Activity Day 2: Mapping Field Data and Exploring Geo Careers

Purpose:

1. To introduce students to the concept of Geographic Information System (GIS);
2. to explore a geographic tool (ArcExplorer-Java Edition for Education) used for displaying spatial data;
3. to compare a great circle distance with a grid coordinate distance;
4. to plot point data collected from a Global Positioning System (GPS) unit;
5. to introduce students to potential careers in geography;
6. to guide students how to construct a resumé.

Description:

On Activity Day 2, students will be introduced to the concept of Geographic Information Systems (GIS) and geospatial technology. They will use ArcExplorer-Java Edition for Education (AEJEE), which is a stand-alone GIS data viewer, to explore different types of map projections; measure the distance between two points on the map; and create the map layout. Students will explore the satellite image of the Washington DC region and learn how to add GPS point data into a geographic information system. This activity will serve as an introduction to mapping and geospatial technology, and will help students gain a set of highly desirable skills for future employment.

Next, students will be introduced to career prospects and job opportunities in GIS. This includes a broad range of careers in GIS, from environmental science to urban planning to commercial businesses to defense, and beyond. The U.S. Department of Labor has identified geospatial technologies as one of the nation's current high growth industries. Career advisement materials have already been developed by professional societies; these materials will be supplemented with literature from local private companies. This session will encourage students to combine their passions or interests with GIS for a satisfying and successful career.

During the final segment of the day, TU faculty will assist students as they construct résumés, using Microsoft Word, from outlines with suggested types of background information, school/community activities, and work experiences that could be included. Students will each be given a memory stick to store their résumés for future use. With student permission, copies of the résumés will be kept by Mrs. Bello so that they will be easily retrievable during the students' senior year.

Lesson 1:

Map projection and distance measurement

One of the biggest challenges facing a cartographer (mapmaker) is that of representing a spherical surface on a flat piece of paper or computer screen. Showing a three-dimensional object in a two-dimensional space would involve distortion of **distance**, **area**, **shape**, or **direction**, or some combination thereof.

Map Projection is the transformation process that projects a spherical globe, along with land masses, bodies of water, and other features onto flat surface.

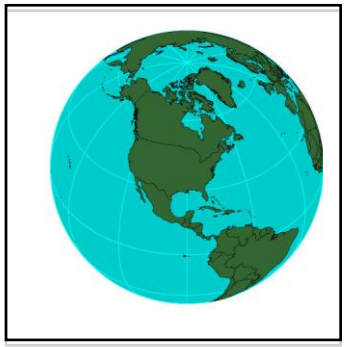
In this lesson, you will explore the following world projections in order:

- Orthographic
- Robinson
- Sinusoidal
- Peters
- Mercator
- Bonne

1. Which projection do you like best? Why?

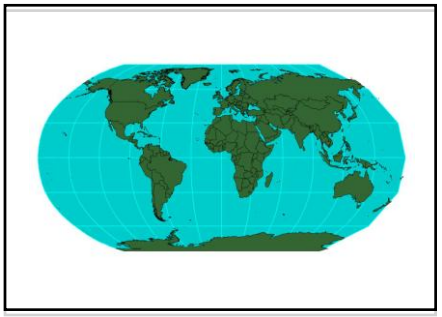
2. Choose the world projection you like best and create an attractive map layout. You can print out your map or export it as an image file. (See Demo)

(a) Orthographic



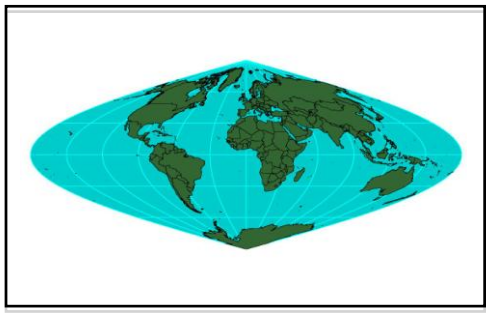
Used for perspective views of the Earth. Areas and shapes are distorted by perspective.

(b) Robinson



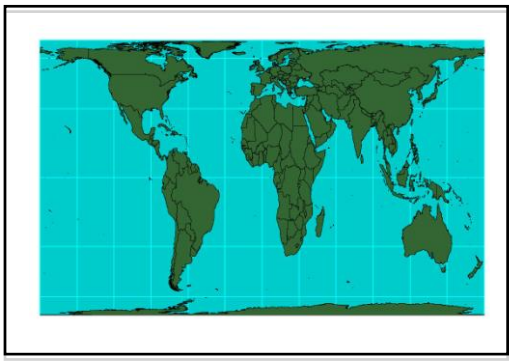
A compromised map projection to make the world "look right".

(c) Sinusoidal



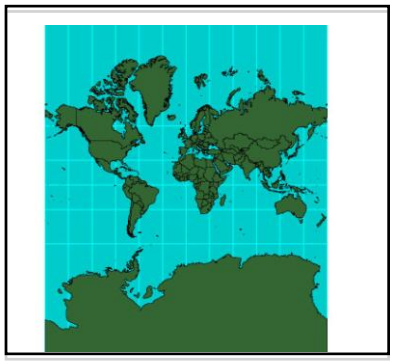
Used frequently in Atlases to show distribution.

