Orienteering and Technology Part III

Graphic Information Systems

❒ **Greg Sack, OCIN**

In an article titled "Geographic Information Systems in the Classroom" published by ElementK Journals in December of 2000, Matt Gebhardt states: "One of the fastest-growing group of businesses that you never hear about are the businesses that specialize in Geographic Information Systems (GIS). GIS are mapping applications that take spatial data for a variety of topics and layer them one on top of the other in order to see a correlation that's otherwise difficult to notice.

John Brown, director of the GIS project at Essential Information (an advocacy group dedicated to researching the civil rights of low-income families and founded by Ralph Nader), explains that trends and patterns are often missed when the data is presented in a spreadsheet. 'People who have a hard time relating to statistics can instantly grasp the impact of a map,' he says.

Any time there's an insurgence of a relatively unknown technology being spread across many different industries, the cry goes out for educated and skilled workers. And who's there to answer this call? It's the responsibility of educators and educational administrators to respond so that the next generation of workers will be prepared to meet the demands of society and excel within its ever-changing structure. And this education isn't restricted to geography or social studies classrooms; GIS can also be used to enhance your instruction in most subject areas."*

What's it to me?

Well, it should mean a lot to you, if you want to get orienteering into the junior or senior high school. With the ever increasing emphasis on interdisciplinary studies marching side-by-side with the demands for integrating technology incorporated in the Elementary and Secondary Education Act (ESEA) teachers are just not going to have time for anything without strong leads to their curriculum.

On the other hand, how does a teacher get the students involved with such complex and abstract concepts as "spacial data" and "analysis, synthesis and output of geographically referenced information?"

You have the key!

Your experience with orienteering, its character and body building aspects, its fun and reasoning building aspects, can can be the doorway to understanding and the excitement in learning. We already know of orienteering's ability to teach across the curriculum. Now we need to build orienteering's ability to bridge the gap from concrete reality to abstract concepts.

Listen in on an online conversation among GIS students considering the merits of using GIS in the classroom:

Jill W.

"I think a great deal of people have a hard time just sitting and listening to a lecture. If the class had a visual of everything and an actual presentation going on in the class room instead of a monotone teaching droning on with an cheesy overhead projector or screeching on the chalkboard, I'm sure they'd absorb more. Most of the kids I went to school with never bothered to crack open and look at the assigned book.

GIS is definently an attention getter. I think too if students had the opportunity to use it on their own to research, they can look at what they are interested in and find their own way to learn."

Leslie B.

"I am an educator of high school students. I teach three vocational courses in Horticulture and Natural Resources. As a vocational educator, I see an opportunity to prepare students to enter the work force with occupational skills. Agriculture and Natural resource management careers use GIS as a tool for analysis. It is therefore an area of interest to me so I can prepare students for their future.

I allow them to select from an array of topics. This may include but is not limited to: Forest management, land-use, urban development, crop rotation, soil erosion, water quality, air quality, pest populations, etc.. As you can see, our topics are as broad as the field of Agriculture itself.

The issue may cross into other countries, be impacted by war, overpopulation, poor resource management, poverty, language, culture, health issues etc."

Personally, I plan to use GIS to teach art history and webpage design. I will begin by having students make the map in OCAD. We will have a series of schoolgrounds events geared to teach what we so love to teach: map reading, compass use, scale, etc.

How do I make a GIS map?

Don't. Have the kids do it. You can easily save the line features like trails and topo lines to use as a starting point. All features will come into ArcView 3.x as line features. (See sample next page.) You can also export your map as a BMP file to use as a base image.

Your GIS program may have a favored bitmap file type, like TIFF, so you may have to bring the BMP into Photoshop or similar program to resave it. But the kids can use the drawing function of the GIS program to get acquainted with map creation. Then they will be more intimately acquainted with the features that they will load the associated database information with.

