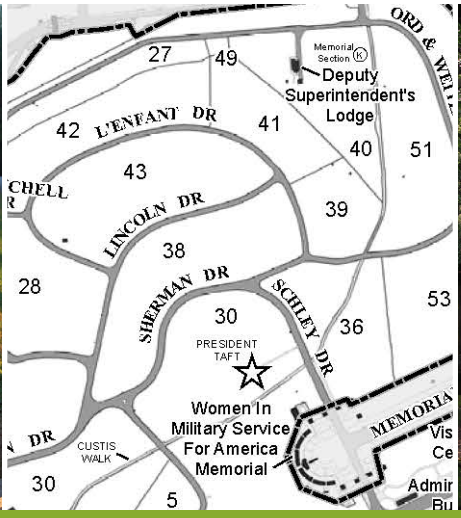

9 GPS to GIS
What's So Spatial About the Cemetery?

By Steven Branting

Guiding Question
How does the mapping of a cemetery allow one to discover burial patterns?

Project Duration
Two or three 45-minute class periods

Grade Level
Grades 6-12 (ages 11-18)

Learning Objectives
Students will be able to:
- investigate the role of field work in the development of GIS data sets
- visualize possible patterns of human activity
- experiment with current technology as a mapping tool
- collect and import GPS data into My World

Subjects
- Geography
- History

GPS to GIS

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How does the mapping of a cemetery allow one to discover burial patterns?

Activity Overview

Every community has intriguing historical mysteries worthy of student investigation. National Center for History in the Schools states that nothing "more powerfully initiates historical thinking than those issues, past and present, that challenge students to enter knowledgeably into the historical record and to bring sound historical perspectives to bear in the analysis of a problem." This project allows students to collect and use local data from ground observations and satellites and to create and use their own data sets of GPS waypoints. As a final step, students learn how to categorize their field data to display the burial patterns in their community's cemetery during a period of history of their choice.

Connections to National Standards

NATIONAL GEOGRAPHY STANDARDS

- Standard 3: How to analyze the spatial organization of people, places, and environments on Earth's surface
- Standard 17: How to Apply Geography to Interpret the Past

NATIONAL HISTORY STANDARDS

- Standard 4: Historical Research Capabilities

Vocabulary

- **spatial,** *adjective*—having to do with location and placement.
- **waypoint,** *noun*—a set of GPS coordinates used for navigation.
- **attribute,** *noun*—non-spatial information about a geographic feature in a GIS, usually stored in a table. example: the name on a tombstone.
- **metadata,** *noun*—data about data; describes and documents its subject matter, for example: how, when, where, and by whom the data was collected

Teaching Notes

Before the lesson, check your equipment and become familiar with how it operates. Test the uploading process for your GPS units prior to starting this lesson. If your computer has a serial port, use COM1. If you are uploading using a USB cable adapter, most computers use COM4.

My World GIS uses GPS data in decimal degrees. You can check your GPS units by opening the SETUP function and setting the UNITS to **hddd.ddddd.** The format allows the data to imported in spreadsheets, which can also be used for mathematics activities on mean, median, and mode.

Familiarize yourself with the Student Activity Sheet and complete the introductory GPS activities. Students work well in groups of 2-3 when mastering GPS usage skills.

Engage the students in a discussion about cemetery layout and planning. Solicit prior knowledge about cemeteries and how they are organized. Ask students to draw a diagram showing how they think a cemetery is organized. **Sample Classroom questions:**

- What factors should be considered when deciding what years will bracket the field data gathering investigations?

- Why don't cemeteries bury individuals in a sequential manner, plot-by-plot in a row, as deaths occur?

Help students to design their own class data recording form to be used when they visit the local cemetery. Show them a photograph of a sample headstone and what information will need to be recorded by a field researcher. Possible attributes might be location (lat/long), name, date of birth, date of death, epitaph, stone style, condition of stone, related family nearby, etc. The data categories they choose to use will be added later to the layer of GPS waypoints that are displayed.

Provide students with a map of the cemetery that you will be visiting. While many cemeteries have these, you may need to create a new map. If your cemetery is large, you may need to limit the area to be studied. If a short history of the cemetery is available, you may want to share it with students.

Provide portable writing boards or notebooks for student use in the field.

If you have an older version of My World, you may see an error message when you try to edit the attribute table for the points. This can only be resolved by installing My World 5.0.1 or later.

There is no data dictionary for this project. As students collect unique data and build a project file, teachers may want to have students record metadata and create a data dictionary.

Extending the Learning

- Contact your city or county GIS offices, which will have a wide variety of local and current data sets. This data will allow students to create a context for the spatial pattern of waypoints from their field exercise. While, as noted above, these data sets are not necessary for this lesson, local data sets are the most accurate for your particular location.
- A student might also test the reliability of a GPS unit by marking the same location 50-100 times at various times of the day to take advantage of the change in the satellite constellation. Uploading these points into a MyWorld layer of the town's road network will produce a waypoint scatter. The student will discover that the GPS unit does not plot the same point but calculates within "accuracy range," which can be drawn as a circle around the data points. Mathematics students may wish to transfer the pattern of the waypoints to a scatter plot on an X-Y grid.
- The distribution of any number of items can be discovered using the techniques in this lesson. Groups of students could determine the pattern of a specific species of tree, recording the apparent age of the tree for insertion into the data set. Other distribution investigations could be stray animals, litter, homes built during a selected period or in a specific style (e.g., Queen Anne, Craftsman, Victorian), or signs found on school property.

Additional Resources

- Branting, Steven. "Not Your Father's History Lesson." *Western Historical Quarterly.* Logan UT: Western Historical Association. XXXVIII, 2, pp. 205-213, 2007.
- "Resurrecting a Pioneer Cemetery." *Idaho Yesterdays.* Boise ID: Idaho State Historical Society. Volume 4. Number 1, pp. 28-45, 2006.
- "Overview of Standards in Historical Thinking," National Center for History in the Schools. Los Angeles: University of California.

GPS to GIS

What's So Spatial About the Cemetery?

By Steven Branting

How does the mapping of a cemetery allow one to discover burial patterns?

In this My World GIS and GPS activity, you will collect and use local data from ground observations and satellites as well create and use your own set of GPS waypoints. After collecting and importing GPS data into My World GIS, you will categorize the field data to display the burial patterns in a local community's cemetery during a period of history of your choice.

Use your student answer sheet to record data and answers for the questions below.

Part I: Test the accuracy of your GPS unit and the MARK function

GETTING STARTED

1. Turn your GPS unit on and allow it to acquire satellites. (Note: you need to be outside for this to work.)

2. In the chart on your student answer sheet, record the date and your local time.

3. Write down the coordinates and elevation in the area on your student answer sheet.

4. MARK the site with the GPS unit and place a physical marker of some sort (i.e., flag, rock, or pencil) on the ground at the spot you are standing.

5. Repeat steps 1-3 **every three minutes** until you have five sets of data. Use the built-in clock in your GPS unit to tell time.

6. Calculate the arithmetic mean, or average, of the latitude, longitude, and elevation. Answer the questions about your data.

QUESTION 1. Which column (lat, long, or elevation) had the worst accuracy?

QUESTION 2. Why do you think the numbers changed?

Part II: Design your own Investigation

Now that you have a sense of how the GPS works and how accurate your collected data will be, you will design a geospatial investigation to carry out at your local cemetery. Consider the following questions when designing your cemetery investigation.

- What factors should be considered when deciding what years (starting, ending) you will use to for your data gathering investigations?
- Why don't cemeteries bury individuals in a sequential manner, plot-by-plot in a row, as deaths occur?
- What patterns might emerge as you gather location data and map it?

1. Outline your data collection plan; what data will you record at the cemetery? Make a list of data to collect, and draft a tentative data table on your student answer sheet.

2. Plan and assign team member roles for the field trip. List tasks, and review equipment needed.

3. After the trip to the cemetery, return to your computer, launch My World, and import the data.
   - Turn on your GPS unit and connect it to your computer, with a serial cord.
   - With the GPS connected to the computer, choose **File > Import Data** from GPS Device.
   - A dialog box will open showing you the connections; check they are correct, and click **Go.**
   - My World will download the points, create a layer, and put it on the map.

4. Choose **Layer > Save Layer As...** to save your file. Save it to the desktop or your projects folder depending on your teacher's instructions.

5. Choose **Layer > Start Editing Layer** to open the editing window. In the editing window you can add fields to your table to include the additional attribute data you recorded, such as name, date, or plot number. When you have finished editing, choose **Layer > Stop Editing Layer,** to return to your map.

6. Edit the layer's appearance and add other layers to your map as needed to continue your investigation.

Name _____ Date_____

GPS to GIS: What's So Spatial About the Cemetery?

Answer the questions from your student handout in the spaces below.

Part I: Test the accuracy of your GPS unit and the MARK function

GETTING STARTED

Date and Time					
	Latitude		Longitude		Elevation
	ddd.dddd	N/S	ddd.dddd	E/W	feet
position 1					
2					
3					
4					
5					
Average					

1. Which column (lat, long, or elevation) had the worst accuracy?_____

_____

2. Why do you think the numbers changed?_____

_____

Name _____ Date_____

GPS to GIS: What's So Spatial About the Cemetery?

Part II: Design your own investigation

1. Outline your data collection plan. What data will you record at the cemetery? Draw out your tentative data table below. Be sure to include columns for both the spatial and the attribute data.

2. Plan and assign team member roles and tasks for the field trip. List equipment needed.

ANSWER KEY

Name _____ Date _____

GPS to GIS: What's So Spatial About the Cemetery?

Answer the questions from your student handout in the spaces below.

Part I: Test the accuracy of your GPS unit and the MARK function

GETTING STARTED

Date and Time					
	Latitude		Longitude		Elevation
	ddd.dddd	N/S	ddd.dddd	E/W	feet
position 1					
2					
3					
4					
5					
Average					

1. Which column (lat, long, or elevation) had the worst accuracy? Elevation generally is the most variable (least accurate.)

2. Why do you think the numbers changed? Answers will vary. Depending on the number of satellites available and the view of the sky, there can be a large variability in the data.

ANSWER KEY

Name _____ Date_____

GPS to GIS: What's So Spatial About the Cemetery?

Part II: Design your own investigation

1. Outline your data collection plan. What data will you record at the cemetery? Draw out your tentative data table below. Be sure to include columns for both the spatial and the attribute data.

   Possible column heads for the charts might be location (lat/long), name, date of birth, date of death, epitaph, stone style, condition of stone, related family nearby, etc.

2. Plan and assign team member roles and tasks for the field trip. List equipment needed.