(d) Peter



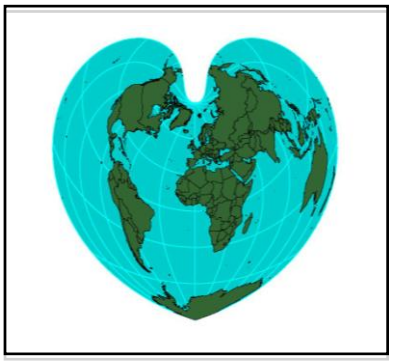
A rectangular equal area projection emphasizing low latitude.

(e) Mercator



Used for navigation or maps of equatorial regions. Any straight line on map is a line of constant direction.

(f) Bonne



Simple conic equal area projection, useful for mapping continent-size areas of the Earth; should not be used for areas of considerable east-west direction.

Lesson 2:

Calculating a grid coordinate distances

A ***great circle*** is formed by passing a plane through the center of the sphere. This plane forms a perfect circle where it intersects with the sphere's surface (Figure 2). Certain qualities about the circle are worth knowing:

1. The plane forming the great circle bisects the spherical surface.
2. Great circles always bisect other great circles.
3. An arc segment of the great circle is the shortest distance between two points on the spherical surface.

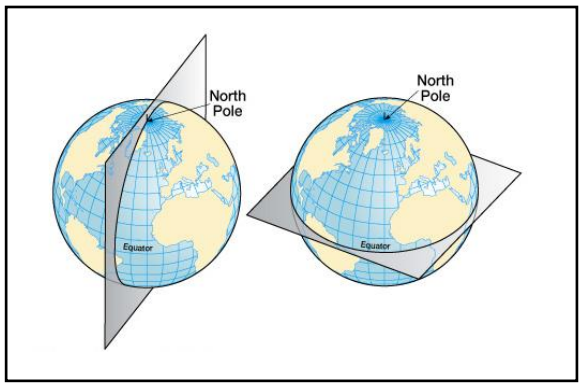


Figure 2. Any plane that divides Earth into equal halves will intersect the globe along a great circle; the great circle is a full circumference of the globe.

A ***great circle distance*** is the shortest distance between two points on the surface of the Earth. On the Earth, to travel along a meridian (north-south) is to go the shortest distance. Traveling along a parallel (east-west) is *not* the shortest distance! Following the path of the equator, however, is an efficient way of travel.

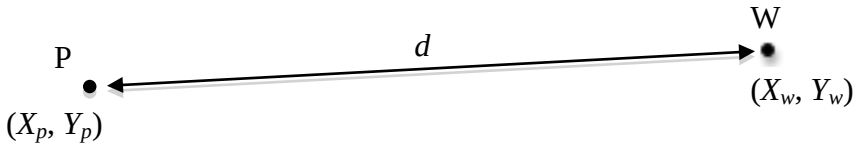
A ***grid coordinate distance*** is measured on a two-dimensional coordinate system in which *x*- and *y*- axes intersect at 90 degrees, and the interval along each axis is linear.

Select two cities on the world map and record the x-coordinate (longitude) and y-coordinate (latitude) in the table below:

	Latitude *(decimal degrees)*	Longitude *(decimal degrees)*
City 1:		
City 2:		

How to calculate a grid coordinate distance

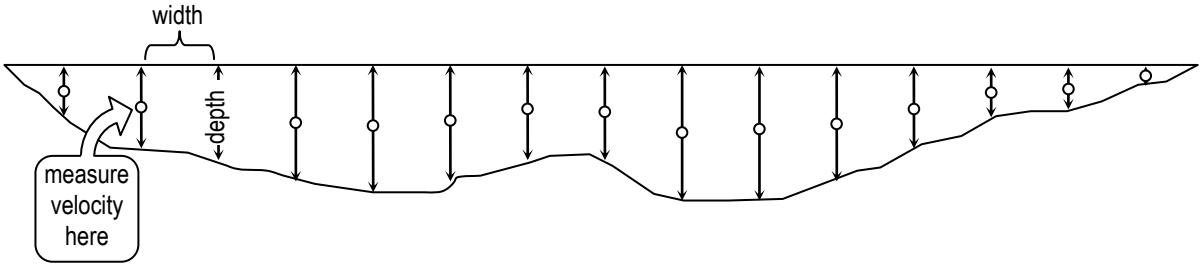
Distance between two points, P (X_p, Y_p) and W (X_w, Y_w)



Equations: $d = \sqrt{(X_p - X_w)^2 + (Y_p - Y_w)^2}$

The distance between _____ and _____ is _____ miles.