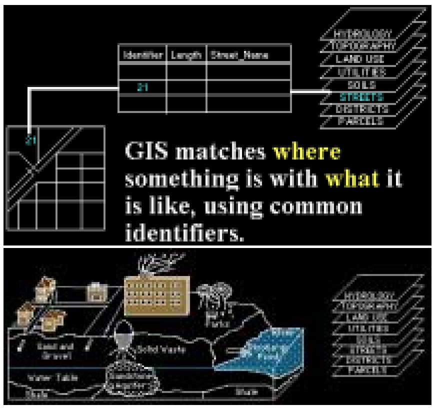
Bigger issues might be where to get the programs, data and training. Well here are a some sites that you might check out:

Intergraph's website, **http://www.intergraph.com/education** has a

* *The full text is available upon request. Email me at raphic@fuse.net*

free starter kit and free software sampling offers. There are an offer for free student programs and a grant offer for a free site license. For more information, contact them at education@intergraph.com.

ESRI's **http://www.esri.com/industries/k-12/index.html** gets you into a



whole world of lesson plans (**http://gis.esri.com/industries/education/arclessons/arclessons.cfm**) and free stuff. Click on the GIS link for a nice explanation of what GIS is. See my previous article, "Orienteering and Technology," for training and additional URLs.

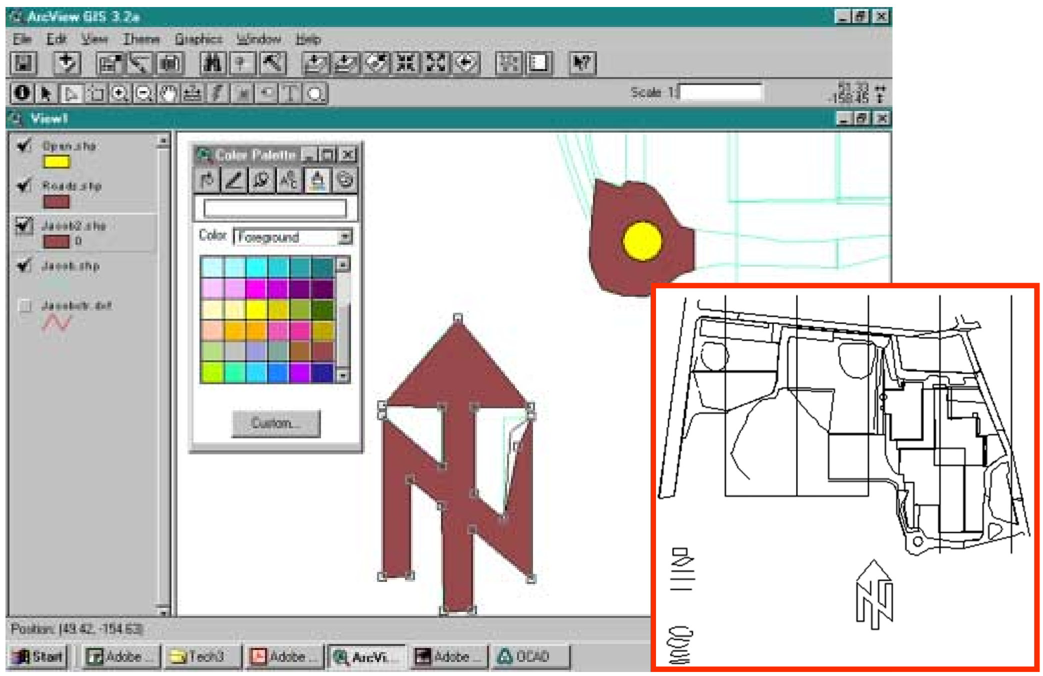
http://www.gis.com/ and **http://www.geographynetwork.com/** are full of cool helpers.

Don't forget your own state and county likeMontana's Natural Resources' **http://www.nris.state.mt.us/gis/mtmaps.html**

For data and maps a good place to start is **http://ask.usgs.gov/** or visit EPA's Surf Your Watershed web site if you need to locate the subbasin of interest to you, or don't know the subbasin number. Please direct all comments and questions about the National Hydrography Dataset, and accompanying documentation, to nhd@usgs.gov. Call 1-888-ASK-USGS (1-888-275-8747), or e-mail **ask@usgs.gov** with comments and questions relating to other USGS products and services.

The ASK USGS--Earth Science Information Center (ESIC) web site (**http://ask.usgs.gov**) offers nationwide information and sales service for USGS map products and earth science publications. I found an education link there that led me to the appended USGS "Finding Your Way with Map and Compass" and "How to Obtain Aerial Photographs" articles.

