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Spatial Thinking: The Analytical Skills of Geography

Primary goals of studying Geography

1. Conditions at places: why people in particular places act the way they do
2. Connections between places

Purpose of this Chapter

- To convey implications of current research about brain anatomy & physiology
- To show specific ways teachers can help students engage the “brain regions” that do various kinds of spatial thinking

Spatial Thinking - Advantages

Recent brain-scanning research seems to say that the human brain has several "regions" that are structured to do spatial thinking.

And that memories are more likely to persist when multiple brain regions are engaged.

Deliberately engaging the spatial-thinking areas as part of our teaching is therefore likely to promote better learning of geography.

(and math,
and reading,
and ...)

8 Modes of Spatial Thinking

- Comparison
- Aura
- Region
- Transition
- Hierarchy
- Analog
- Pattern
- Association



Location

Where is it?

Why is it there?

*and...
so what?*

These are the fundamental questions that make an investigation geographic, as opposed to historic, scientific, etc.

BUT

... they are very hard to answer without applying some specific skills that are usually called spatial thinking.

Conditions

What is it like there?

What can you see, hear, smell, feel, etc.
at that particular location?

CLIMATE

LANDFORM

ETHNICITY

POPULATION
DENSITY

LAND
USE

VEGETATION

ART

RELIGION

Connections

How is this place linked to other places?

What natural processes and human features help connect this place with others?

RIVER

WIND

SLOPE

RAILROAD

CANAL

RADIO

FAMILY

CORPORATION

INTERNET

GOVERNMENT

Comparison

How does this place compare with that one?

DIFFERENCE

DENSITY

BAR
GRAPH

RATIO

COMPARING
INDEX

SCALED
SYMBOL
MAP

PIE
GRAPH

CHOROPLETH
MAP

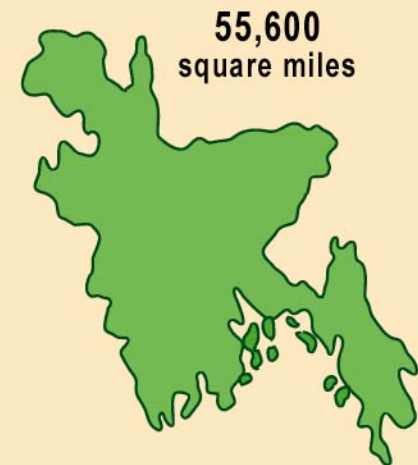
Comparison

How does this place compare with that one?

Bangladesh is roughly the same size as Iowa, but it has 50 times as many people.



Bangladesh

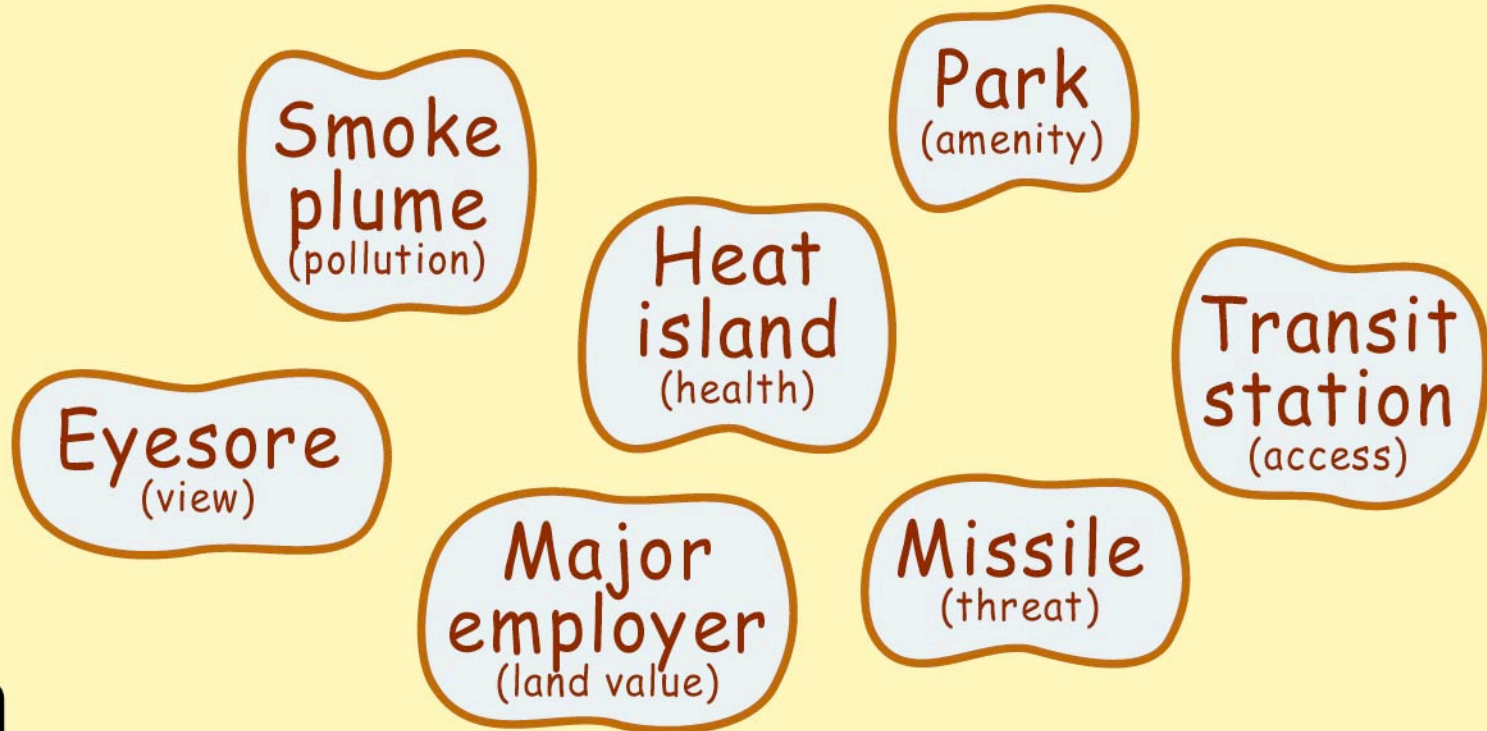


What state (or other familiar area) is comparable to the country you are studying today?

Would a comparison be the same if you did it from a different perspective, e.g. old/young, male/female, black/white?

Aura

How does the presence of something in this place affect other places nearby?

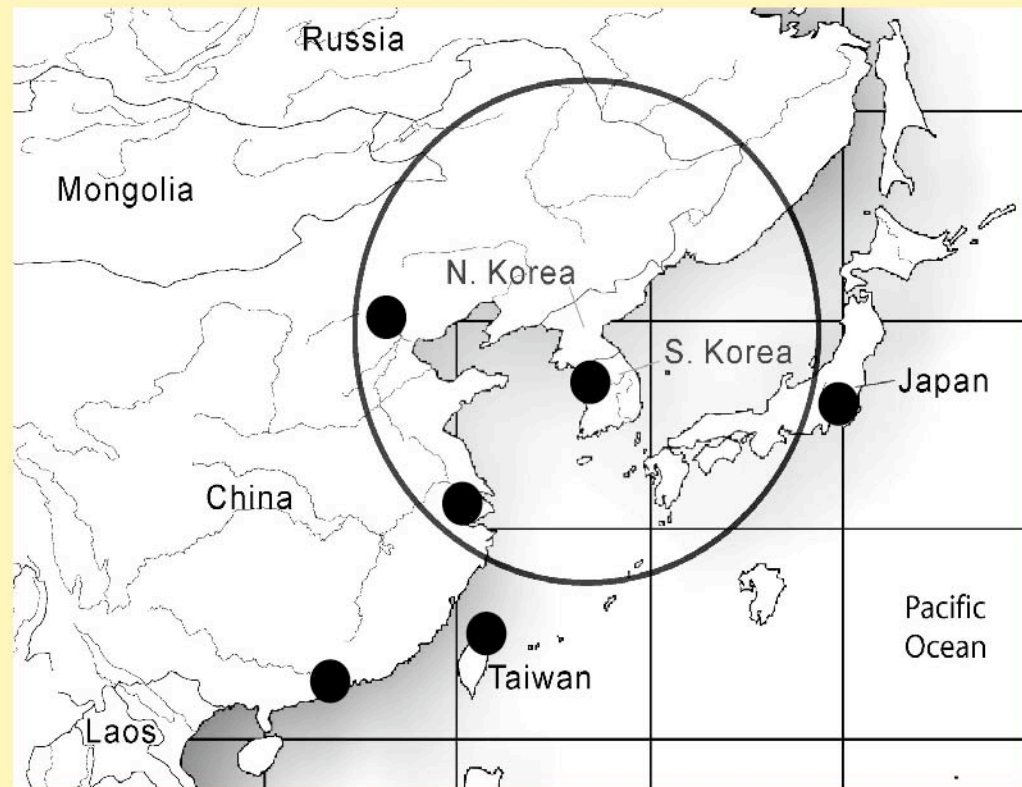


Aura (influence)

How does the presence of something in this place affect neighboring places?

Which global cities are within the aura of a nuclear missile in North Korea?

- ___ Beijing
- ___ Hong Kong
- ___ Seoul
- ___ Shanghai
- ___ Taipei
- ___ Tokyo



Region

Identify a group of places that are

- similar to this place in some way, or
- connected to this place in some way

(and draw a line around them).

GREAT
PLAINS

CLIMATE
REGION

FARMING
REGION

FIRE
HAZARD
REGION

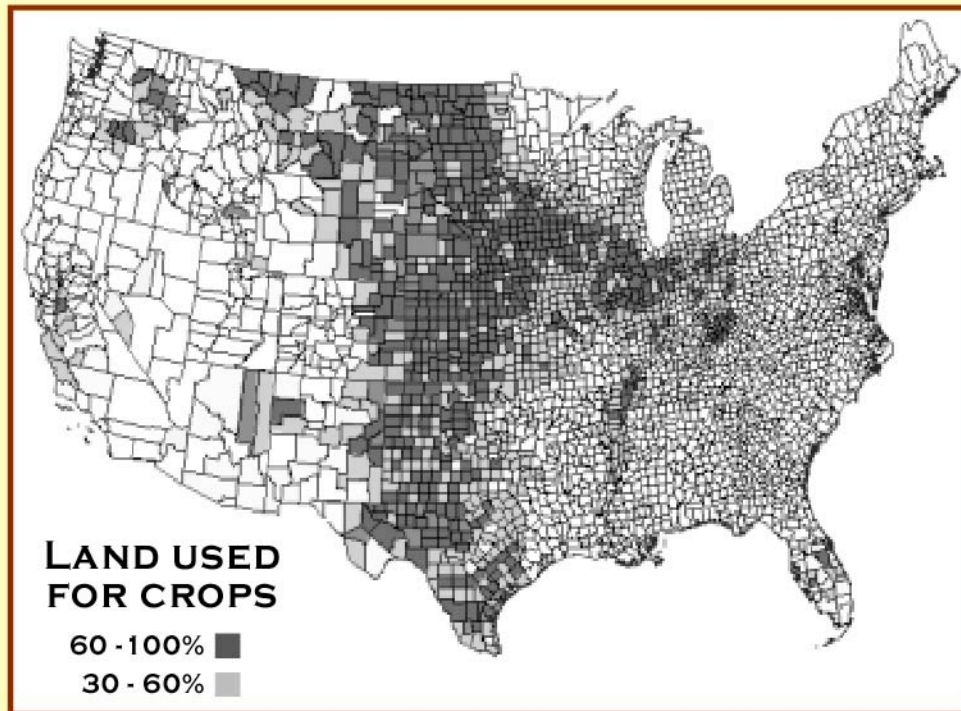
ENTERPRISE
ZONE

CHANNEL 2
TELEVISION
MARKET

PUERTO RICAN
NEIGHBORHOOD

Region

- Identify places that are
- like this place in some way, or
 - connected to it in some way.



Students could simplify this map by tracing the outline of the cropland region onto another blank map.

Transition

What is the nature of the change
between this place and that one over there?

STEEP
CLIFF

GRADUAL
RISE

SERIES
OF STEPS

PROFILE
GRAPH

UNIFORM
SLOPE

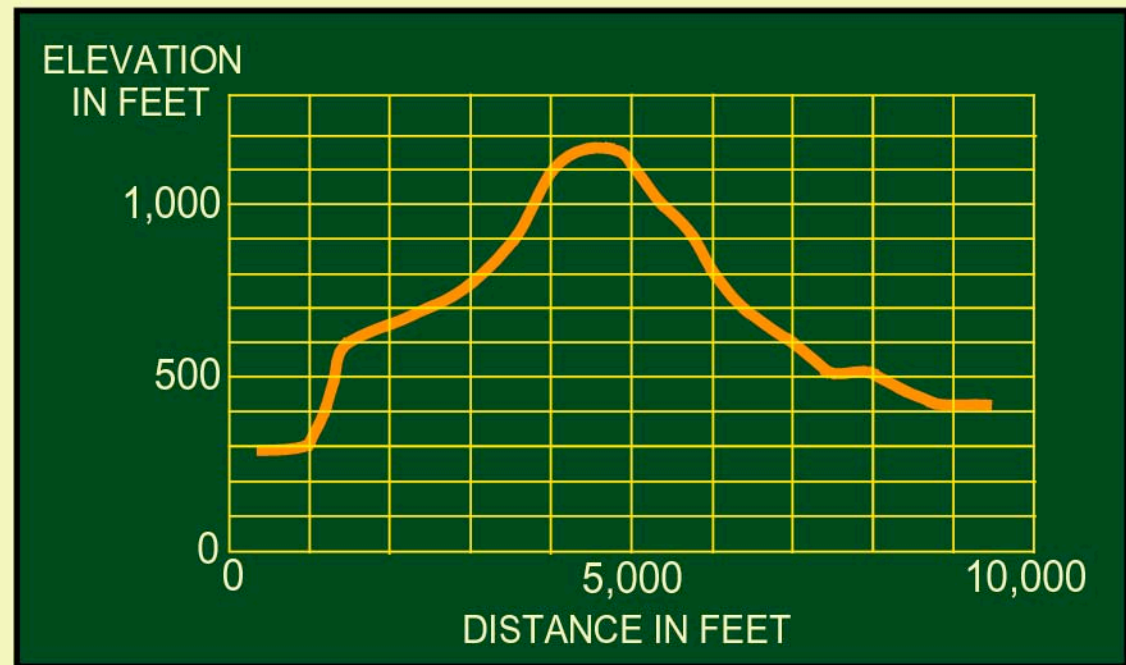
ISOLINE
MAP

BORDER
EFFECT

Transition

What is the nature of the change between this place and another one?

Students can draw side-profile graphs to show the change in land elevation as you cross a ridge such as this one at Harpers Ferry.



Hierarchy

What larger area is this one inside?

What smaller areas are inside it?

COUNTRY
STATES
COUNTIES

WATERSHED
SUBWATERSHEDS
INDIVIDUAL SLOPES

HOSPITAL
CLINICS
DOCTORS

SOIL REGION
ASSOCIATIONS
LOCAL MAP UNITS

PORT
WAREHOUSES
STORES

Hierarchy

What larger area is this area inside?

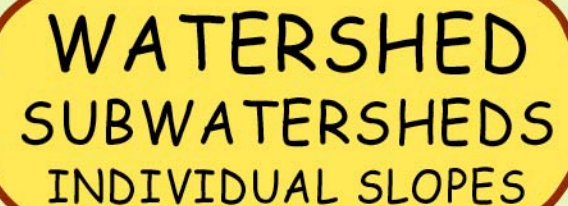
What smaller areas are inside it?

Students could explore the idea of hierarchy

- in political geography by listing the governments that have jurisdiction over a particular place
- in physical geography by tracing a local stream all the way to the ocean.



COUNTRY
STATE
COUNTY
TOWN



WATERSHED
SUBWATERSHEDS
INDIVIDUAL SLOPES

Analogy

Are there places that have similar situations
(e.g., on different continents, mountains, cities, etc.)
and therefore might have similar conditions?

MEDITERRANEAN
CLIMATES

RAILROAD
SUBURBS

WATERGAPS
THRU RIDGES

BORDER
CROSSINGS

FJORDED
COASTS

SOUTH-FACING
SLOPES

GENTRIFYING
NEIGHBORHOODS

Analogy

New York City and Seoul, Korea, have similar latitudes and positions on their continents. Not surprisingly, they have similar climates.



Pattern

Is the spatial arrangement of things random, or does it have a pattern?

RINGS,
DONUTS

CLUSTERS

STRINGS

PAIRS,
TRIOS,
ETC.

ALIGNMENTS

EVEN
SPACING

BIASES,
IMBALANCES

Pattern

Do Israeli settlements on the West Bank have a spatial pattern that is not random?

If so, is there a plausible reason that might explain their arrangement?



Source: CIA maps, 1983, 1986, 1989

Association

What features usually occur together?

What features seldom occur together?

MOSQUITOES
AND MALARIA

MALLS AND
FREEWAYS

FACTORIES
AND THEATERS

SCHOOLS AND
PLAYGROUNDS

FAULTS AND
EARTHQUAKES

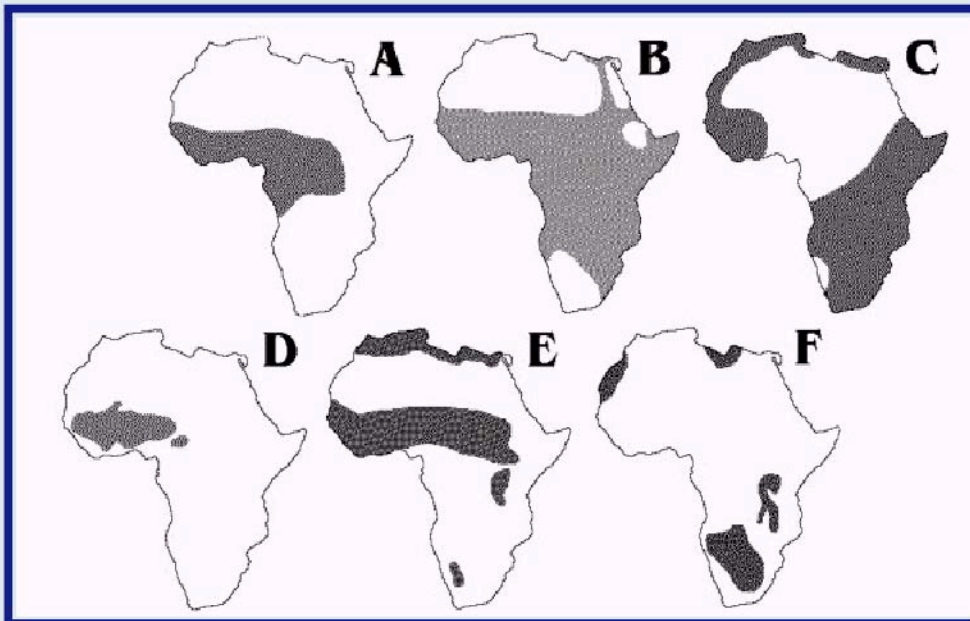
COURTHOUSES
AND LAW OFFICES

HOG FEEDLOTS
AND HOTELS

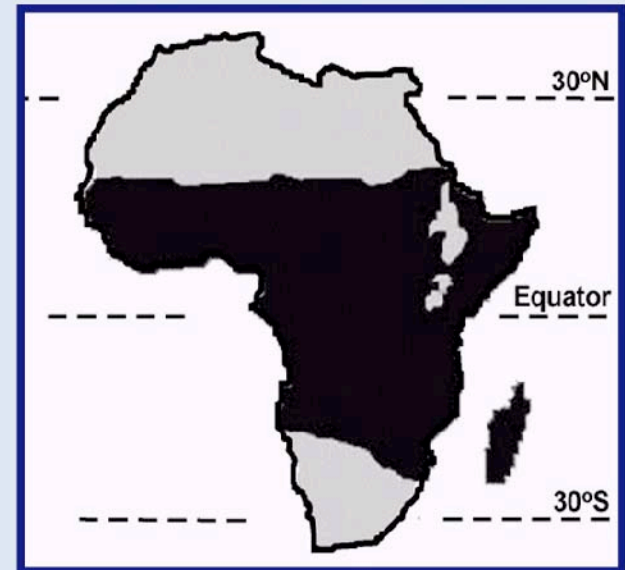
Association

What features tend to occur together?

Which of these six "bugs" occurs in the same areas as malaria and therefore is a plausible carrier of the disease?

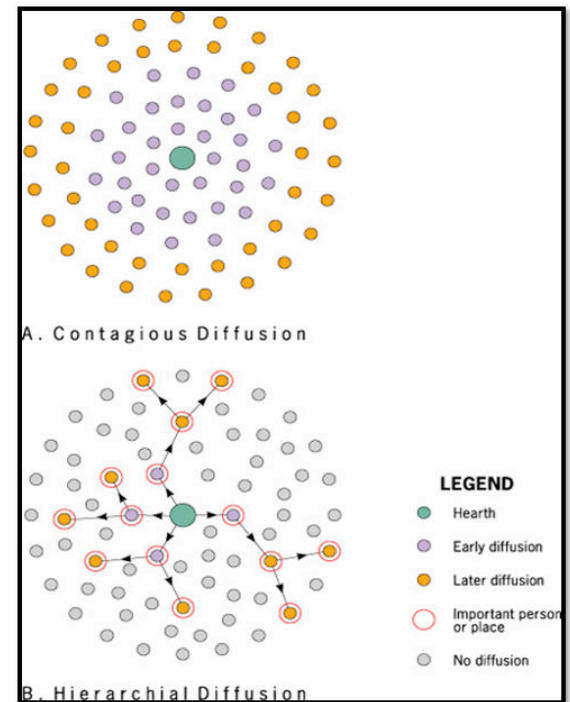
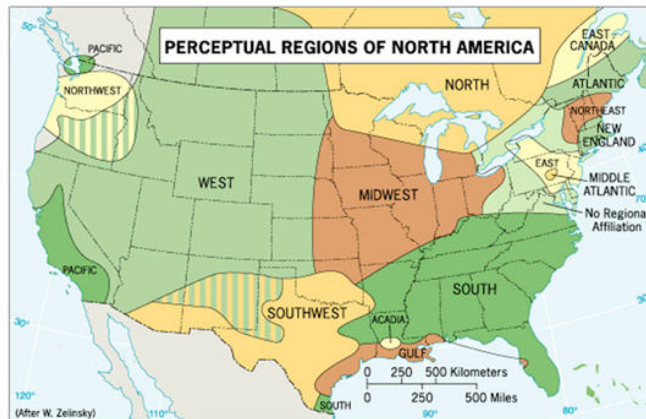


INCIDENCE OF MALARIA



3 Spatio-Temporal Dimensions

- Change
- Movement
- Diffusion



Change

How has this place changed through time?

What were its conditions/connections before and after:

CITY EXPANDED

COLONISTS ARRIVED

ELECTION

EARTHQUAKE

HURRICANE

NEW MALL

TERRORIST ATTACK

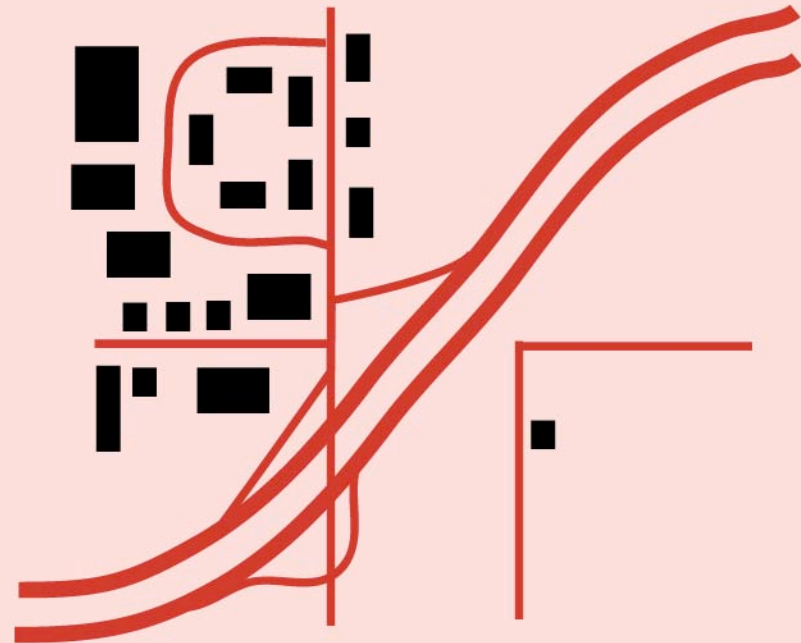
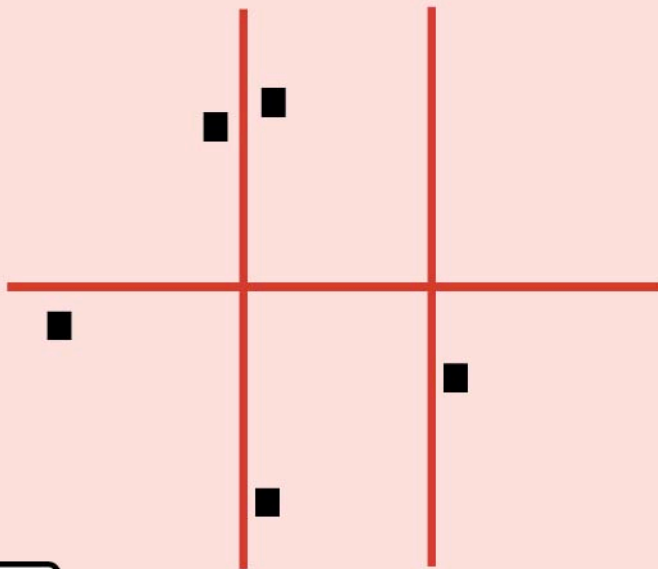
FACTORY CLOSED

GLACIER RECEDED

Change

How has this place changed through time?

(Which three buildings remained when a new freeway was built?)



Movement

How do things change position through time?

PETROLEUM
TRADE

MOUNTAIN
CLIMBER

BIRD
MIGRATION

ENEMY
ARMY

HURRICANE

OCEAN
CURRENT

COMMUTER
TRAIN

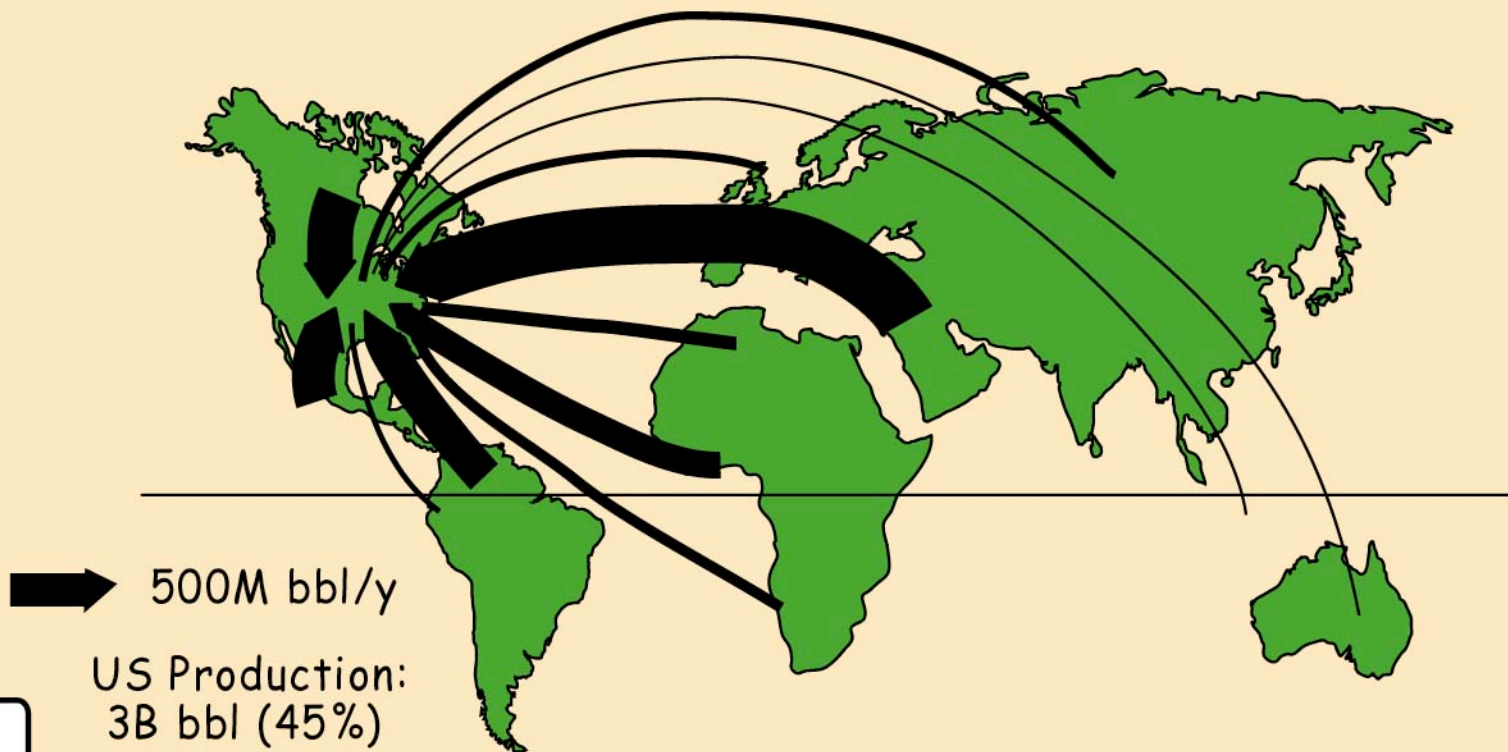
CLOTHING
FACTORY

CENTER OF
POPULATION

Movement

How do things change position through time?

(Where does oil used in the United States come from?)



Diffusion

Has something expanded through time
(or shrunk, or changed position)?

URBAN
AREA

CROPLAND

MAD COW
DISEASE

FLOOD
PRONE
AREA

ZEBRA
MUSSEL

OZONE
HOLE

REPUBLICAN
MAJORITY

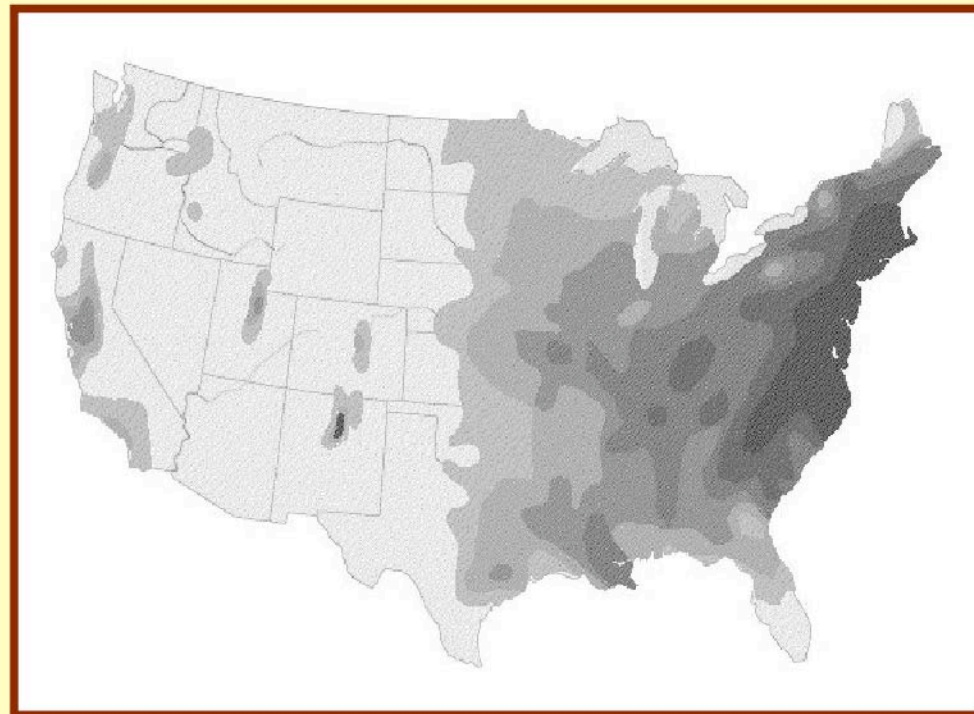
POLAR
ICECAP

Diffusion

Has something expanded through time?

**EXPANSION
OF
EUROPEAN
SETTLEMENT
1600-1900**

**(DARKER SHADING
INDICATES OLDER
SETTLEMENTS)**



Building Spatial Models

- A scientific statement of how we think things might be related in space
- Usually involves applying several spatial-thinking skills to different aspects of a big problem
- Long-distance connections
- Things that happen in 1 part of world can affect other places

Spatial Model

What processes allow conditions or events that occur in one place to have effects on other places, perhaps far away ?

FOREST CLEARING
AND URBAN FLOODS

EL NINO
NEAR PERU
AND DROUGHT
IN CANADA

CROP FAILURES
AND EMIGRATION

TERRORISM
AND TOURISM

INTEREST
RATES
AND TRADE

Exceptions

Where are the places in which things do NOT "follow a rule" observed elsewhere?

RESIDENTIAL AREAS
WITH NO PARKS

SWAMPS WITH
FEW MOSQUITOES

RIVER FLATS
WITH NO FLOODS

COMMERCIAL FARMS
RUN BY WOMEN

DESERTS
NEAR THE
EQUATOR

HIGH MOUNTAINS
WITH LITTLE SNOW

HILLY SUBURBS
WITH TINY HOUSES

Critical Thinking Questions

1. What is the connection Gersmehl makes between the brain research he presents & teaching Geography?
2. Which of the 8 Modes of Spatial Thinking &/or the 3 Spatio-Temporal Thinking dimensions do you think best connects to the teaching of U.S. History? Why?

Give an example of an activity.

3. Create a Spatial Model about U.S. History: a statement about influences across great distances.

Tactics for Teaching Spatial Thinking

Here are some examples of lesson topics:

Analogy - Spain and California, NY and Seoul

Transition - terrain around Harper's Ferry

Association - malaria and mosquitoes

Connection - oil pipelines near the Caspian

Aura - range of a missile from North Korea

Comparison - countries and familiar states

Diffusion - spread of Plague in Europe

Get back into your groups...

Lesson Plan Part B Task:

Help each other come up with a specific geographic activity using the 8 Modes of Spatial Thinking &/or the 3 Spatio-Temporal Thinking Dimensions for your lesson/content standard that will help students answer your Essential Question.