Measuring Stream Discharge



$$Discharge\ of\ a\ stream\ segment = Velocity \times Area\ of\ segment$$

This means "the sum of"

$$Total\ Discharge = \sum_{i=0,1\ldots n}^{n} Width_i \times Depth_i \times Velocity_i$$

i	depth (cm)	width (cm)	velocity (cm/s)	discharge (cm^3/s)	comments
0	3 cm	50	3	450	Chidi, DJ, Marcus, & Dejuan's group
1	11	50	9	4,950	
2	14	50	12	8,400	
3	17	50	16	13,600	
4	15	50	20	15,000	
5	12	50	15	9,000	
6	12	50	6	3,600	
7	11	50	5	2,750	
8	7	50	2	700	
9	.1	50	1	50	
			Sum of all segments:	58,500 cm^3/s = 0.0585 m^3/s	1 m^3 = 100cm x 100cm x 100cm =1,000,000cm^3

i	depth (cm)	width (cm)	velocity (cm/s)	discharge (cm^3/s)	comments
0	5.5 cm	50	2	550	"Group 1"
1	11.5	50	7	4,025	
2	12	50	8	4,800	
3	15	50	13	9,750	
4	12	50	17	10,200	
5	12	50	16	9,600	
6	11	50	10	5,500	
7	11	50	3	1,650	
8	4.5	50	2	450	
9	1	50	1	50	
			Sum of all segments:	46,575 cm^3/s = 0.0466 m^3/s	1 m^3 = 100cm x 100cm x 100cm =1,000,000cm^3

Stream Discharge on 9/20/2008

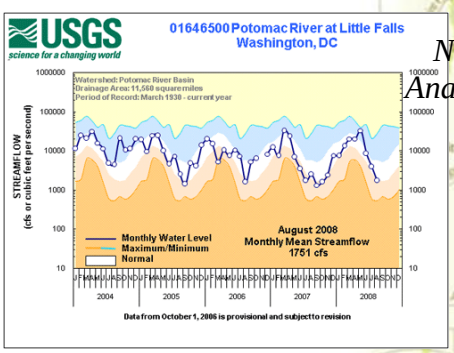
Lower Beaverdam Creek:	0.05 m^3/s
NE Branch Anacostia R.:	0.48 m^3/s
NW Branch Anacostia R.:	0.51 m^3/s
Potomac R. at Little Falls:	51.53 m^3/s
Susquehanna River:	114.09 m^3/s
Patuxent River:	9.03 m^3/s
Estimates of stream discharge	
Rappahannock River:	7 m^3/s
York River:	6 m^3/s
James River:	28 m^3/s
Choptank River:	3 m^3/s

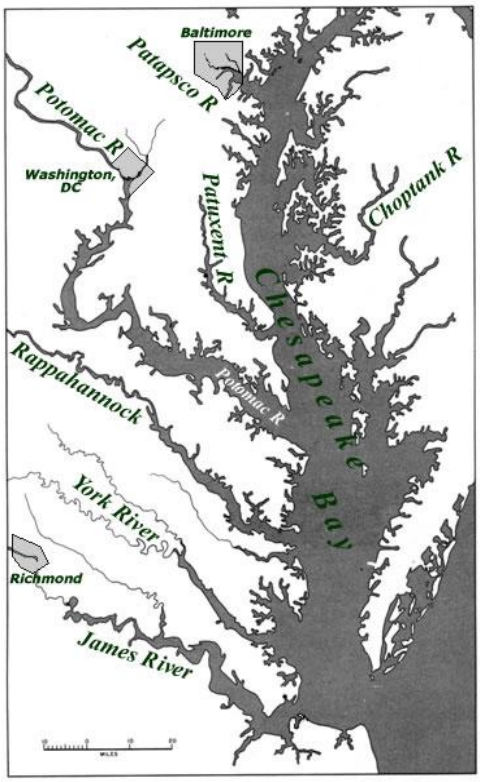
Potomac River at Little Falls

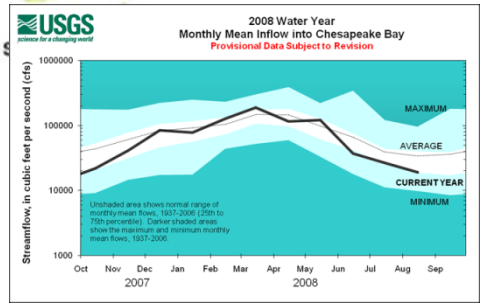
NE Branch Anacostia River

NW Branch Anacostia River

Lower Beaverdam Creek at Fairmont Heights HS







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OBJECTIVE: To obtain a scholarship in graphic arts.

EDUCATION:
Fairmont Heights High School — Capitol Heights, MD
Expected Graduation Date — June 2011
Grade Point Average — 3.4

SCHOLASTIC AWARDS:
National Honor Society — 2008-2009
Honor Roll — 2007-2009
Perfect Attendance Award — 2007-2008

ACTIVITIES:
Geomatics Academy — 2008-2009
Outdoor Track — 2007-2009
- Captain — 2008-2009

Females Achieving Monumental Excellence — 2008-2009

EXPERIENCE:
Forever 21, salesperson — 2008-present
- Assisted customers in fashion selection
- Operated cash registers
- Stocked new merchandise

VOLUNTEER WORK:
Habitat for Humanity — Summer 2007
Camp Sunshine, counselor — Summer 2008
- Organized craft activities for 9 year-olds
- Responsible for cabin of 6 girls for overnight trip

REFERENCES:
Paul Frank, teacher
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