There was a link to the USGS data services as well. I tried accessing maps, but got lost in the maze. Finding good data and maps resources will just have to be the subject of another article. ▲



The Geographic Information Systems Support Center

It is estimated that more than eighty percent of governmental functions are associated with managing information about specific locations or geographic areas. A Geographic Information System (GIS) is a computer system for the input, editing, storage, maintenance, management, retrieval, analysis, synthesis and output of geographically referenced information. GIS supports applications such as land planning, natural resource monitoring, transportation planning, site location, monitoring crime and accidents, public health and environmental analysis, and economic and census analysis.

http://www.state.oh.us/das/dcs/gis/

Layout by Greg Sack

Finding Your Way with Map and Compass

Part of a 7.5-minute topographic map at 1:24,000 scale.

A topographic map tells you where things are and how to get to them, whether you're hiking, biking, hunting, fishing, or just interested in the world around you. These maps describe the shape of the land. They define and locate natural and manmade features like woodlands, waterways, important buildings, and bridges. They show the distance between any two places, and they also show the direction from one point to another.

Distances and directions take a bit of figuring, but the topography and features of the land are easy to determine. The topography is shown by contours. These are imaginary lines that follow the ground surface at a constant elevation; they are usually printed in brown, in two thicknesses. The heavier lines are called index contours, and they are usually marked with numbers that give the height in feet or meters. The contour interval, a set difference in elevation between the brown lines, varies from map to map; its value is given in the margin of each map. Contour lines that are close together represent steep slopes.

Natural and manmade features are represented by colored areas and by a set of standard symbols on all U.S. Geological Survey (USGS) topographic maps. Woodlands, for instance, are shown in a green tint; waterways, in blue. Buildings may be shown on the map as black squares or outlines. Recent changes in an area may be shown by a purple overprint. A road may be printed in red or black solid or dashed lines, depending on its size and surface. A list of symbols is available from the Earth Science Information Center (ESIC).

From Near to Far: Distance

Maps are made to scale; that is, there is a direct relationship, a ratio, between a unit of measurement on the map and the actual distance that same unit of measurement represents on the ground. If, for instance, 1 inch on the map represents 1 mile (which converts to 63,360 inches) on the ground, the map's scale is 1:63,360. Below is a listing of the scales at which some of the more popular USGS maps are compiled.

A convenient way of representing map distance is by the use of a graphic scale bar. Most USGS topographic maps have scale bars in the map margin that represent distances on the map in miles, feet, and kilometers. The table below shows the corresponding area of coverage for each scale and the linear distance that each scale represents in inches and centimeters.

From Here to There: Determining Direction

To determine the direction, or bearing, from one point to another, you need a compass as well as a map. Most compasses are marked with the four cardinal points—north, east, south, and west—but some are marked additionally with the number of degrees in a circle (360: north is 0 or 360, east is 90, south is 180, and west is 270). Both kinds are easy to use with a little practice. The illustrations on the reverse side show how to read direction on the map.

One thing to remember is that a compass does not really point to true north, except by coincidence in some areas. The compass needle is attracted by magnetic force, which varies in different parts of the world and is constantly changing. When you read north on a compass, you're really reading the direction of the magnetic north pole. A diagram in the map margin will show the difference (declination) at the center of the map between compass north (magnetic north indicated by the MN symbol) and true north (polar north indicated by the "star" symbol). This diagram also provides the declination between true north and the orientation of the Universal Transverse Mercator (UTM) grid north (indicated by the GN symbol). The declination diagram is only representational, and true values of the angles of declination should be taken from the

Map Series Name	Scale	1 inch represents	1 centimeter represents	Map area (approximate square miles)
Puerto Rico 7.5-minute	1:20,000	1,667 feet	200 meters	71
7.5-minute	1:24,000	2,000 feet	240 meters	49 to 70
7.5- by 15-minute	1:25,000	2,083	250 meters (about)	98 to 140
Alaska	1:63,360	1 mile	634 meters (about)	207 to 281
Intermediate	1:50,000	0.8 mile	500 meters (about)	County
Intermediate	1:100,000	1.6 miles	1 kilometer (about)	1,568 to 2,240
United States	1:250,000	4 miles	2.5 kilometers (about)	4,580 to 8,669

