Project 01: Mapping the Outbreak

by David Hunter

When the zombies attack, where should you run, where regroup, and where rebuild your life? These questions, key to survival, will help focus your attention on a highly motivating and dangerously overlooked fact: Geography skills can save you from the zombie apocalypse!

Click here to download *Dead Reckon*, (https://active.socialstudies.com/active_reader/download/INT3801/INT380_deadreckon.pdf) the graphic novel that accompanies this project. It tells the story of a student just like you, who's using geography skills to solve an identical situation: to warn others about the impending zombie outbreak! *Dead Reckon* will help set the stage for your own upcoming adventure with geography and zombie hordes.

Here are some things to keep in mind before beginning this *Zombie Based Geography* unit:

- Many of the map-making activities in *Zombie Based Geography* may include group work and discussion.
- Some activities are designed for entire-classroom participation, teamwork, and sharing.
- Your teacher may adapt some activities to include both Active Classroom and regular classroom components.
- Some activities may give you multiple, creative options to complete them.
- Some activities may direct you to use resources outside of Active Classroom.
- Your teacher may ask you to upload your completed assignments directly to Active Classroom lessons or bring them into class with you.

- If you have any questions, please consult with your teacher.

Introduction: Mapping the Outbreak

Mapping the Outbreak, you'll learn to display geographic data on a map and analyze spatial relationships. You'll plot four days' worth of Zombie Attack Data on your map, and be able to anticipate where future zombie attacks will take place.

Zombie Outbreak Data Map

If the zombie virus was spreading, wouldn't you want to *know where it was going*? In this project, you will learn to *use geographic tools and data* to track the spread of the zombie apocalypse.

Driving Question

How are *geographic tools* used to *make predictions* and *find solutions*?

What You Will Produce

Create a map using the Zombie Attack Data provided.

Your Map Will

- Include important *map features* (direction, symbols, legend, index, scale)
- Identify *major cities*
- Show the *spread* of zombie attacks
- Show the *connections* between cities that help the zombie virus spread

You Will Also Explain

- How you decided where the zombies would spread

By the end of this project, you will be able to answer these questions

- What the heck is geography?
- What tools do geographers use and why?
- How do I design a map?
- Where are the major cities in my country?
- How are major cities connected and how do they relate to each other?
- What is the process of diffusion?
- How do I display data using maps?

Pre-Assessment Quiz

1. What is geography?

2. What is migration?

3. What is diffusion?

Match the following maps with their definitions:

4. Physical Map
   a. ○ Shows average weather and rain of a region.
   b. ○ Includes contour lines to show the elevation or height of an area.
   c. ○ Shows major highways, airports, cities, railroad tracks, and local points of interest.
   d. ○ Includes symbols to show the locations of different resources or economic activity.
   e. ○ Shows the features of an area, such as mountains, rivers, and lakes. Usually uses color.
   f. ○ Doesn't show physical features, but shows borders or boundaries and major cities.

5. Climate Map
   a. ○ Shows average weather and rain of a region.
   b. ○ Includes contour lines to show the elevation or height of an area.
   c. ○ Shows major highways, airports, cities, railroad tracks, and local points of interest.
   d. ○ Includes symbols to show the locations of different resources or economic activity.
   e. ○ Shows the features of an area, such as mountains, rivers, and lakes. Usually uses color.
   f. ○ Doesn't show physical features, but shows borders or boundaries and major cities.

6. Economic or Resource Map
    a. ○ Shows average weather and rain of a region.
    b. ○ Includes contour lines to show the elevation or height of an area.
    c. ○ Shows major highways, airports, cities, railroad tracks, and local points of interest.
    d. ○ Includes symbols to show the locations of different resources or economic activity.
    e. ○ Shows the features of an area, such as mountains, rivers, and lakes. Usually uses color.
    f. ○ Doesn't show physical features, but shows borders or boundaries and major cities.
7. Topographical Map
    a. ○ Shows average weather and rain of a region.
    b. ○ Includes contour lines to show the elevation or height of an area.
    c. ○ Shows major highways, airports, cities, railroad tracks, and local points of interest.
    d. ○ Includes symbols to show the locations of different resources or economic activity.
    e. ○ Shows the features of an area, such as mountains, rivers, and lakes. Usually uses color.
    f. ○ Doesn't show physical features, but shows borders or boundaries and major cities.
8. Political Map
    a. ○ Shows average weather and rain of a region.
    b. ○ Includes contour lines to show the elevation or height of an area.
    c. ○ Shows major highways, airports, cities, railroad tracks, and local points of interest.
    d. ○ Includes symbols to show the locations of different resources or economic activity.
    e. ○ Shows the features of an area, such as mountains, rivers, and lakes. Usually uses color.
    f. ○ Doesn't show physical features, but shows borders or boundaries and major cities.
9. Road Map
    a. ○ Shows average weather and rain of a region.
    b. ○ Includes contour lines to show the elevation or height of an area.
    c. ○ Shows major highways, airports, cities, railroad tracks, and local points of interest.
    d. ○ Includes symbols to show the locations of different resources or economic activity.
    e. ○ Shows the features of an area, such as mountains, rivers, and lakes. Usually uses color.
    f. ○ Doesn't show physical features, but shows borders or boundaries and major cities.

Match the following geography tools with their definitions:

10. Atlas

a. ○ Image from space used to take measurements or create maps.
b. ○ A compiled book of maps.
c. ○ Visual symbols of data. Shows change or compares numbers.
d. ○ Images from the sky used to take measurements or create maps.
e. ○ A computer program used to store, manage, and analyze data.
f. ○ A model of the Earth, used to avoid distortions in spatial relations on the world.

11. Globe

a. ○ Image from space used to take measurements or create maps.
b. ○ A compiled book of maps.
c. ○ Visual symbols of data. Shows change or compares numbers.
d. ○ Images from the sky used to take measurements or create maps.
e. ○ A computer program used to store, manage, and analyze data.
f. ○ A model of the Earth, used to avoid distortions in spatial relations on the world.

12. Aerial Photograph

a. ○ Image from space used to take measurements or create maps.
b. ○ A compiled book of maps.
c. ○ Visual symbols of data. Shows change or compares numbers.
d. ○ Images from the sky used to take measurements or create maps.
e. ○ A computer program used to store, manage, and analyze data.
f. ○ A model of the Earth, used to avoid distortions in spatial relations on the world.

13. Satellite Photograph

a. ○ Image from space used to take measurements or create maps.
b. ○ A compiled book of maps.
c. ○ Visual symbols of data. Shows change or compares numbers.
d. ○ Images from the sky used to take measurements or create maps.
e. ○ A computer program used to store, manage, and analyze data.
f. ○ A model of the Earth, used to avoid distortions in spatial relations on the world.

14. Graphs

    a. ○ Image from space used to take measurements or create maps.

    b. ○ A compiled book of maps.

    c. ○ Visual symbols of data. Shows change or compares numbers.

    d. ○ Images from the sky used to take measurements or create maps.

    e. ○ A computer program used to store, manage, and analyze data.

    f. ○ A model of the Earth, used to avoid distortions in spatial relations on the world.

15. GIS

    a. ○ Image from space used to take measurements or create maps.

    b. ○ A compiled book of maps.

    c. ○ Visual symbols of data. Shows change or compares numbers.

    d. ○ Images from the sky used to take measurements or create maps.

    e. ○ A computer program used to store, manage, and analyze data.

    f. ○ A model of the Earth, used to avoid distortions in spatial relations on the world.

Lesson 1—Intro to Geography

Geography Tools

What are the Different Types of Tools Geographers Use?

Geographers use all sorts of tools to help them investigate their questions. They commonly use *maps, globes, atlases, aerial photographs, satellite photographs, information graphics,* and a computer program called *GIS*. Read below to learn about different tools.

Some Tools Geographers Use

Maps

A map is a flat representation of a part of Earth.

Geographers use many different types of maps. Maps can show lots of different information, including the location of places in the world.

Maps use projection to try and display a round object (Earth) on a flat surface (a map). Cartographers (map-makers) have long struggled with trying to find the most accurate projection to make maps with.

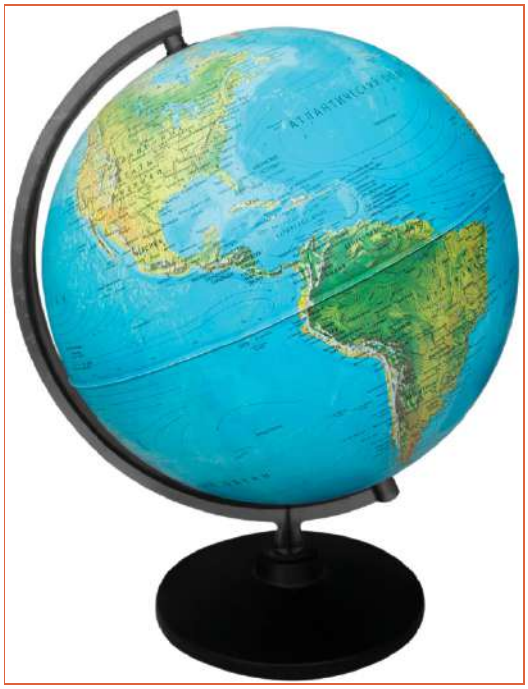
Atlas

An atlas is a book of maps.

An atlas contains maps of the world or a region of the world. Some atlases also include more information about the places they include in the maps.

Atlases can be very helpful for traveling. Instead of bringing many maps, you can bring one atlas.

Globe



A globe is a model of the Earth, used to *avoid distortions* in spatial relations on the world.

Maps of the world are distorted from trying to make a round object fit on a flat surface. The globe is round, so it remains accurate.

The globe provides an accurate scale of how far apart locations are. You can also use a globe to get a comparison of the size of different locations.

Aerial Photographs

Aerial photographs are photographs taken from the sky and used to take measurements or create maps.

Aerial photographs can be taken from airplanes, balloons, or even kites.

The image below is an aerial photo of South Boston, MA. It was taken in 1978. You can download aerial photos at: http://earthexplorer.usgs.gov.

Image courtesy of the U.S. Geological Survey.

Satellite Photographs

Satellite photographs are like aerial photographs, but they are taken from space.

Satellite photographs can capture large areas of the Earth, but they can also zoom in pretty close.

The image below is a satellite photo of Marion Island, South Africa. Marion Island is a protected land and is only inhabited by researchers studying the island.

Image courtesy of the NASA Earth Observatory. Image created by Jesse Allen, using EO-1 ALI data provided courtesy of the NASA EO-1 team and the United States Geological Survey.

Information Graphics

Information graphics, or infographics, are visual symbols of data. They are images that show information using pictures or symbols.

Information graphics can be as simple as a bar graph or as complex as the image below.

The infographic below is a display of land cover change in the mid Atlantic between 1996–2006. This graphic shows that over 10 years, forests and wetlands have decreased, while other types of land cover, including human developments, have increased. The graphic does not represent actual locations of land cover, just numbers representing it.

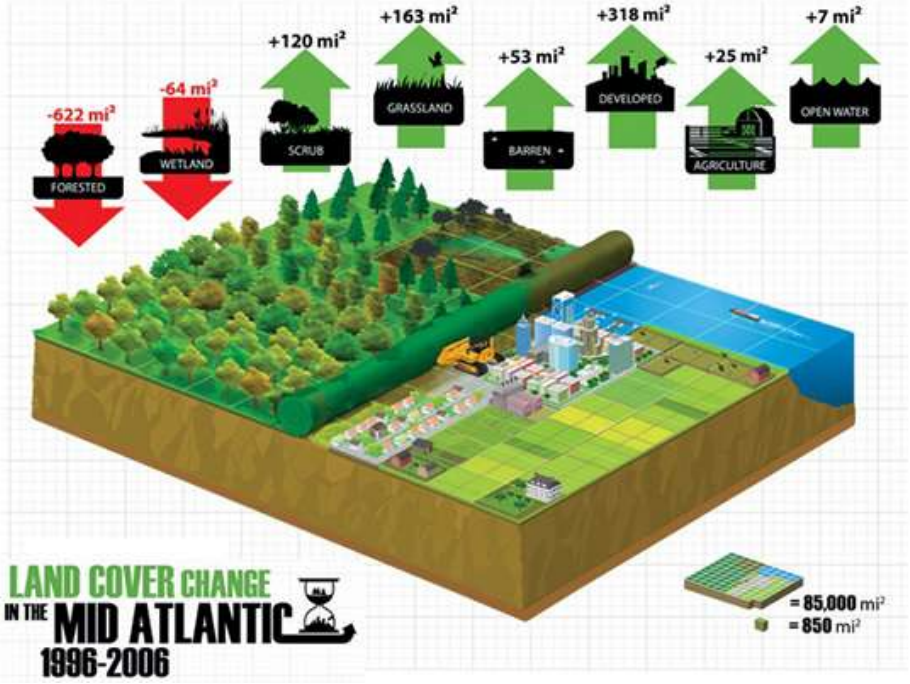


Image courtesy of the National Oceanic and Atmospheric Administration (NOAA)

GIS (Geographic Information System)

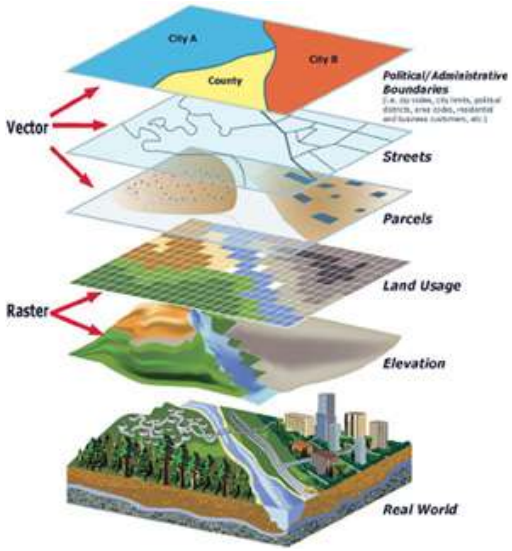


Image courtesy of the San Bernardino County Information Services Department

GIS is a computer-based program used to store, manage, and analyze data.

A GIS map is more than a map because it can pull up a lot of information. Geographers use GIS to help make decisions.

Imagine that you wanted to make sure schools were not near any factories that might pollute the air. With a GIS map, geographers can use the database (a place that stores information) to show where all the schools are. They can then use the database to also show where all the factories are. The GIS helps geographers see all kinds of information and how it relates to locations.

The image above is an example of how a GIS layers information.

Geographer Interview 1

Julie Bassuk, Makers Architecture, Seattle, WA

Read an interview of a real person who uses geography in his or her career. *Answer* the questions that follow. *Be ready to share* your answers and ideas!

1) What is your job title?

My title is co-managing partner of MAKERS Architecture and Urban Design LLP, and I am the current chair of the Seattle Design Commission. I am a planner, sometimes called an "urban planner," "city planner," "land-use planner," or "facility planner."

2) How would you describe what you do?

I do a lot of different things. I help cities transform neighborhoods, ports manage waterfronts, and organizations develop campuses. The common theme is that I work with my clients to create a "vision" of what is desired in the future and then make a plan to get there.

3) How do you work with geography? What kinds of questions do you try to answer? What problems do you try to solve?

For each project, I build a series of maps to show existing conditions, problems, and opportunities, answering questions like the ones below:

Existing Conditions

- Who lives and works in the area?
- Where are the houses, schools, stores, and businesses?
- Where are people going? On foot? On bikes? In cars? On the bus?
- Where are the parks and playgrounds? Natural forests, wetlands, or streams?
- Are there any beautiful views in the neighborhood?

Issues and Opportunities

- Where isn't it safe or fun to walk or bike?
- Where are more houses, schools, stores, or businesses needed?
- Where should there be more places to play? Walk the dog? Get to school?

4) Why is geography important to you?

Geography is important to me for three reasons—it helps me understand projects, communicate ideas, and get people to work together.

5) What kinds of geographic maps or tools do you use in your work?

Typically in my office, we start our background research on the internet using Google Maps. Then,

we use Geographic Information Systems (GIS) to prepare base maps and gather information about a project. If the project requires a more detailed design, we use AutoCAD. We then prepare analysis maps, typically using GIS and Adobe Illustrator. We also prepare a lot of hand sketches and 3-D models using SketchUp.

6) How do you decide which tools to use?

It depends on the project needs and what information is available. At a neighborhood, city, or regional planning scale, GIS and illustration tools are most useful to communicate information and generate ideas. Design projects demand a higher level of accuracy and lend themselves to AutoCAD. Hand sketches are great for rough drafts, quick illustrations, or to invoke a particular feel. If the project requires a greater contextual understanding, we'll build a 3-D model of the site and surroundings in SketchUp.

7) How would your skills help you in the event of a zombie apocalypse?[1]

Great question. We would employ our skills to develop a survival plan, with five areas of focus:

1. **Know Your Enemy.** Analyze zombie movement patterns to map existing behavior and predict future movement.

- Will they tend to move down unobstructed areas, like major roads?
- Are they attracted to population centers as their food source?
- Do they move toward bright lights? Loud noises?
- What areas are difficult for zombies to access? Rooftops? Underground?
- What barriers restrict zombie movement? Water bodies? Tall fences or walls? Hidden passageways?

1. **Retreat to Safety.** Map a network of "safe havens" for apocalypse survivors. We'd use geographic tools to identify areas likely to be safe from zombies.

- Away from zombie attractors (see above)
- Protected by zombie barriers (see above)
- With access to essential resources like clean water and food, shelter, fuel, weapons, etc.

1. **Help Your Friends.** Use maps to communicate safe haven locations and access routes to survivors. For example, the sketch below identifies safe haven islands in Seattle's Ship Canal between Lake Washington and Lake Union. This assumes zombies can't swim, have taken over downtown Seattle, and move most freely on highways and major arterials.
2. **Rebuild the World.** Once the safe haven network is established, rebuild a post-apocalyptic society.

