivers in these basins flow?

Zoom to the Po River Basin in northern Italy.

What direction does the Po River flow?

42) Into which sea does the Po River flow?

Zoom to Switzerland.

43) Describe in your own words the relationship of landforms to rivers and river basins.

44) What direction(s) do the rivers flow in Switzerland?

45) Why?

Turn on the Springs, Wells, and Dams theme.

46) What are dams used for?

47) Which countries contain the most dams?

48) Why do you think these countries contain the most dams? The ecological regions theme may help you with part of your answer.

Zoom to Spain.

Use the "Create Profile" tool [Create Profile] and draw a line from the Spain-France border near Andorra southwest across Spain to Gibraltar. Choose to profile the data set "elevation."

49) Describe how the land elevation changes across Spain from Andorra to Gibraltar.

50) Describe the relationship between the elevation of Spain and the direction of river flow.

Turn on the population theme.

51) Which river basins contain the most population?

52) What issues and concerns in terms of water quality and availability might these basins face?

53) Congratulations! You have completed your mission and have contributed much to the

understanding of water resources in Europe. Indicate what you consider to be the most surprising thing you have learned, the most interesting thing, and the most significant thing.

Most surprising:

Most interesting:

Most significant: