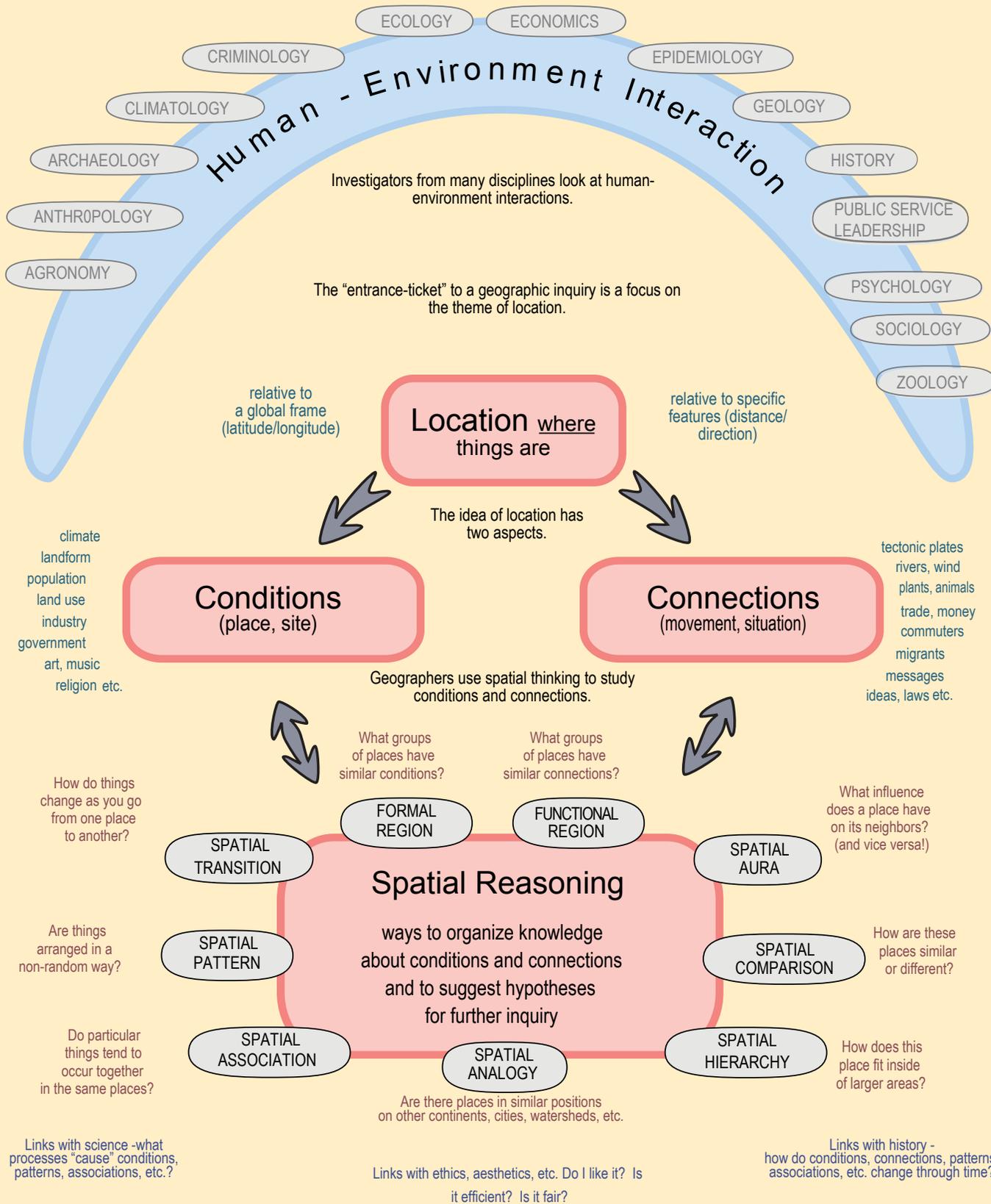


What is Geography?

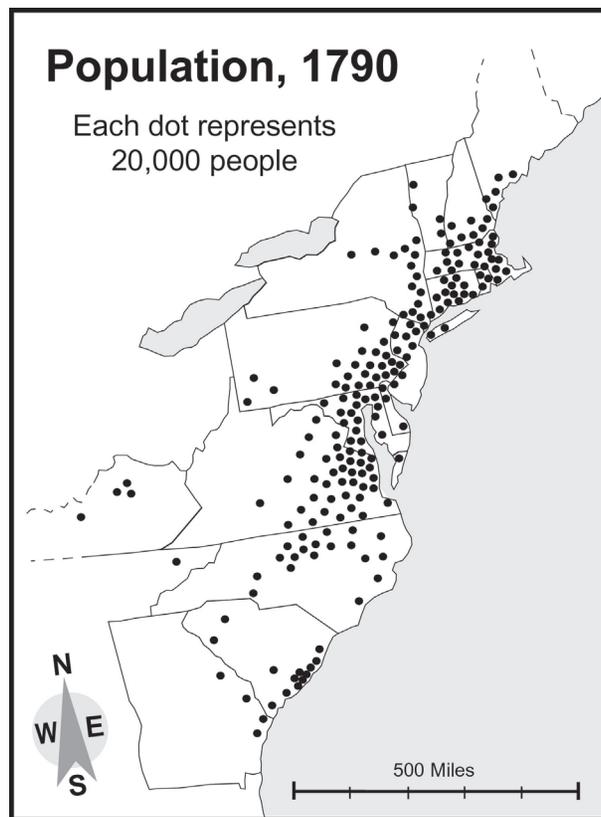
The over-arching goal of geographic inquiry is to understand how people interact with their environment in places.



MODES OF SPATIAL THINKING

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Recent research seems to indicate that the human brain has a number of distinct areas that are structured to do specific kinds of spatial thinking. This list of spatial-thinking questions is based on a review paper that was published in the December 2006 issue of *Research in Geographic Education*, which in turn was adapted from a discussion paper commissioned for a report entitled *Learning to Think Spatially* (National Academies Press, 2006).



Location - Where is this? This is the “entrance ticket” to a geographic inquiry, and it has two facets:

a. **Conditions** (Site) - What is here at this place?

b. **Connections** (Situation) - How is this place linked to other places?

These are the “facts”
of geography.

And this is how we
hook them together.

Modes of Spatial Thinking

1. **Comparison** - How are places similar or different? How can we compare them fairly?
2. **Aura** (Influence) - What effect(s) does a feature have on nearby areas?
3. **Region** - What places can be grouped together because they are similar to and close to each other?
4. **Hierarchy** - Where does this place fit in a hierarchy of small-inside-larger areas?
5. **Transition** - Is the change between places abrupt, gradual, or irregular?
6. **Analog** - What distant places have similar positions and therefore may have similar conditions?
7. **Pattern** - Are there clusters, strings, rings, waves, other non-random arrangements of features?
8. **Association** (Correlation) - Do features tend to occur together (have similar spatial patterns)?

Spatio-temporal thinking - How do spatial features change through time?

And these link
geography and history.

Change in conditions (e.g. climate, military control, land use, etc.) at a place over time

Movement of something (e.g., train, hurricane, political border, etc.) over time

Expansion or contraction of something (e.g., disease, urban area, rumor, etc.) over time

Exceptions - Where are places that do not seem to follow an observed “rule”? A map of exceptions, in turn, can be subjected to spatial analysis in order to discern regions, patterns, etc.

Other recent research seems to support the idea that memories are more likely to last if they involve links among multiple brain regions that “collaborate” to solve an intuitively important problem. This conclusion has profound implications for curriculum design, because it lends further support to the idea that students are more likely to become proficient in the so-called “foundation skills” of mathematics and reading if they work with topics and materials that are designed to engage multiple brain areas, including those that do spatial thinking. The conclusion about long-term memory also has implications for student assessment that should be explored, as people try to refine the role of high-stakes testing in educational policy and curriculum reform.

WHAT IS AN EXPERT MAP USER?

When studying a map, an expert map user is able to employ more kinds of spatial thinking, and to use each one of them more effectively, than a novice. Expertise in map reading implies the ability to go beyond simply identifying locations on a map and decoding symbols to get information about conditions and connections at specific places. In short, an expert map user is able to reduce overall cognitive load by making effective use of other neurologically distinct modes of spatial reasoning.

LOCATION: An expert map reader can use the grid, scale, direction arrow, political borders, coastlines, and other clues to describe the location of any feature on a map.

a. **CONDITIONS:** An expert map reader can decode the symbols on a map and make valid statements about conditions at any specified location on the map.

b. **CONNECTIONS:** An expert map reader can decode the symbols on a map and make valid statements about connections between locations on the map.

SPATIAL REASONING

1. **COMPARISON:** An expert map reader can make a verbal and/or graphic comparison of conditions or connections at several locations on a map.
2. **AURA:** An expert map reader can identify places on a map that are likely to be influenced by a specific event (or a specific feature) in a particular place on the map.
3. **REGION:** An expert map reader can identify groups of places on a map (regions) that are close to each other and have similar conditions or connections.
4. **TRANSITION:** An expert map reader can describe how things change between two places (is a change in elevation, for example, a gradual uphill slope or a steep cliff?)
5. **HIERARCHY:** An expert map reader can describe where an area fits into a hierarchy of smaller-to-larger areas (e.g. counties within a state, states within a country).
6. **ANALOGY:** An expert map reader can identify distant places that have similar situations (e.g. latitude or distance from a port) and therefore might have similar conditions.
7. **PATTERN:** An expert map reader can identify features arranged in a non-random way on a map (i.e. have spatial patterns that may be effects of some cause).
8. **ASSOCIATION:** An expert map reader can compare patterns on maps and identify features that tend to occur together (and therefore might also be linked in other ways).

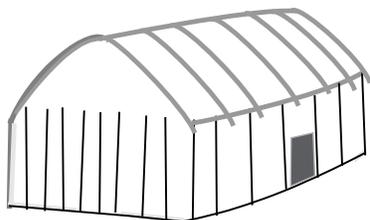
SPATIO-TEMPORAL THINKING

1. **CHANGE:** An expert map reader can use maps made at different times to describe changes in conditions or connections at a place, and to predict possible future change.
2. **MOVEMENT:** An expert map reader can use maps made at different times to identify things that might have moved, and to predict possible future motion.
3. **DIFFUSION:** An expert map reader can use maps made at different times to describe changes in the extent of something, and to predict possible future spread (or shrinkage).

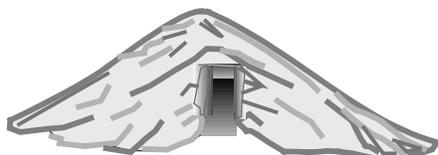
SPATIAL MODELS: An expert map user can use these map-reading skills to test hypotheses about how features or events in one place can affect conditions or connections in other places, often far away.

EXCEPTIONS: An expert map user can identify places that do not “fit the rules” one might infer by using the skills described above. An expert can map the exceptions, identify regions, patterns, associations, etc. on it, and suggest hypotheses for investigation.

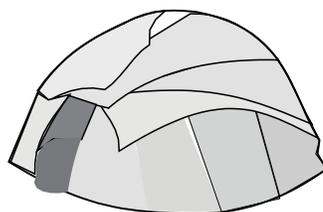
Native American Houses



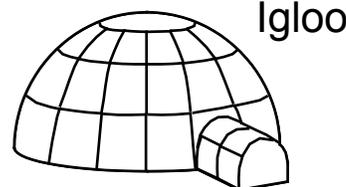
Longhouse



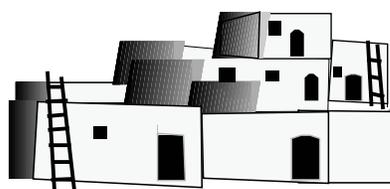
Earthlodge



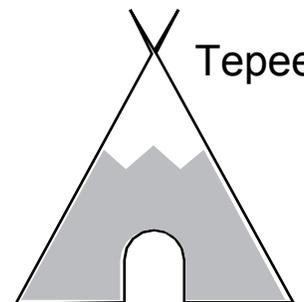
Wigwam



Igloo



Pueblo



Teepee

Source: redrawn from Waldman, 1985, Atlas of the North American Indian, and www.native-languages.org/houses.htm

3C

The main purpose of a house is to protect people and their things from the weather.

Houses have to fit the weather and other conditions in their environment.

It also makes sense to build with materials that can be found nearby or are easy to transport. An earthlodge, for example, is a good choice if you live near a river in a grassland - a place that has water for irrigating crops but no trees to provide wood for building.

Match the houses on the diagram above with the places on the map and the descriptions of conditions:

A. A multi-family house made of wood in a forest environment with cold winters.

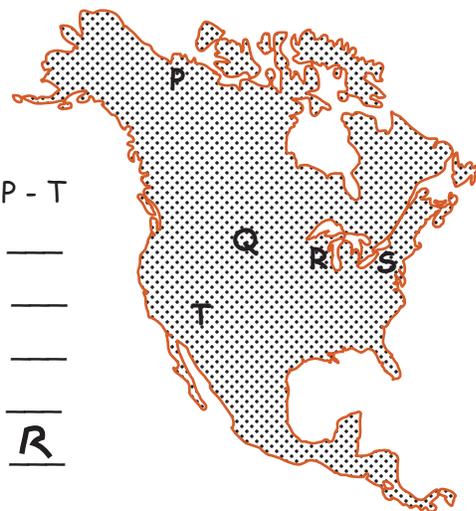
B. A multi-family house made of stone or sun-dried bricks in a desert environment.

C. A house made of animal skins stretched over a frame that is easy to take down and move.

D. A house made with blocks of ice in a cold environment.

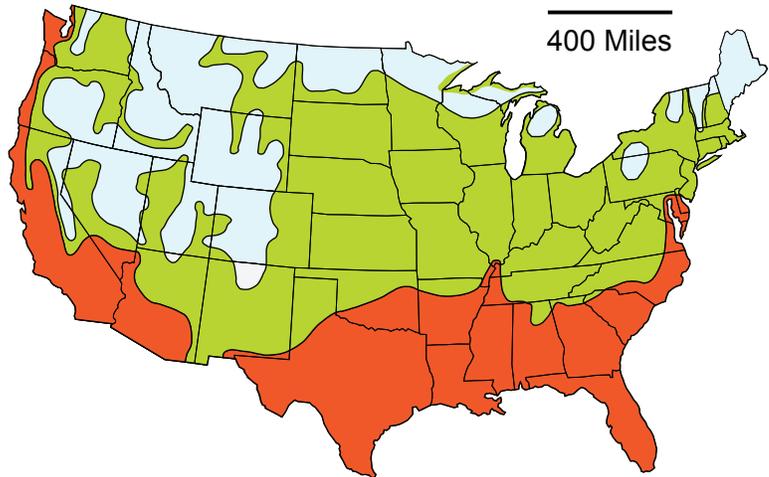
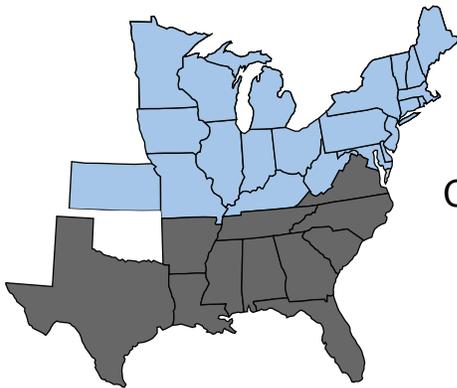
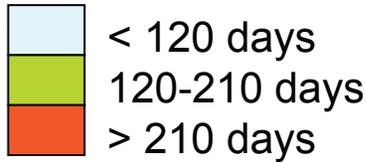
E. A house made of wood with a layer of insulating dirt covered with tree bark or animal skins.

- | | | |
|-------|--------------|----------|
| A - E | | P - T |
| ___ | 1. Igloo | ___ |
| ___ | 2. Longhouse | ___ |
| ___ | 3. Pueblo | ___ |
| ___ | 4. Teepee | ___ |
| ___ | 5. Wigwam | <u>R</u> |



Thought question for discussion: Do you think people who lived in different kinds of houses might have different ideas about how to deal with invaders who are coming from Europe?

Frost-free Season



Cotton was the main crop of plantation slavery. Cotton farming requires about 200 frost-free days. Put these two facts together to explain why these states seceded to form the Confederacy (and where some of them faced pro-union resistance within their borders).

3K

Farming is difficult if the frost-free season is less than about 4 months long. There is great risk of crop damage by late spring frost or early autumn frost. If you memorize (roughly) where the 4-month line goes, you will know the northern limit of farming.

Cotton is different - it is much more valuable than corn or wheat, but it needs a longer frost-free season. Memorize where the 7-month line goes - start near Washington, DC, then go south to the Carolinas, southwest around the southern Appalachian Mountains, then north a little in the flat Mississippi Valley, and then southwest across Oklahoma and Texas.

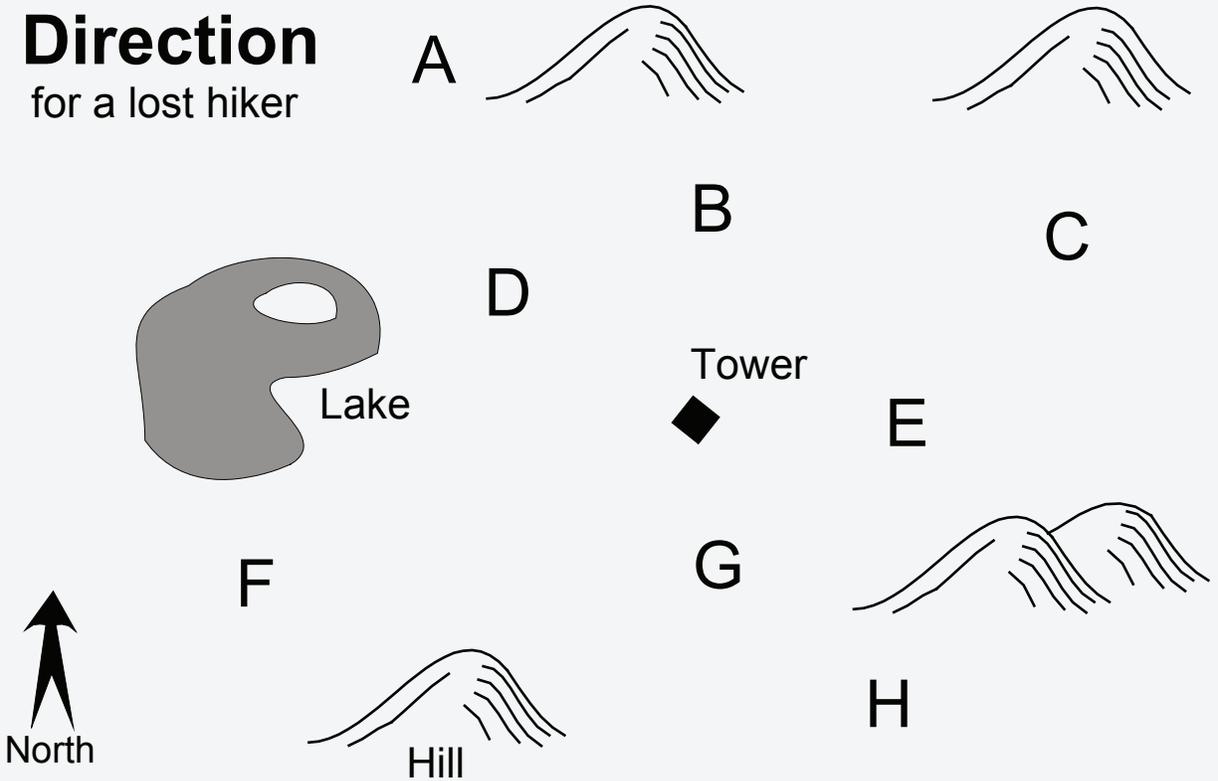
To understand why the limit on cotton is important, read the statements below, and put an M on the line next to the one in each pair that seems to need **more** workers.

- The soil has a lot of soft **humus** (organic material), because freezing stops decay.
- The soil is harder to work, because microorganisms eat soft humus in a hot climate.
- The soil is moist and easy to dig because of melting snow in springtime.
- The soil can be very hard, almost like rock, if it is dry in springtime.
- You plant about 10,000 seeds per acre. The seeds are hard, smooth, and easy to handle.
- You plant about 20,000 seeds per acre. The seeds are fuzzy and often stick together.
- The plants are vulnerable to weed competition at first, but they soon grow tall and shade the ground. That blocks the sunlight that weeds need to grow fast.
- The plants grow slowly and do not make much shade. They are vulnerable to competition from weeds, unless someone chops the weeds down.
- Each plant has one or two big "ears," which take 5-10 seconds to harvest.
- Each plant has many small "bolls," which may take several minutes to harvest.
- After the seeds dry, it takes a few seconds to remove the outer husks from each ear.
- 32 seeds must be pulled out of each cotton boll. That takes a lot of time.

Count how often you marked the top crop in each pair. That is corn, the main crop of the North. The bottom crop is cotton. How does this help explain why cotton farmers wanted slaves?

Direction

for a lost hiker



4E

Direction is a basic spatial concept, along with distance and location. This map is a greatly simplified map of a small area in the glacial hills of western Massachusetts.

Imagine that you are a hiker walking in this area, and you are not sure where you are.

1. Write the letter of the place where you are most likely to be if:

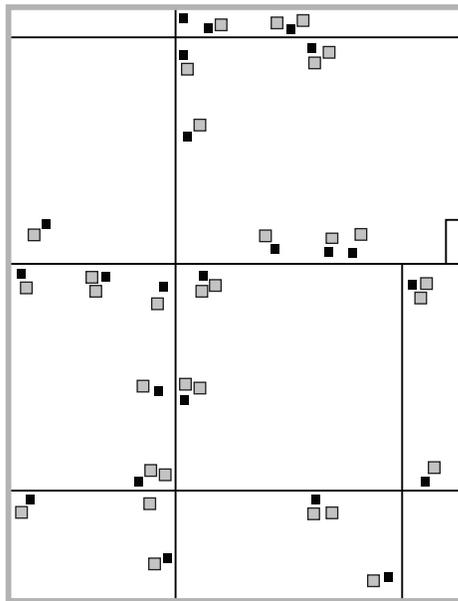
- ___ a. You can see a tall tower directly south of you.
- ___ b. You see a small hill north of you and a double-topped hill to the south.
- ___ c. You see a double-topped hill to the southeast and a tower to the west.
- ___ d. You see a lake to the south-southwest and a hill to the east.

2. Write the letters where you start and end if you walked south until you were between a tower and a lake and then walked southwest until you were south of the lake?

I started at place ___ and ended at place ___.

3. Write directions to go from place C to place D, climbing to the top of at least two hills on the way, stopping for lunch at place H, and going for an afternoon swim in the lake:

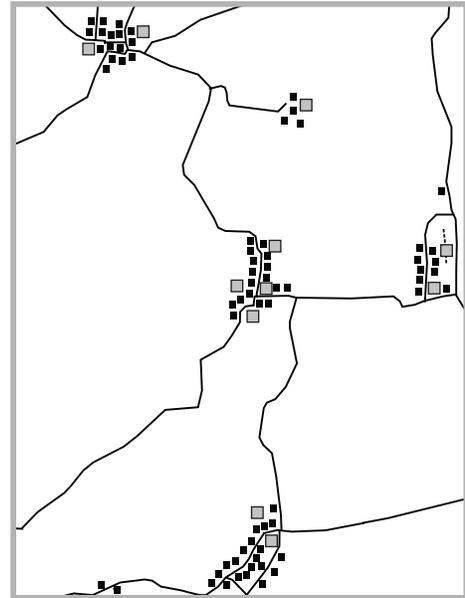
Settlement in Iowa and Germany



1/2 mile

■ House

□ Other building



Sources: Iowa - U.S.G.S., Hawkeye, Iowa, quadrangle, 1981
Germany - Waal, Bavaria, Topographische Karte, 1958

4K

The settlement pattern of an area is the arrangement of houses and other buildings.

It is related to population density, but it is not the same thing as population density.

Two areas can have the same population per square mile but different settlement patterns. For example, in the late 1800s, many European people moved to the United States to claim land and become farmers. Because of the rules of the Homestead Act of 1862 ("you have to build a house and live on your land for five years"), people changed how they lived. In Germany, farmers lived in villages and traveled to their land for farming. In Iowa, farmers live on their land and travel to towns for schools, shopping, and other services.

1. Which settlement pattern provides more privacy?
2. Which one is better for saving energy while doing things like delivering mail?
3. How about easy access by ambulances or fire trucks during an emergency?
4. Which settlement pattern is better for security?
5. Which one is better for arranging a party?

These questions may not have a "right answer," but settlement patterns certainly have implications for things like security, mail delivery, ambulance service, or energy use.

Project: go to a mapping website such as Google Earth, Yahoo Maps, or TopoZone.

Find three areas with similar population density but different settlement patterns.

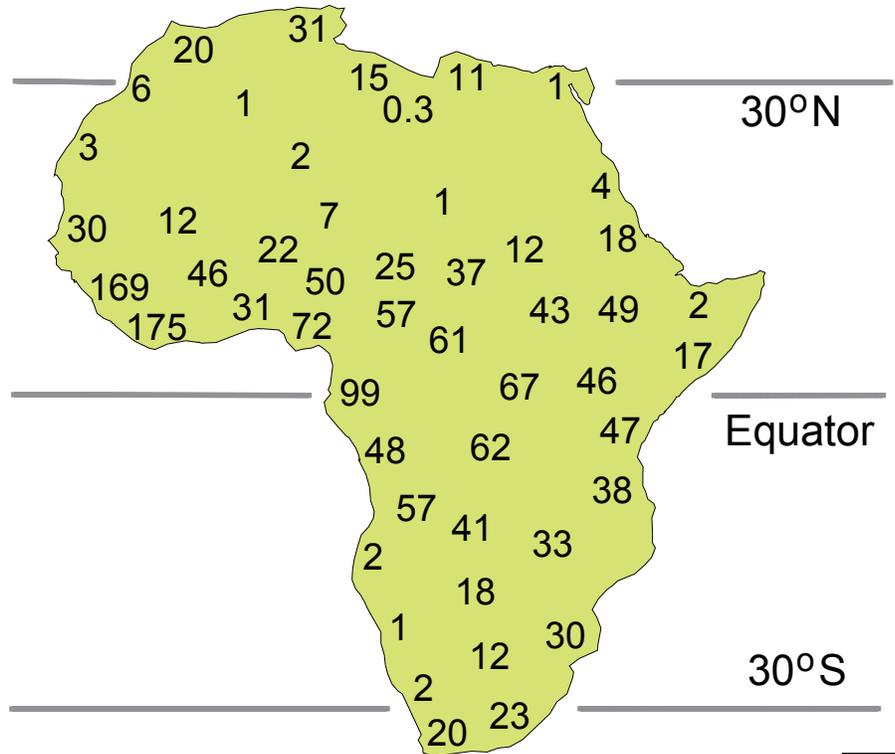
Write a paragraph or design a poster or powerpoint slide comparing the patterns.

You can use any criteria that you think are important. Be sure to **explain your criteria**.

Precipitation in Africa

The numbers show annual precipitation in inches

as measured at 50 airports and other major weather stations



Gersmehl and Rohde, 1994; data from *Climates of the World*, 1969

4U

This map uses numbers to show the precipitation measured at 50 places. A mapmaker, however, could make the pattern easier to see by using a different "graphic vocabulary."

For example, you could translate this number map into an isoline map. An **isoline** is like a fence.

Isoline: a line that separates areas that get more precipitation from areas that get less.

Each isoline has a specific value (amount of precipitation), which is chosen by the mapmaker.

0. You can skip this step if you have already made an isoline map. Otherwise, start by identifying the extremes. Use a yellow marker and circle all places that get 12 inches of precipitation or less. These areas are the great deserts in Africa. Use a dark blue marker and draw a square around all places that get at least 60 inches of precipitation. These areas are likely to be rainforests.
1. Take a black marker and draw a line that separates all places that get 12 inches or less from places that get more than 12 inches of precipitation. If your line goes between places with higher and lower precipitation along the coast, it should end at the coast. It should curve around and meet itself if there is a small "island" of low precipitation in a large area of high precipitation, or vice versa.
2. Use the same marker and draw another isoline with a value of 60 inches. This line separates places that get more than 60 inches from places that get less.
3. Mapmakers can draw as many isolines as they think are necessary to show the pattern. On this map, you might want to add a line at 36 inches and another at 120.
4. Now color the spaces between the lines. Use a light blue color for the driest areas. Use darker shades for areas with more rain. That's the basic rule about colors on an isoline map - use darker color to show "more."

Some mapmakers like to get creative by using different **hues**, like yellow for deserts, green for in-between, and blue for rainy areas. This can make an attractive map, but stick to the rule and make sure the colors also go in a clear **sequence** from light to dark.