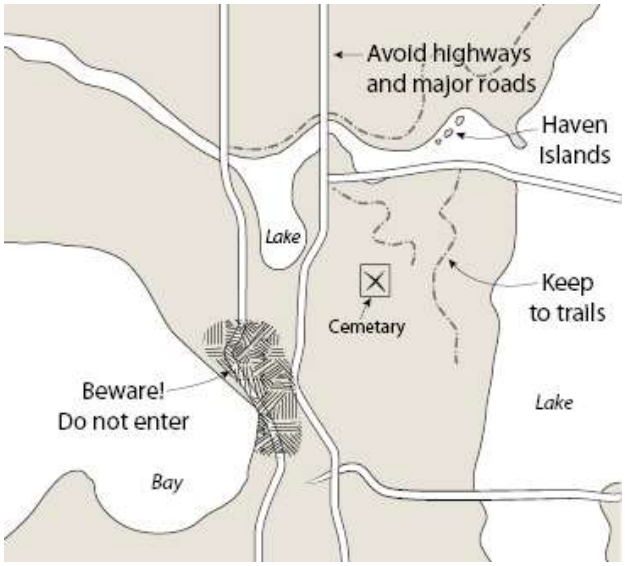
- Create a system to fairly distribute resources between the safe havens.
- Reduce dependence on resources that require trips outside the safe havens.

- Establish “urban agriculture” on rooftops, hanging from walls, behind fortress walls, etc.
- Develop a sustainable, renewable source of energy, harnessing solar, wind, water, ground source heat, etc.
- Focus on bicycle and other non-fuel dependent methods to move people around the safe haven network.

- Prevent zombie kills. Employ “zombie prevention through environmental design,” or “ZPTED” principles to create safe places. For example, if zombies are attracted to loud noises, strategically place loud noise-making devices to lure zombies away from safe havens, essential resources, and access routes.

1. **Play It Safe.** Prevent future zombie outbreaks.

- Develop a ZERP (Zombie Emergency Response Plan).
- Learn to recognize early stage outbreaks and identify, map, and limit exposure to conditions that lead to outbreaks.



1. What is his or her *job title*?

2. How does this person *use geography*?

3. What *kinds of questions* does this person try to answer?

4. What *tools* does this person use?

5. Would you want this person on your team of zombie apocalypse survivors? *Why?*

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1 Betsy Jacobsen, Wesley Kirkman, Rachel Miller, and Alex Wallace (MAKERS' urban design, planning, and Geographic Information System special forces team) helped answer this question. Graphic by Wesley Kirkman.

Geographer Interview 2

Yuko Caras, King County, WA

Read an interview of a real person who uses geography in his or her career. *Answer* the questions that follow. *Be ready to share* your answers and ideas!

1) What is your job title?

Senior GIS analyst (it is more like GIS specialist now for the work wise).

2) How would you describe what you do?

Currently I work with the Solid Waste, Parks and Airport Department for King County. I make paper maps, interactive online maps, and do analysis, depending on what my clients want.

3) How do you work with geography?

Overlay different information on top of each other and find answers.

4) Why is geography important to you?

Some things are difficult to conceptualize but easy to understand when you actually see it. Geography makes it easy to understand spatially and leads to making a good decision.

5) What kinds of geographic questions do you try to answer?

Analysis is interesting. One of my projects on and off has been estimating an amount of debris due to large earthquakes in the area. The solid waste department needs to plan temporary debris-dumping stations when big earthquakes hit the area. One part is to find property we can place debris on, and the other part is to figure how much debris we will have due to an earthquake. We found where the temporary debris-managing locations would be, considering landscape, environmental restrictions, accessibility, and capacity. We also have a software/system to estimate how much building debris will be produced by inputting epicenter and magnitude of earthquake.

6) What kinds of geographic maps or tools do you use in your work?

Predominantly Esri software in King County. (GIS)

7) How do you decide which tools to use?

Depends on your resources and questions. There are open-source GIS and free for use and share. If you are making simple maps or doing simple analysis, this is probably fine. If you are doing analysis, you do need some sort of GIS software, either Esri's or open source. If you are making a sophisticated map, you probably use some graphic software (i.e. Adobe Illustrator) after making a simple map and export to those formats to tweak.

8) How would your skills help you in the event of a zombie apocalypse?

You do need to understand the characteristics of zombies first. What they can do and what they can't. Once you have all that information, you can create a layer for each piece of information. For example, knowing how fast they move each day will create a buffer from where they are for each day until they get to you. The more information you have, the more accurate your map will be. I could overlay all those layers spatially and see where is the last place they reach and head there. Also I could place any objects to slow them down along the way, or place a barricade to protect [the] unharmed area before they come (because I will know how long it will take them to get there).

1. What is his or her *job title*?

2. How does this person *use geography*?

3. What *kinds of questions* does this person try to answer?

4. What *tools* does this person use?

5. Would you want this person on your team of zombie apocalypse survivors? *Why?*

Geographer Interview 3

Mary Ullrich, King County, WA

Read the interview of the real person who uses geography in his or her career. *Answer* the questions that follow. *Be ready to share* your answers and ideas!

1) What is your job title?

GIS specialist

2) How would you describe what you do?

I take information that has some sort of geographic component, like an address or coordinates, and analyze it to answer questions, and then put the results on a map.

3) How do you work with geography?

Geography is a way to study patterns on our Earth. We have data sets that represent features located in King County. They range from things we can see, like manholes, signposts, roads, sewer lines, and building footprints, to things we can't see, like parcel boundaries, sewer district boundaries, and school district boundaries. These data sets have location information that allows us to pin them to the Earth in a known place with a dimension. They also have attributes detailing size, length, name, and anything else we are interested in collecting about those features. Once these data sets are complete, I can start asking questions and analyze the resulting patterns.

4) Why is geography important to you?

I majored in geography because it was so interesting. While I did learn how to make a good map, the focus of the program was learning about the patterns that exist on our planet. Physical geography: Why do deserts and rain forests occur where they do? Cultural geography: Why do humans utilize land and resources in one part of the world differently than those in another part of the world. And how does that affect the planet? Economic geography: Where's the best place for a certain business? How are we using resources to meet our needs? Is growth good? I like what wiki.answers.com has to say about geography and why it is important: It helps us to know things around us and how to utilize them. It helps us to know places on Earth. It helps us to choose a career for living. It helps us to understand the way of life of other people.

5) What kinds of geographic questions do you try to answer?

Some examples are: Where do the people who speak Korean live? Where are all the five-year-olds? Where do the people using the park-and-ride lots live? What is the percentage of rural population in the school districts in King County. Where is the best place to put a wastewater treatment plant? Which areas in King County don't have access to healthy food? Who needs to be alerted to an upcoming construction project. Which roads meet the criteria for evacuation routes? Which properties are vulnerable to a flood? Which sewer lines are letting storm water into the

system, and what is the best way to fix this? Where are the vulnerable people and what is the best way to get them out in case of a flood? What's the best place for a coffee shop?

6) What kinds of geographic maps or tools do you use in your work?

I use a specialized software program called ArcGIS that lets me collect and manipulate data; query and analyze the data to answer questions; and it has a pretty good mapping component, so I can display the results of my analysis on a map. This program also has an online version that I'm starting to learn. Also I utilize Microsoft Office tools like Excel and Access. Finally I do some programming using a language called Python.

7) How do you decide which tools to use?

It depends on what I'm doing. Generally, I use ArcGIS for all my work. However, if I'm doing a lot of tabular analysis, I'll use Access. If I have a repetitive task, I'll build a model in ArcGIS and then transfer it to Python to make it possible to run in the background. People like spreadsheets, and often I have to transfer data to and from Excel, depending on what is needed.

8) How would your skills help you in the event of a zombie apocalypse?

Since my work requires a computer, my skills would be most useful in a planning phase. A few years ago, King County planned for a possible imminent disaster. The Howard Hansen Dam was compromised, and the event of a major flood on the Green River was a reality. We spent several months helping folks around King County identify what resources and people were at risk and how to mitigate that risk. We identified where people with disabilities were and figured out evacuation routes for them, we identified properties at risk and installed sandbags to protect them, we made maps identifying areas of greatest risk and evacuation routes so folks would have paper copies available when needed. The state department of transportation brought in small platforms so they could raise their equipment above flood level without having to move it.

For the zombie apocalypse, I'd want to know where the zombies are and how fast they are moving; what areas are defensible and will provide the resources I need to survive (food, water, shelter); how I would get to those areas; who has the supplies I need, like weapons, food, maps, compasses, fuel, et cetera, while I travel to those areas. I'd also like to know who offers survival classes, including weapons training, wilderness survival, and how to keep a vehicle running on chewing gum and wire.

1. What is his or her *job title*?

2. How does this person *use geography*?

3. What *kinds of questions* does this person try to answer?

4. What *tools* does this person use?

5. Would you want this person on your team of zombie apocalypse survivors? *Why?*

Geographer Interview 4

Roger White, Department of Geography, Memorial University of Newfoundland

Read the interview of the real person who uses geography in his or her career. *Answer* the questions that follow. *Be ready to share* your answers and ideas!

1) What is your job title?

Honorary research professor.

2) How would you describe what you do?

Mostly I develop computer-based models of geographical systems, working with a team at the Flemish Institute for Technological Research, in Belgium. I develop and test the models, while the people I work with program them and prepare data necessary to run them.

What are these models?

Most of them predict the future changes in land use in cities and regions. Some of the more recent ones also predict the changing locations of where people live and work. Examples of output maps are shown below. These predictions are spatially very detailed; often the resolution is 100 or 200 metres. These models are being used in Belgium, Ireland, The Netherlands, France, and Puerto Rico, among other places.

I also supervise graduate students (mostly PhD level) at my home university, Memorial University of Newfoundland, in Canada, and co-supervise graduate students at several other universities in Canada, Belgium, The Netherlands, and France. I used to teach urban, economic, and theoretical geography at Memorial University.

3) How do you work with geography?

I try to create a new way of doing geography. Geography is a very old field, going back at least to Ptolemy, who devised the first scientific map projection. But geographers have mostly been content to describe the world by writing about it, mapping it, or photographing it from the air or from space. When we look at the geography of the Earth—the agricultural areas, the location of the cities, the way they grow, the changes in the transportation networks as the years go by, we must wonder what causes these patterns, and the changes in them that we see over the years. Theoretical geography seeks to explain the processes that generate the geography that we live in. If we understand the processes, then we can predict what the geography of our world will be like in the future. Not only that, we can predict the effect of some of our actions. For example, if we build a new highway connecting two cities, how will that change the pattern of growth in the region over the next twenty-five years? Do we like the long-term effects of the road? Would the

impact be better if it were built following a different route? Or if it were not built at all? The models help us make better decisions by giving us some idea of what the long-term impacts of our projects will be. If we don't like the predicted effects, we can change the plan.

4) Why is geography important to you?

Geography is important to me because I want to understand why the world is the way it is. Also, I want to be able to provide tools that will be useful for planners and other decision makers who are intervening in a practical way with actions that will affect the future geography for better or worse.

5) What kinds of geographic questions do you try to answer?

I try to answer the basic geographical questions of why things are where they are, whether they will stay there, and if not, where will they move to. Being able to answer these questions allows many practical problems to be solved. For example, being able to predict where growth will occur permits us to know where we will need to build infrastructure like roads, schools, and hospitals. It also allows businesses to plan where they can most profitably locate new facilities like power centers, supermarkets, or coffee shops.

We sometimes develop geographic modeling tools for other kinds of systems. For example, we have developed a model of the lobster fishery, which can be used to test the impact of possible regulations. This is more efficient [than] testing the regulations by imposing them and then seeing what their effect is.

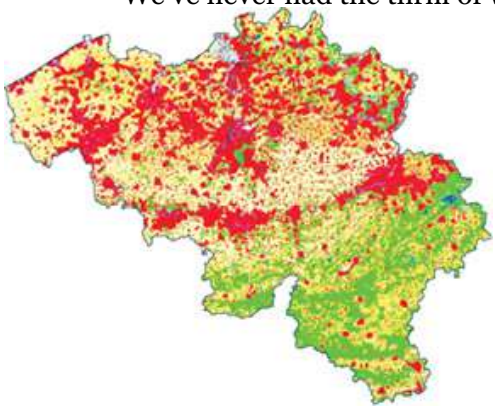
6) What kinds of geographic maps or tools do you use in your work?

I use maps of many sorts as inputs to the models: maps of the topography (digital elevation map), maps of transport networks (roads of various categories, commuter rail, light rail transit), land use and land cover maps, zoning maps, population density maps, employment maps, etc. Many of these maps are generated or pre-processed using a GIS (Geographical Information System). For testing the models, I use several types of pattern analysis tools (statistical techniques), as well as fractal analysis. All of these maps and tools are used in our work of creating new geographical tools that can be used by businesses, transportation engineers, urban planners, and emergency response personnel.

7) How do you decide which tools to use?

We use whichever tools we can find that allow us get the results we want. How do we find them? We do Google searches. We go to conferences and workshops and talk to others to keep up to date on new tools that are being developed. Frequently we must develop our own tools because no one else has yet done so. For example, we have developed several new statistical tools for pattern analysis of maps so that we can better understand the performance of the models we are developing.

8) How would your skills help you in the event of a zombie apocalypse?



Predicted land use in Belgium, 2060.

The greater Dublin, Ireland, area: predicted population density in the year 2050.

We've never had the thrill of working with an actual zombie apocalypse. But in collaboration with a team at Los Alamos National Labs, we did once work with a disaster scenario for Los Angeles, where the city was destroyed by a mega-earthquake on an unknown fault. In this project, we got together with a group of seismologists who with supercomputers could predict the pattern of destruction in the L.A. area in real time, and the resulting scenarios were fed to representatives of the utilities (gas, electric, water), Caltrans (freeways and traffic), and local emergency response organizations. Our geographical software was used to let the participants practice coordinating their responses so that they could learn to work together rather than at cross-purposes. It was also used to show how, in the longer term, the pattern of development in the L.A. area could be guided to lessen the impact of a giant earthquake. Zombies would be an interesting add-on to the software, since they would multiply rapidly in a disaster situation, and diffuse rapidly to cause problems even in relatively undamaged areas.

1. What is his or her *job title*?

2. How does this person *use geography*?

3. What *kinds of questions* does this person try to answer?

4. What *tools* does this person use?

5. Would you want this person on your team of zombie apocalypse survivors? *Why?*

Geographer Question Design

Show That You Can Think Like a Geographer!

You have heard some examples of the real questions people try to answer with geography.

- *Create* your own *question* about the world.
- *Explain* why you would like to ask that question.
- *Decide* which kinds of *geographic tools* you would use to answer this question.
- *Explain* why you would use those tools.
- *Remember:* Try to think of a question that requires *geographic concepts* to find an answer.

1. What *question* would you try to answer using *geographic concepts*?

2. *Why* would you choose this *question*?

3. What *tools* would you use to help find answers for this question?

4. *Why* would you choose these *tools*?

Lesson 2—Different Types of Maps

Different Types of Maps

What Are the Different Types of Maps Geographers Use?

Geographers definitely use maps, but there are *different kinds of maps*. Read on to learn about different maps and their uses.

Some Maps Geographers Use

Physical Map

A physical map shows the *features* of an area, such as mountains, rivers, and lakes.

These maps usually use color to show the different landforms.

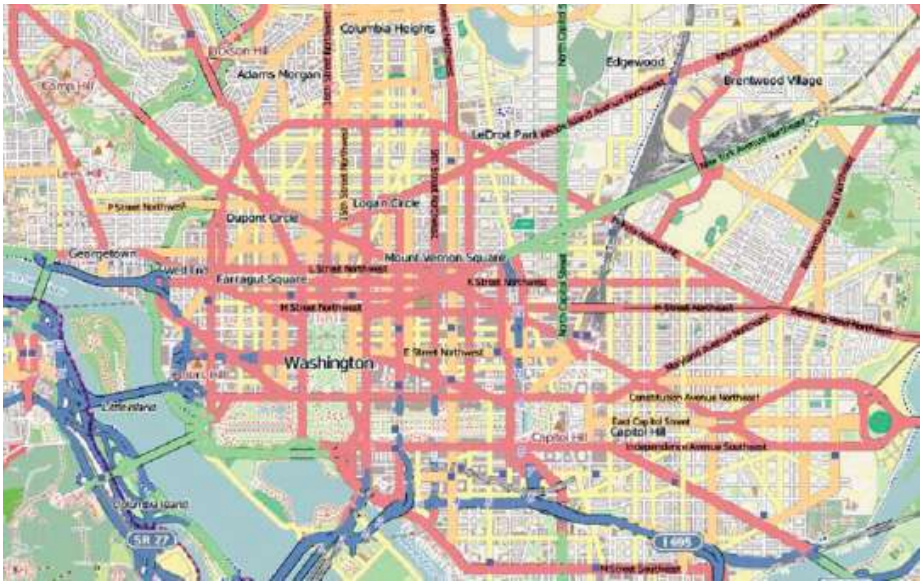
The map below is a physical map of the United States. In this map you can see mountain ranges, rivers, lakes, and oceans.

Road Map

A road map shows major highways, airports, cities, railroad tracks, and local points of interest.

Road maps are most suitable for people who are trying to figure out driving directions. Road maps can have different scales, showing all the streets in a city or even all the highways in a country.

The map below is a road map of Washington, D.C. It shows some of the major roads and locations.



Political Map

A political map shows countries, borders, or major cities.

This kind of map doesn't usually show physical features like mountains. A political map of the U.S. would show state boundaries, capitals, and major cities.

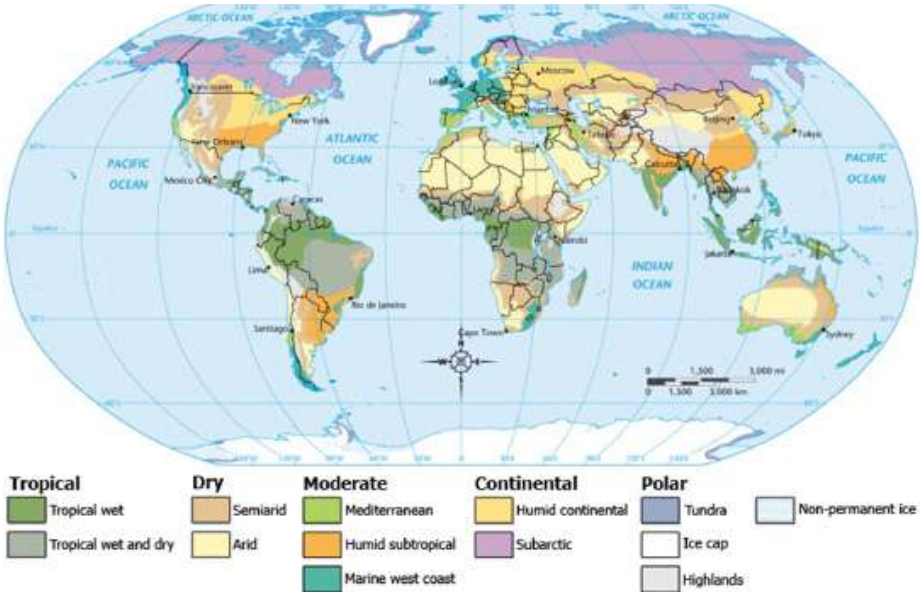
The map below is a political map of the world. It shows country names and borders.

Climate Map

A climate map shows the *average weather* of a region.

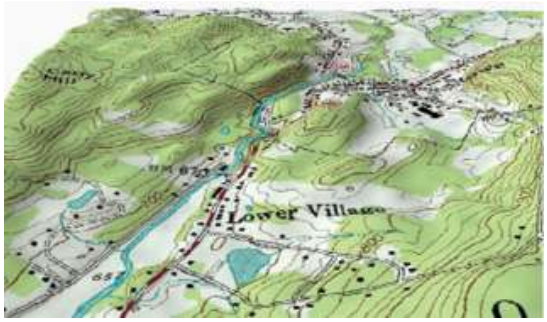
These maps show the different types of climate a region may have. A common way to classify climates is to use average precipitation and temperature.

The map below is a climate map of the world. In this map you can see regions of the world divided into several different climates, designated by color.



Map by Waitak and Splette on Wikimedia Commons, File:ClimateMap_World.png. CC BY-SA 3.0 and the GNU Free Documentation License, Version 1.2 or any later version.

Topographical Map



Map by Kbh3rd on Wikimedia Commons, File: Topographic-Relief-perspective-sample.jpg, CC BY-SA 3.0 and the GNU Free Documentation License, Version 1.2 or any later version.

A topographical map includes *contour lines* to show the *elevation,* or height, of an area.

The closer together the contour lines are, the steeper the land is.

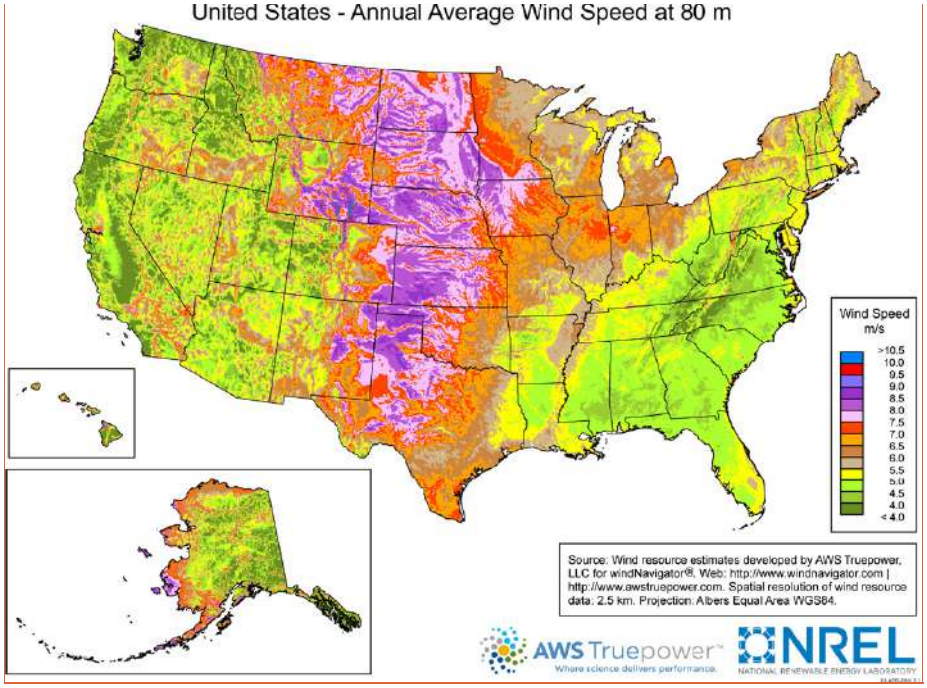
The map above is a topographical relief map of Stowe, VT. Stowe is a popular destination for skiing. With this map, you can distinguish steep hills from flatter land.

Resource Map

A resource map shows the distribution of various *resources*.

Resources (such as minerals, lumber, and agriculture) are not distributed equally around the world. Resource maps help to show the amount of resources in an area.

The map below is a wind resource map of the United States. This map shows the average wind speeds for an entire year. Colors show the different amounts of wind each area gets. This would be useful for determining where to place tall wind turbines to generate electricity.

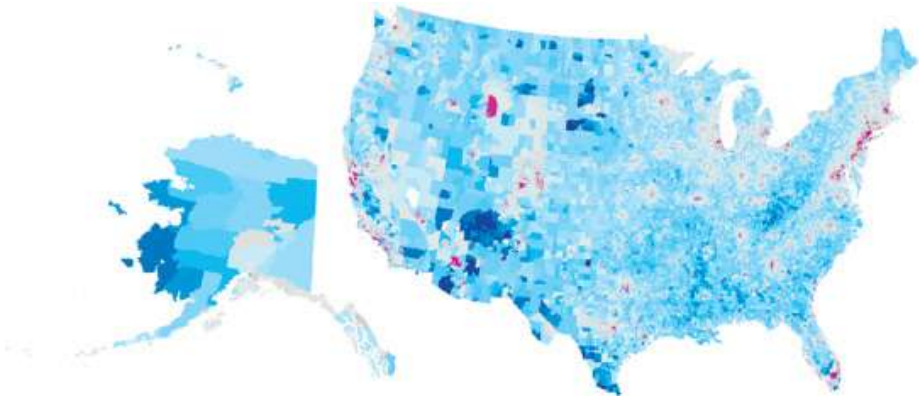


Economic Map

An economic map shows information about *wealth* and money.

Just as resources are not distributed equally, wealth or money are not distributed equally either.

The map below is an economic map of the United States. This map shows the amount of money in different regions. The data or information to make this map came from the U.S. Census Bureau. The Census Bureau does a big survey (the census) of all U.S. citizens every 10 years.



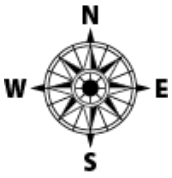
Map Elements

What Are the Important Parts of a Map?

Maps are very helpful tools. Map elements are the parts of a map that make it easier to read. Almost all maps use most of these elements. The basic elements of a map are *direction*, *scale*, *symbols and legend*, *labels*, and *grid and index*.

Common Map Elements

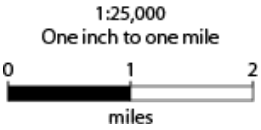
Direction



Direction is shown on a map by using a compass rose. The compass rose shows the directions of the map so that map readers can relate those directions to the real world.

Sometimes a compass rose will just show *North*. If you know which way North is, you can figure out *East, West,* and *South*.

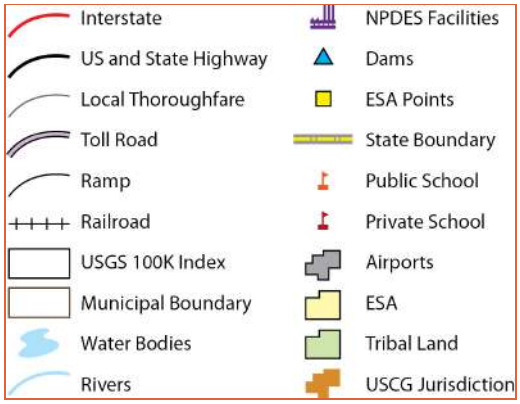
Scale



Scale shows the *distance* measurements on the map. If a map is *to scale*, map readers can measure parts of the map to calculate accurate distances in the real world.

Scale can be displayed *numerically, verbally,* or *graphically*.

Symbols and Legend



Map legend produced by the EPA Region 1 GIS Center on April 20th, 2006.

Symbols are graphics that represent something on a map. They can be a dot, a line, shape, or an icon that looks similar to what it represents.

Symbols are identified in the *legend*. The legend is usually a small box in a corner or on the side. It includes the symbols and their meanings. It is also referred to as the *key*.

Labels are the words that identify a location. They may show something with a specific name (streets or rivers).

Labels can also be used to represent something if there is only one of it, instead of making up a symbol to just represent one thing.

Map courtesy of the National Park Service.

Grid and Index

Not all maps use a grid and index, but it is very useful if the map will be used to find locations. A grid and index is common in an atlas and on road maps.

A grid is a series of horizontal and vertical lines running across the map. Sometimes maps will use *latitude and longitude*, but smaller maps use a more basic grid with numbers and/or letters.

The index helps the map reader find a specific location by following the numbers and letters in the grid.

Notice that the index is in *alphabetical order*, so it is easy to look up the name of the place.

Follow the *coordinates* (A2, B3, etc.) next to the location's name to find the location on the map.

Index

- Española—C3
- Fernandina—A2
- Genovesa—C1
- Isabela—B2
- Marchena—B1
- Pinta—B1
- San Cristobal—D2
- San Salvador—B2
- Santa Cruz—C2
- Santa Fe—C2
- Santa Maria—C3

The map of the Galápagos Islands above uses a grid and index.

Map Use Question Assignment

Which Map Would You Use to Answer These Questions?

Read the scenarios below. Determine *which type of map* you would use to help you solve the problem. *Explain your answers.*

1. You need to plan a delivery route for a trucking company that delivers furniture. What kind of map do you use and why?

2. You are buying some land to build a house. You want to make sure that the land is not too steep to build on. What kind of map do you use and why?

3. It is the zombie apocalypse, and you are trying to find a location to rebuild a city. You want to make sure you will enjoy the weather all year round. What kind of map do you use and why?

4. You are gathering intelligence for the CIA. You are required to describe the landforms of a country. What kind of map do you use and why?

5. It is still the zombie apocalypse, and you are still trying to find a location to rebuild a city. You want to make sure you choose somewhere that has all the resources you need. What kind of map do you use and why?

6. You are planning a trip to another continent. You want to see which countries you might be able to visit on your trip. What kind of map do you use and why?

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Lesson 3—Map Elements

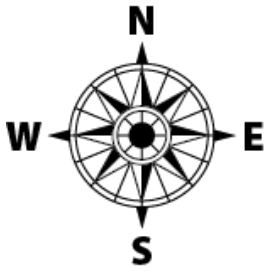
Map Elements: Extended

Direction: How to Represent Direction

The compass rose shows how the direction on a map relates to the direction in the real world. The compass rose uses directions such as North, South, East, and West. A compass rose is very important when maps are used to travel or find directions to somewhere.

Examples

A compass rose may show the four cardinal points of North, South, East, and West. Sometimes it will show intermediate points, such as Northeast, Southeast, Southwest, and Northwest.



Sometimes only North will be given on a map. For this reason, it is very important for us to be able to determine which directions are West, East, and South, based on just North.

Some *important things* to keep in mind when making a compass rose:

- It needs to be accurate.
- North is not *always* "up" on a map.
- Display of scale should be clear.
- As you plan your map, think where you will place the compass rose.
- Consider the design of your compass rose.
- Look at other compass roses for ideas.

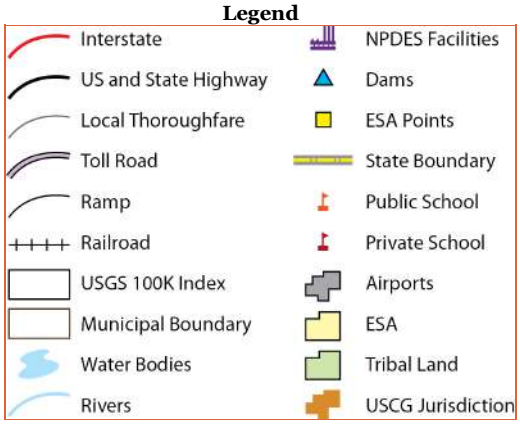
A *quality* compass rose is easy to find and clear to read. It is also accurate.

A *high-quality* compass rose will often not just be clear but creative as well. The style of the compass rose may match the style of the map.

Key and Legend: How to Create a Quality Key and Legend

The legend or key is the place on the map that shows the important information needed to be able to understand the map. The legend most often includes the definitions of *symbols* used on the map, but sometimes it will also include the scale or compass.

Examples



Map legend produced by the EPA Region 1 GIS Center on April 20th, 2006.

Without a legend or key, a map reader may have a very difficult time understanding what all of the symbols mean.

Some *important things* to keep in mind when making a legend or key:

- Be clear.
- Include examples of the symbols.
- Label as “Legend” or “Key.”
- Consider using a small border to separate it from the rest of the map.
- Remember to include all the symbols your map uses.
- As you plan your map, think about the space you will need for a legend.
- Consider typing the text in your legend.

A *quality* legend or key is easy to find and clear to read. It shouldn’t be so large that it distracts from the rest of the map, but it shouldn’t be so small that it is hard to find or read.

A *high-quality* legend or key will often not just be clear but creative as well. The style of the legend might match the overall style of the map.

Image courtesy of the U.S. Fish and Wildlife Service.

Map Grid: How to Create a Quality Map Grid

The map grid is a set of vertical and horizontal lines overlaid on the map. Not all maps use a *grid and index*, but it is very useful if the map will be used to find locations. A grid and index is common in an atlas and on road maps. Sometimes maps will use *latitude and longitude*, but smaller maps use a more basic grid with numbers and/or letters.

Example

A location on a map can be identified by following the intersection of the rows and columns. If a mapmaker wants to display where *San Salvador* is, the mapmaker would look at the top and side of the map to see that it is in the grid where *B* and 2 intersect. In the *index*, San Salvador would be listed as B2.

Some *important things* to keep in mind when making a map grid:

- Be clear.
- Make the grid lines light enough to still be able to read the map.
- Consider using a lighter color for the grid lines.
- Label the top, bottom, and sides of the grid.
- Use a ruler to measure out the grid spacing before drawing the lines.

A *quality* grid is easy to understand and clear to read. It shouldn't be so large that it distracts from the rest of the map.

A *high-quality* grid will have appropriate spacing between grid lines. The lines will also be straight, even, and not distracting.

Map Index: How to Create a Quality Map Index

The map index helps the map reader find a specific location. A map with an index often uses a grid. The reader can look at the index for a listing of locations contained on the map.

Example

Notice that the index is in *alphabetical order*, so it is easy to look up the name of the place.

The numbers next to the names of the cities are *coordinates*. These help the map reader find the city by using the map grid.

Some *important things* to keep in mind when making a map index:

- Be clear.
- Make the list in *alphabetical order*.

Index

- Española—C3
- Fernandina—A2
- Genovesa—C1
- Isabela—B2
- Marchena—B1
- Pinta—B1
- San Cristobal—D2
- San Salvador—B2
- Santa Cruz—C2
- Santa Fe—C2
- Santa Maria—C3

- It is best to type the index and then apply it to a map.
- Label the index.
- While planning your map, consider where you will place the index.

A *quality* index is easy to understand and clear to read. It is in alphabetical order, typed, and has an appropriate-size font.

A *high-quality* index includes all important locations and features. It is also organized and blends in well with the map. It is not distracting, but should be easy to find and easy to read.

Scale: How to Represent Scale

The scale shows the map reader how the distance on the map compares to the distance in the real world. If a map is to scale, real-world distances can be calculated using the map. If a map is *not to scale*, you could use a map to find where something is, but not exactly how far. For example, on a map of stores in a mall, you may not care how many feet away your favorite store is; you probably just care about going in the right direction.

Examples

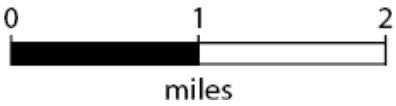
Numerical

Scale is shown as a ratio. In this scale, every 1 foot on the map equals 25,000 feet in the real world. Maps that show large areas (world maps) often use numerical scale.

Verbal

This scale tells you how the measurements on the map match the real world. If you measure 3 inches on the map, it is 3 miles in reality.

Graphical



With a graphical scale, a distance is placed on the map and converted to real-world distance.

Some *important things* to keep in mind when making scale:

- It needs to be accurate.
- Include the unit of length if using verbal or graphical (miles, feet, etc.).
- If a map is going to be "to scale," it must match the real world.
- Display of scale should be clear.
- As you plan your map, think of the space you will use to place your scale.
- Consider typing the scale or use a ruler when making a graphical scale.

A *quality* scale is easy to find and clear to read. It is also accurate.

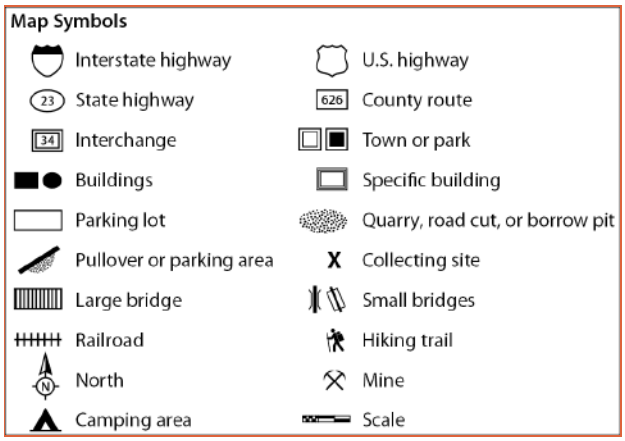
A *high-quality* scale will often not just be clear but creative as well. The style of the scale might match the overall style of the map.

Symbols and Labels: How to Represent Places

Symbols and labels help the reader to identify important locations or information on a map. Symbols are graphics that represent something on a map. Symbols can be simple shapes, colors, patterns, or icons. Labels are words that identify something. Labels can show the name of a street, city, or river. Sometimes symbols have a label.

Examples

The mapmaker decides on what symbols are used on the map, but they are explained in the key or legend.



A label simply provides the words to identify a specific place on a map. When there are multiple cities, rivers, or other places, labels are helpful.

Some *important things* to keep in mind when making symbols and labels:

- Symbols and labels should be clear.
- Symbols should be distinct enough that they aren't confused with other symbols.
- Only provide labels and symbols for parts of the map that are important to the reader.
- As you plan your map, think of what you need to label or identify.
- Look at other maps for symbol ideas.

Quality symbols and labels are easy to spot and clear to understand.

High-quality symbols and labels will often not just be clear but creative as well. The style of the symbols may match the style of the map.

Map Elements Poster Directions

Note: The following *Zombie Based Learning* activity may work best when conducted either entirely in a classroom setting, or with only some of its elements adapted for Active Classroom. Please ask your teacher for instructions to complete this activity, if it is assigned to you.

Create a Poster Explaining Your Map Element

Read the section describing your map element. Then, in the discussion forum, *discuss* the element as a group to answer the following questions. *Create* a poster about your element and be ready to share!

1. What is your group's *map element*?
2. What is the *purpose* of this map element?
3. Why is this map element *important*?
4. How do you make a *clear* and *quality* example of this element?
5. When would a map *not need* this element?

Create your poster

Your poster must include:

- The *name* of the element
- A *large example* of the map element
- The *definition* and *purpose* of the element
- Tips on how to make a *very high quality* example

Map Elements Blank Map Exercise

Click here to download the PDF needed to complete this exercise. (https://active.socialstudies.com/active_reader/download/INT3801/INT3801_blankmapexercise.pdf)

Upload your completed map to this lesson when you are finished, unless instructed otherwise by your teacher.

Map Design Exit Ticket

Show Your Thoughts on Map Design

You have learned about the important parts of a map. *Reflect* on what you have learned. *Consider* what you still want to know. *Answer* the questions below.

1. Can you *make* your own map from scratch?

2. What other *tools* or *materials* would help you make a map?

3. What is your *favorite element*? Why?

4. What else do you *need to know* in order to make your own map?

Lesson 4—Intro to Analyzing Spatial Relationships

Analyzing Spatial Relationships

How Do We Understand How Places Relate?

Analyzing means to look at something very closely, within the details, in order to understand it more.

Spatial Relationships are how different spaces relate.

We *analyze spatial relationships* so that we can better understand how different places affect each other.

Steps to Analyzing Spatial Relationships

1. Structures

Structures mean the places or things that you are analyzing.

The first step is to *choose the two places* you will analyze. These might be two cities, countries, neighborhoods, schools, parks, or anything on the map.

You will often choose your structures based on the geographic question you are asking.

If you are asking, "How did the zombie virus spread from *this* city to *that* city?" you have already chosen your two structures.

2. Relationships

Relationships are what connects the two structures.

The *second step* is to *identify any connections* between the places. If it is two cities, maybe the relationship is a highway or a river, or maybe they are right next to each other and share a border.

Relationships are the actual connections that exist between the two structures.

When researching zombies, imagine that there may be a busy highway between two cities. Could a zombie or infected person easily travel on that connection?

3. Processes

Processes are the patterns that happen across that relationship.

The *third step* is to *analyze what happens* across that connection. If it is a highway, maybe people commute from one city to the other for work. Processes or patterns can include geographic concepts such as migration.

It is helpful to ask questions when analyzing processes. What commonly happens along this connection between these two points? Do people, goods, or ideas move? How?

If you are analyzing zombie outbreaks, try to think about the patterns that are helping zombies travel and move along this relationship.

To Simplify

1. Find a place and find the other.
2. What connects them?
3. What moves and how?

Spatial Relationship Analysis Exit Ticket

Show What You've Learned About Spatial Relationship Analysis

You have learned about analyzing spatial relationships. *Consider* what you have learned. *Answer* the questions below.

1. What is *analyzing*?

2. *Why* do we analyze?

3. What are *spatial relationships*?

4. *Why* do we analyze spatial relationships?

Lesson 5—Structures: Identifying Cities

Spatial Relationship Analysis Step 1

This lesson takes on step 1 of analyzing spatial relationships. Your task is to choose locations to analyze. You will identify major cities on your map project (which you started in Lesson 3). These cities or structures will become clear parts of the analysis through the next few lessons of Project 01.

Your goal will be to analyze the relationships between places with zombie attacks and places near zombie attacks, in order to figure out how the zombie outbreak is spreading and which places should be warned first.

To complete this lesson, you will need the following:

- Atlases or a country map (try an online source like www.worldatlas.com)
- Your map project
- Satellite night photo (provided in this lesson)
- Largest Cities per Region list (provided in this lesson)

1. First, review the steps from Lesson 4 for analyzing spatial relationships: structures (places), relationships (connections), and processes (patterns or movement).
2. Next, view the satellite night photo. This photo is a satellite image of the United States taken from space. (Wikipedia has a good article on satellite imagery and its many uses: http://en.wikipedia.org/wiki/Satellite_imagery.) You'll use this satellite photo to plot places on your map.
3. Now, choose the places you want to plot on your map, based on the satellite photo. You'll need to plot a minimum of 7 cities. Use an atlas, a country map, or the Internet to look up locations of your cities to make sure you're placing them accurately. View the Largest Cities per Region list to assist you in picking out major cities to plot, based on region.
4. Upload your completed map assignment to this lesson.

Satellite Night Photograph

Use this image to complete this lesson.

United States of America at night. Image courtesy of NASA

Largest Cities per Region list

Use this list to complete this lesson.

Largest Cities per Region Teacher Reference			
Regions	**Largest Cities**	**Regions**	**Largest Cities**
West	1. Los Angeles 2. San Diego 3. San Jose 4. San Francisco 5. Seattle 6. Denver 7. Portland 8. Las Vegas 9. Fresno 10. Sacramento	**Southeast**	1. Jacksonville 2. Charlotte 3. Memphis 4. Nashville 5. Louisville 6. Virginia Beach 7. Atlanta 8. Raleigh 9. Miami 10. New Orleans
Southwest	1. Houston 2. Phoenix 3. San Antonio 4. Dallas 5. Austin 6. Fort Worth 7. El Paso 8. Oklahoma City, OK 9. Albuquerque 10. Tucson	**Northeast**	1. New York City 2. Philadelphia 3. Boston 4. Baltimore 5. Washington, D.C. 6. Pittsburgh 7. Newark 8. Buffalo 9. Jersey City 10. Rochester

Midwest	1. Chicago 2. Indianapolis 3. Columbus 4. Detroit 5. Milwaukee 6. Kansas City, MO 7. Omaha 8. Cleveland 9. Minneapolis 10. Wichita		

Lesson 6—Relationships: Examining Connections

Spatial Relationship Analysis Step 2

This lesson takes on step 2 of analyzing spatial relationships. Your task is to identify relationships or connections between the structures (cities). Your goal is to find highways or major roads that connect the cities you plotted on your map in Lesson 5.

Your goal will be to analyze the relationships between places with zombie attacks and places near zombie attacks, in order to figure out how the zombie outbreak is spreading and which places should be warned first.

To complete this lesson, you will need the following:

- Atlases or a country map (try an online source like www.worldatlas.com)
- Your map project from Lesson 5

For this activity, you will plot highways between major cities on your map, as well as other spatial relationships you've learned about.

1. First, find the major connections between the cities on your map. Some could be water or railroads, but almost all have major roads. What do you think the biggest roads or highways are connecting, on your map?
2. Next, display these major connections on your map. Try to use as many of the map symbols you've learned about to display these connections accurately.
3. Upload your completed map assignment to this lesson.

Lesson 7—Processes: What Moves and How?

Spatial Relationship Analysis Step 3

In this lesson, you'll learn about the concepts of diffusion and migration—two examples of processes that occur in spatial relationships. For this lesson's activity, you'll use these concepts to analyze the connections between the cities you plotted on your map in Lesson 5, and then rate the ability of those connections to facilitate movement.

Your goal will be to analyze the relationships between places with zombie attacks and places near zombie attacks, in order to figure out how the zombie outbreak is spreading and which places should be warned first.

To complete this lesson, you will need the following:

- Atlas or a country map (try an online source like www.worldatlas.com)
- Your map project from Lesson 6
- Major Connections Sheet

First, you need to understand the concepts of diffusion and migration. *Diffusion* is the spread of ideas, disease or technology. *Migration* describes a group that moves: This concept can apply to people, animals, and, of course, zombies! Keep these concepts in mind as you complete the Lesson 7 activity: You will rate the different connections between locations—specifically which ones the zombies are most likely to move across.

Examine the connections on your map that you plotted in Lesson 6. Do people move across any of these connections? How? Why? How often? For example, people often move from major cities to suburban neighborhoods for work or commuting. People also move for connections other than work, including entertainment, supplies, tourism, family, travel, and so on.

- For this activity, use the Major Connections Sheet to list the most important connections on your map. These connections should be the busiest, strongest connections that people move across (note: These might be the most likely connections for zombies to move across, as well!).

Major Connections Sheet

Describe the connections on your map. Rate each connections from 1–10: A 10 means it is very busy and lots of processes move across this connection. A 1 means it doesn't facilitate movement.

1. Connection:

   _____

   Rate the connection: _____

2. Connection:

   _____

   Rate the connection: _____

3. Connection:

   _____

   Rate the connection: _____

4. Connection:

   _____

   Rate the connection: _____

5. Connection:

   _____

   Rate the connection: _____

6. Connection:

   _____

   Rate the connection: _____

7. Connection:

   _____

   Rate the connection: _____

8. Connection:

   _____

   Rate the connection: _____

9. Connection:

   Rate the connection:

10. Connection:

    Rate the connection:

11. Connection:

    Rate the connection:

12. Connection:

    Rate the connection:

13. Connection:

    Rate the connection:

14. Connection:

    Rate the connection:

Lesson 8—Using Maps To Answer Questions and Show Data

Plotting the Zombie Attack Data

In this lesson, you will record Zombie Attack Data and apply it to your map. You will finalize your map and place all the map elements. Next, you will write a short description of where you think the next zombie attacks will occur.

Your goal will be to analyze the relationships between places with zombie attacks and places near zombie attacks, in order to figure out how the zombie outbreak is spreading and which places should be warned first.

To complete this lesson, you will need the following:

- Atlas or a country map (try an online source like www.worldatlas.com)
- Your map project from Lesson 7
- Downloadable Zombie Attack Data Tracking Sheet

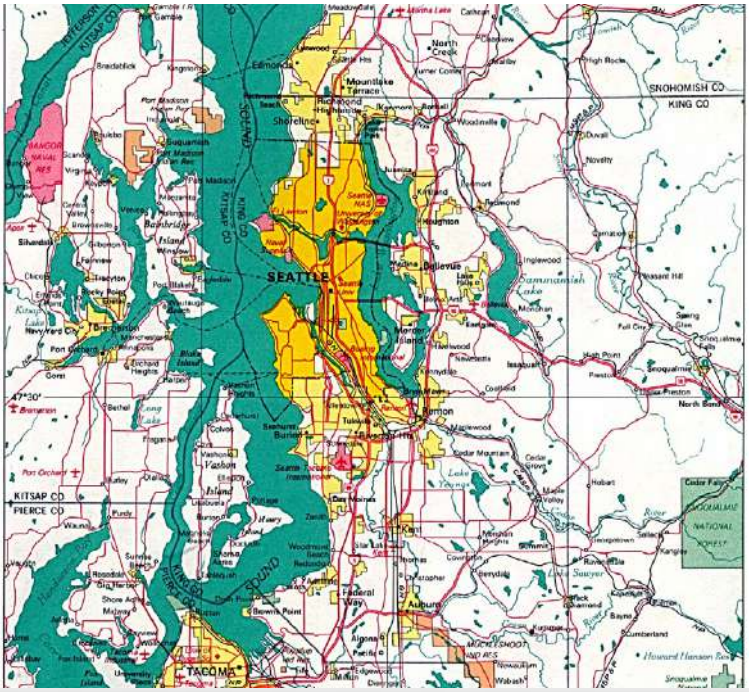
Now it's time to use your new geography skills to predict the directions that the zombie apocalypse is spreading in. Follow the instructions below:

1. Download the Zombie Attack Data Tracking Sheet.
2. Copy down the Zombie Regional Attack Data into your Zombie Attack Data Tracking Sheet.
3. Next, plot the Zombie Regional Attack Data onto your map to show when, where, and how many zombie attacks have occurred.
4. Next, answer the Next Zombie Attack Questions about where the most likely locations for future zombie attacks on Day 5 and Day 6 will be, and why.
5. Finally, upload your completed map to this lesson. Then complete the Post-Assessment Quiz to finish Project 01.

Click here to download a PDF of the Zombie Attack Data Tracking Sheet. (https://active.socialstudies.com/active_reader/download/INT3801/INT3801_zombieattackdatatracking.pdf)
Use this PDF and the Zombie Attack Data below to track the location and number of zombie attacks.

Regional Maps and Attack Data

Use the following maps to help get a feel for the areas you will be investigating. All Zombie Attack Locations can be found on these maps.



California Zombie Attack Data—Reports for 4 Days of Zombie Attacks

This data shows the first 4 days of zombie attacks in California.

Day 1

- One attack in Los Angeles

Day 2

- Five attacks in Los Angeles
- Two attacks in Santa Clarita
- One attack in Anaheim

Day 3

- Twenty-seven attacks in Los Angeles
- Eleven attacks in Santa Clarita
- Seven attacks in Anaheim
- Three attacks in Bakersfield
- Four attacks in Oceanside
- Two attacks in Riverside
- Three attacks in Oxnard

Day 4

- One-hundred thirty-two attacks in Los Angeles
- Fifty-seven attacks in Santa Clarita
- Forty-two attacks in Anaheim

- Twelve attacks in Bakersfield
- Eighteen attacks in Oceanside
- Eleven attacks in Riverside
- Sixteen attacks in Oxnard
- One attack in Fresno
- Five attacks in San Diego
- Two attacks in Barstow
- Two attacks in Santa Barbara

Northeast Zombie Attack Data—Reports for 4 Days of Zombie Attacks

This data shows the first 4 days of zombie attacks in the Northeast U.S.

Day 1

- One attack in New York City

Day 2

- Five attacks in New York City
- Two attacks in Trenton, NJ
- One attack in Bridgeport, CT

Day 3

- Twenty-seven attacks in New York City
- Eleven attacks in Trenton, NJ
- Seven attacks in Bridgeport, CT
- Three attacks in Philadelphia, PA
- Four attacks in Hartford, CT
- Two attacks in Parsippany, NJ

Day 4

- One-hundred thirty-two attacks in New York City
- Fifty-seven attacks in Trenton, NJ
- Forty-two attacks in Bridgeport, CT
- Nineteen attacks in Philadelphia, PA
- Eighteen attacks in Hartford, CT
- Eleven attacks in Parsippany, NJ
- Six attacks in Wilmington, DE
- Five attacks in Springfield, MA

- Two attacks in Providence, RI
- One attack in Hazleton, PA

Washington Zombie Attack Data—Reports for 4 Days of Zombie Attacks

This data shows the first 4 days of zombie attacks in Washington State.

Day 1

- One attack in Seattle

Day 2

- Five attacks in Seattle
- Two attacks at Seattle-Tacoma International Airport
- One attack in Shoreline

Day 3

- Twenty-seven attacks in Seattle
- Eleven attacks at Seattle-Tacoma International Airport
- Seven attacks in Shoreline
- Three attacks in Federal Way
- Four attacks in Edmonds
- Two attacks in Bellevue
- Three attacks in Tacoma

Day 4

- One-hundred thirty-two attacks in Seattle
- Fifty-seven attacks at Seattle-Tacoma International Airport
- Forty-two attacks in Shoreline
- Twelve attacks in Federal Way
- Eighteen attacks in Edmonds
- Eleven attacks in Bellevue
- Sixteen attacks in Tacoma
- One attack in North Creek
- Five attacks in Redmond
- Two attacks in Bainbridge

Next Zombie Attack Questions

Show Your Thoughts On Future Zombie Attacks

You have received the data on recent zombie attacks. *Analyze* the spatial relationships between places that have been attacked. *Answer* the questions below.

1. Where do you think will be attacked on Day 5?

2. *Why*?

3. Where do you think will be attacked on Day 6?

4. *Why*?

Post-Assessment Quiz

1. What is *geography*?

2. What is *migration*?

3. What is *diffusion*?

Describe the following tools and give an example of when this tool would be used:

4. Map

5. Globe

6. Aerial Image

7. Satellite Photograph

8. Infographic

9. GIS