U.S. Department of the Interior
U.S. Geological Survey

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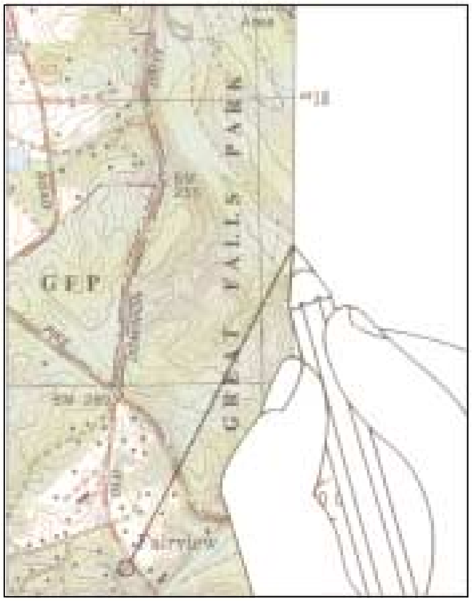
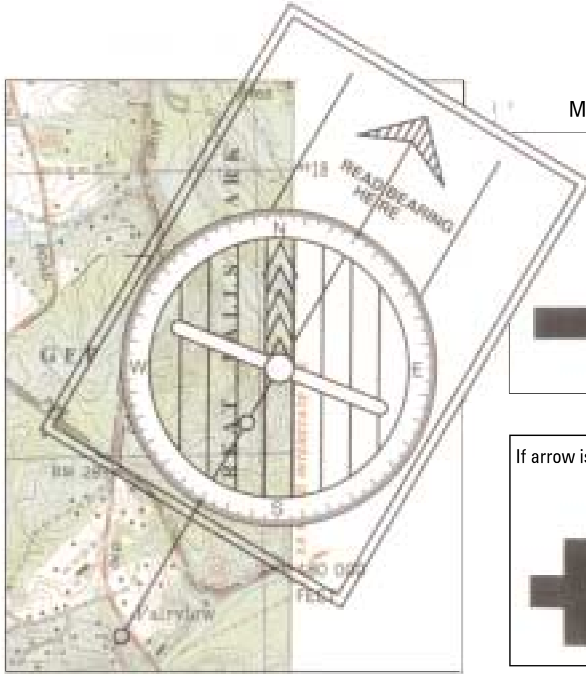
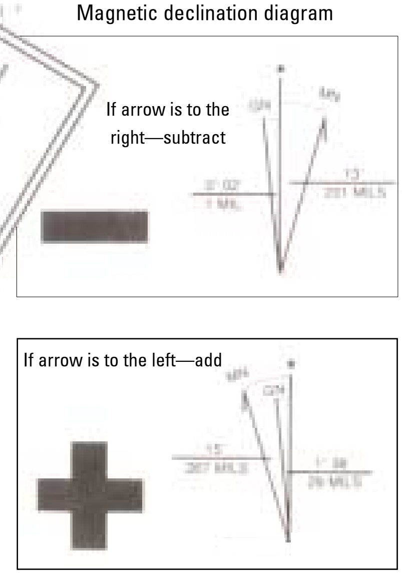


(1) Drawing a straight line over the map edge.



(2) Reading the compass on the map.



(3) Using the magnetic declination diagrams.

numbers provided rather than from the directional lines. Because the magnetic declination is computed at the time the map is made, and because the position of magnetic north is constantly changing, the declination factor provided on any given map may not be current. To obtain current and historical magnetic declination information for any place in the United States, contact:

National Geomagnetic Information Center
Phone: 303-273-8486
E-mail: jcaldwell@usgs.gov
Web site: geomag.usgs.gov

or

National Geophysical Data Center
Phone: 303-497-6826
E-mail: info@ngdc.noaa.gov
Web site: www.ngdc.noaa.gov/ or www.ngdc.noaa.gov/seg/potfld/geomag.shtml

Taking a compass bearing from a map:

(1) Draw a straight line on the map passing through your location and your destination and extending across any one of the map borders.

(2) Center the compass where your drawn line intersects the map border, align the compass axis N-S or E-W with the border line, and read on the compass circle the true bearing of your drawn line. Be careful to get the bearing in the correct sense because a straight line will have two values 180° apart. Remember north is 0, east is 90, and so on.

(3) To use this bearing, you must compensate for magnetic declination. If the MN arrow on the map magnetic declination diagram is to the right of the true north line, subtract the MN value. If the arrow is to the left of the line, add the value. Then, standing on your location on the ground, set the compass so that "zero degrees or North" aligns with the magnetic north needle, read the magnetic bearing that you have determined by this procedure, and head off in the direction of this bearing to reach your destination.

A Word of Caution

Compass readings are also affected by the presence of iron and steel objects. Be sure to look out for—and stay away from—pocket knives, belt buckles, railroad tracks, trucks, electrical lines, and so forth when using a compass in the field.

Information

For information on these and other USGS products and services, call 1-888-ASK-USGS, use the Ask.USGS fax service, which is available 24 hours a day at 703-648-4888, or visit the general interest publications Web site on mapping, geography, and related topics at mac.usgs.gov/mac/isb/pubs/pubslists/index.html.

For additional information, visit the ask.usgs.gov Web site or the USGS home page at www.usgs.gov.

USGS
science for a changing world

How To Obtain Aerial Photographs

The U.S. Geological Survey (USGS) maintains an informational data base of aerial photographic coverage of the United States and its territories that dates back to the 1940's.

This information describes photographic projects from the USGS, other Federal, State, and local government agencies, and commercial firms.

In this part of the original 9 x 9 inch photograph, at a scale of 1:40,000, 1 inch on the photograph represents 3,333 feet on the ground. The original photograph is from NAPPW Roll 6860, Frame 59.

In this 2X (18 x 18 inch) enlargement of the same photograph, at a scale of 1:20,000, 1 inch on the photograph represents 1,666 feet on the ground.

The pictures on this page show a part of a standard 9- by 9-inch photograph and the results obtained by enlarging the original photograph two and four times. Compare the size of the Qualcomm Stadium, Jack Murphy Field, in San Diego, Calif, and the adjacent parking lot and freeways shown at the different scales.

USGS Earth Science Information Center (ESIC) representatives will assist you in locating and ordering photographs. Please submit the completed checklist and a marked map showing your area of interest to any ESIC.

Information

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Please visit the USGS home page at http://www.usgs.gov/.

In this 4X (36 x 36 inch) enlargement of the same photograph, at a scale of 1:10,000, 1 inch on the photograph represents 833 feet on the ground.

U.S. Department of the Interior
U.S. Geological Survey

USGS Fact Sheet 081-99
April 1999

Checklist for Obtaining Aerial Photographs

1. If you know the project, roll, and frame number of the photographs you want, contact your nearest ESIC for ordering assistance.

2. If you do not know the precise aerial photograph you need, complete this form and return it with your ***marked map showing your area of interest,*** to any ESIC. A researcher will provide information about available photographs that match your requirements. Please include your daytime telephone number. If you have any questions, call 1-888-ASK-USGS.

Name (first, middle initial, last)	Date
Company or agency	Telephone number (day)
Address	FAX number
City, State, and ZIP code	E-mail address

Specific area to be shown (enclose a **detailed marked map**)

State: ______ County: ______ Town: ______

USGS quadrangle map name (if known): ______

Township, range, and section (if known): ______

Latitude and longitude (if known): ______

Specific feature (crossroads, neighborhood, or farm) you want to see: ______

Please describe your intended use (to assist the researcher):

Film type

- ☐ Black and white
- ☐ Color infrared
- ☐ Color (limited availability)
- ☐ No preference

Most aerial photographs on record were taken with black-and-white film. Color-infrared photographs are available for the entire country.

For detailed information about color infrared, refer to the publication "Understanding Color-Infrared Photographs" available free from any ESIC.

Date of photograph

- ☐ Most recent
- ☐ Oldest

Specific year or range of years: ______

Season of year, if you have a preference: ______

Comments: