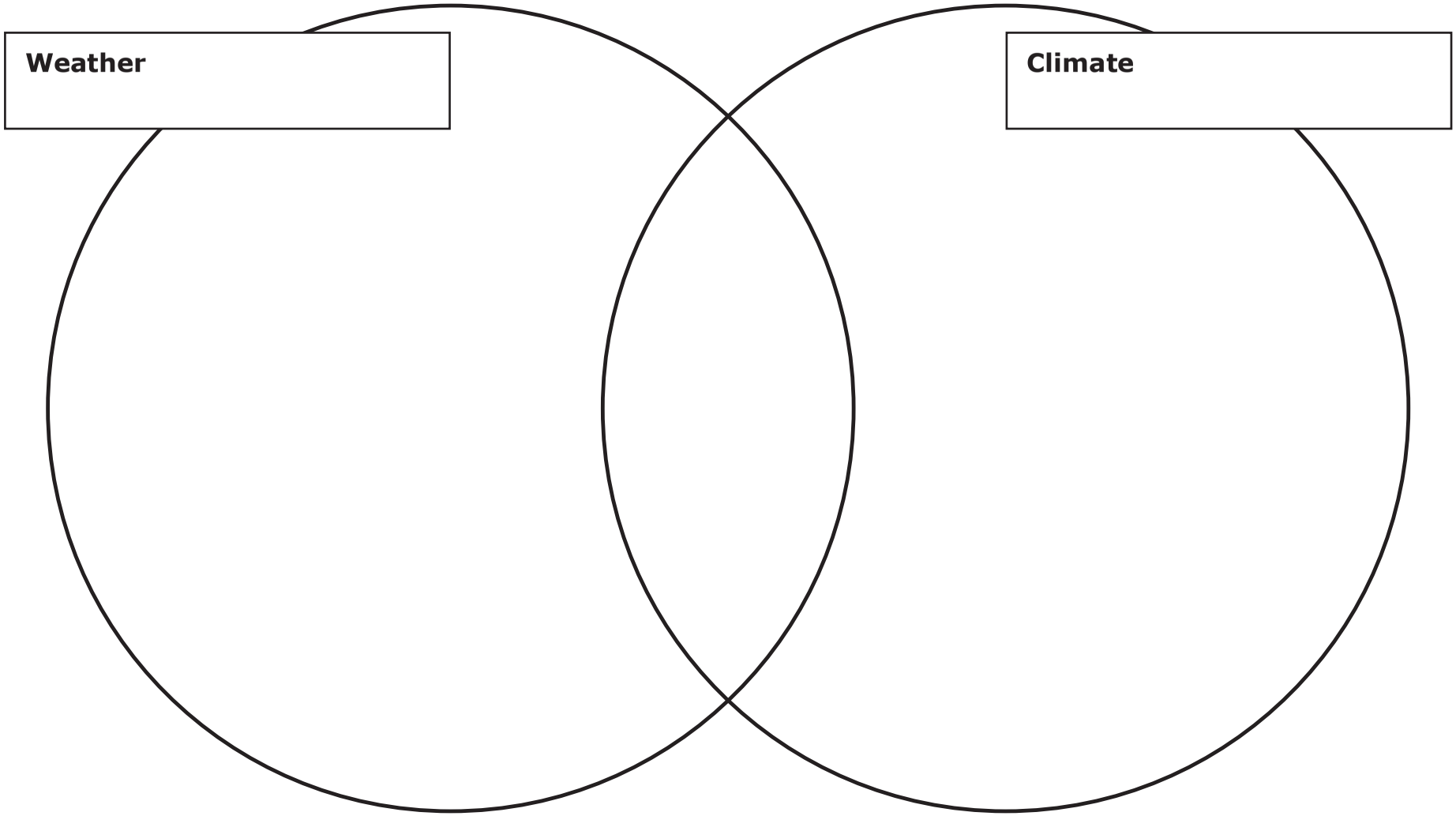
IR-20: Weather/Climate Venn Diagram



Scenario 1: You are on vacation at a location on the coast at approximately 20° N latitude. What predictions would you make about the climate of this area?	**Scenario 2:** You are considering attending a university located in Boston, Massachusetts, in the northeastern part of the United States. What predictions would you make about the climate of this location?
Scenario 3: You are online friends with someone in southern Argentina. What predictions would you make about the climate of your friend's home?	**Scenario 4:** You are traveling to attend a football championship game in Tampa Bay, Florida. What climatic conditions would you expect at this location?
Scenario 5: Your father is taking a business trip to Saudi Arabia. What predictions would you make about the climate of your father's destination?	**Scenario 6:** You are going on a skiing trip to Aspen, Colorado. What climate conditions would you expect at this location?

As you read about climate, complete the following graphic organizer. Identify main ideas and details about each concept. The first one is done for you. Use numbers and letters to organize the information as shown in the example.

Concept	**Notes**
Weather Forecast	1. Short-term Prediction a. Temperature Range b. Precipitation c. Clouds 2. Useful for Predicting Extreme Conditions
Climate	
Factor 1: Latitude	
Factor 2: Elevation	
Factor 3: Proximity to Water	
Climate Regions	
1. Low Latitude	
2. Mid Latitude	
3. High Latitude	

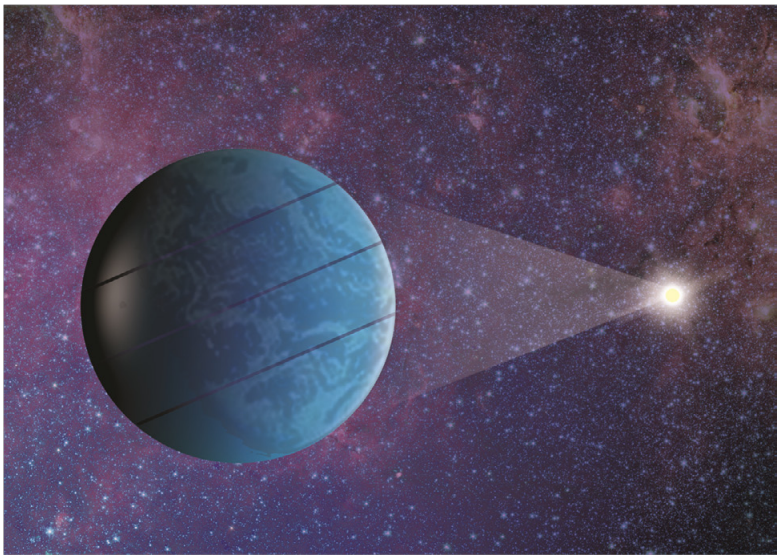
If money were not an issue and you could make decisions completely on your own, where would you choose to live? Would it be in the Alps, where you could take advantage of some of the best skiing anywhere in the world? Maybe you would want to find that perfect beach in the Caribbean Sea or in the South Pacific. There is always the opportunity to live with the rich and famous in Hollywood, California, or along the French Riviera in southeastern France. For most people, the factor that determines the most ideal location in which to live or vacation is climate. Is it warm or cold? Does it rain or snow often? What recreational activities are possible?

When you watch the **weather** on the nightly news, the meteorologist tells you the forecast: the expected temperature range, the anticipated amount of precipitation, the likely wind speed, and the cloud conditions. But these predictions are for a very short period of time. In fact, most meteorologists' forecasts will not be very accurate beyond the next 24–36 hours. Despite the limitations of weather forecasting, this information can still be very useful. With the appropriate technology, severe storms, or at least the conditions from which severe storms could be spawned, can be predicted. This is especially important when monitoring weather extremes, such as tornadoes, hurricanes, droughts, and floods.

Climate is the term used for long-term patterns of weather conditions. Climatologists assess the general trends over a period of time and conclude that the average annual temperature in Tahiti is 83° F during the day and 72° F at night, while the average annual snowfall in Switzerland is close to 20 feet. This data is important to local people and tourists alike. Climate patterns are the result of the thermal patterns that are created by solar energy. When combined with Earth's rotation on its axis and its revolutions around the Sun, ocean currents and prevailing winds are produced.

Earth's seasons of the year are determined by the tilt of Earth on its axis. Earth is tilted about 23° from perpendicular, which creates the four seasons of the year. Since the axis of Earth is tilted, the Sun hits Earth at various places and different times throughout the year, providing most people a spring, summer, fall, and winter.

Besides the tilt of Earth on its axis, there are several factors that affect climate. The first and most important factor is relative location to the Equator. Because the Sun hits Earth most directly on the Equator, that air heats up faster than anywhere else on the planet. The heating of the atmosphere in conjunction with the amount of water in the tropics results in rain occurring on a daily basis. This precipitation may last several hours or only a few minutes, but daily precipitation in the tropics is inevitable. The **tropics** is a region of the planet defined by the man-made lines of the Tropic of Cancer (23 1/3° N) and the Tropic of Capricorn (23 1/3° S), which represent the northern and southern extent of the Sun hitting Earth. Generally, a horizontal pattern of different climate regions radiates from the Equator.



What do you think the human impact would be if something caused the tilt of Earth's axis to be altered?

The second factor influencing climate, and the major exception to the influence of latitudinal location, is elevation. For each 1,000 feet in **elevation**, the temperature decreases by 1 degree. The Rocky Mountains of North America and the Andes Mountains in South America are the best examples of how elevation can affect climate. In these areas, there is a very clear vertical alignment of climatic conditions because of the influence of elevation. For example, Mexico City has a lower average temperature and less annual precipitation than Houston, Texas. Mexico City is closer to the equator than Houston. However, Mexico City's elevation is 2,240 meters (7,347 feet) above sea level compared to Houston, which is about 13 meters (43 feet) above sea level. Obviously, the higher elevation affects Mexico City much more than its relative location to the equator.

A third factor of climate is the effect of ocean currents on adjacent land. Water can absorb heat and then transport it to distances far from its origin. The Gulf Stream transports water from the Gulf of Mexico, where it is warmed by the Sun, to the eastern seaboard of the United States, then further north to Canada and the Arctic. That current is picked up by the **North American Drift**, which is responsible for distributing the warm water to the shores of the British Isles. The effect of this process has a moderating effect on the climate of western Europe, which is generally located 10°–20° further north than the United States.

Ocean currents can influence landmasses in the opposite manner also. As low pressure systems around the polar regions force cold water toward the equator, the wind blowing from the water toward the continents cannot absorb moisture from the cold water. As the wind continues to push toward the equator, the air gets warmer, but there is still little if any moisture in it. Consequently, there is a lot of warm, dry air that blows onto the land. Evidence of this process can be found in the Sahara Desert in Africa, the Gobi Desert in Asia, and the Great Victoria Desert in Australia. The Peru Current is a cold-water current that flows along the western coast of South America. The Atacama Desert is a cool coastal desert that exists on the western edge of South America because there is an insufficient amount of precipitation throughout this region due to cooler water temperatures.

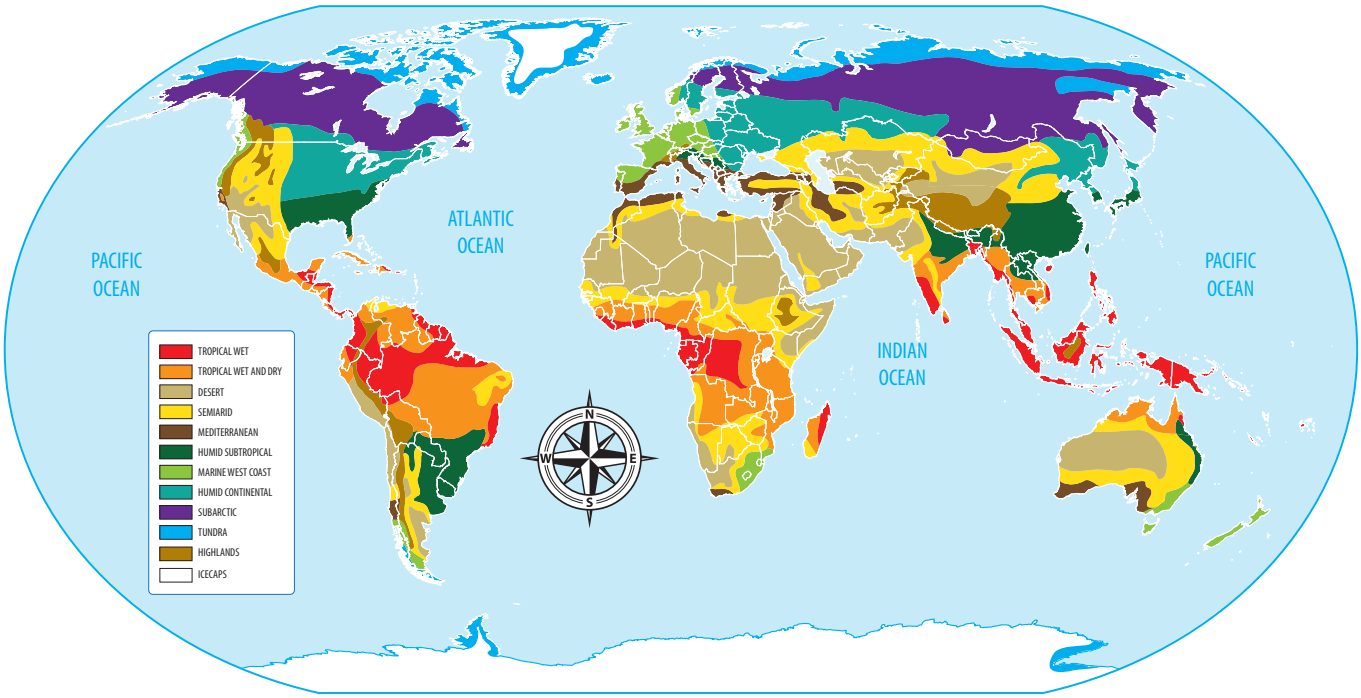
There is another factor dealing with the proximity to water that should be considered when studying climate. Water is able to absorb heat energy and release it slowly, which has a moderating effect on the climate of nearby landmasses. San Francisco, California, and St. Louis, Missouri, demonstrate this phenomenon. Despite San Francisco's northern latitude, it rarely snows there because the temperature is moderate all year long, rarely dropping below the freezing point of 32° F (0° C) and rarely rising too high. At a similar latitude, St. Louis, located in the middle of the continent of North America, is much further inland from the coast; therefore, it has a more dramatic range of temperature and amount of precipitation.

Average Temperatures of San Francisco and St. Louis (Degrees Fahrenheit)					
		January	**April**	**July**	**October**
San Francisco (37° N, 128° W)					
High Temperature		55	64	71	70
Low Temperature		41	47	54	51
St. Louis (43° N, 84° W)					
High Temperature		37	66	88	68
Low Temperature		20	46	70	48

Did you notice that the average temperatures in San Francisco never fall below the freezing point? Yet St. Louis, located at approximately the same latitude, has an average temperature at or below the freezing mark for low temperatures during 4–5 months a year.

Another moderating effect of the proximity to water is the development of fog. Fog forms when cold air and warm air come in contact with each other. Warm air comes off the water during the winter, when the land gets cold, and cooler air from the water rolls over the warmer land in the summer, resulting in fog. Consequently, San Francisco often experiences foggy conditions because of its location relative to the cold-water currents of the Pacific Ocean.

WORLD CLIMATE ZONES



Climate Regions

Because of the influence of latitudinal location, the general pattern seen in the climate map above is one of horizontal bands. Below is a general description of each region.

Low-Latitude Climates

The **low-latitude climates** are grouped closest to the equator (low numbers of latitude). They are the tropical wet, tropical wet and dry, semiarid, and desert subregions. The tropical wet subregion has the warmest temperatures of any subregion and typically experiences rain every day. The amount of daily rain will vary, but on an annual basis, there is an average accumulation that exceeds 120 inches. The soil in this subregion cannot support crops of food for large communities because of the rate of erosion. Interestingly, many trees in the tropical rainforest have adapted to the conditions, and the tree roots have been known to grow up toward the sky rather than deep into the ground. This climatic subregion can be found straddling the equator around the globe, primarily along the Amazon River in South America; the Congo basin in central Africa; and throughout the coastal areas of Southeast Asia, especially Malaysia and Indonesia.

The second subregion within the low-latitude climate region is called tropical wet and dry. Again, this subregion is aptly named, since there is a distinct wet season and a separate dry season. The annual accumulation of precipitation will range between 80 inches and 120 inches, but there is a distinctive dry season, during which little, if any, rain will occur. Peru and the majority of Burma, Thailand, and Cambodia are excellent examples of the tropical wet and dry subregion. India, however, with its wet and dry monsoon seasons, is the ideal example of this climate subregion.

The next low-latitude climate subregion is arguably the most important one to human beings. This climatic subregion is called semiarid or steppe. The definition of a semiarid region is an area that receives between 10 inches and 20 inches of rain annually. Typically summer temperatures will be quite high, and winters may be mild to cold. Snow can be found during the winter, but it does not happen regularly. These conditions allow for a variety of agricultural practices and products. In fact, this climatic subregion is home to the largest and most productive agricultural fields in the world. Semiarid lands are normally found beginning around the edges of deserts and tend to be narrow or irregularly shaped, especially when compared with the shape of a desert. The most productive steppe subregions can be found in the Great Plains region of Canada and the United States, the Pampas in Argentina, and the Northern China Plain.

The last low-latitude climate subregion is desert. By definition, a desert receives less than 10 inches of rain annually. Typically, hot deserts are located in this region, with the Sahara Desert being the largest and best known. The most extreme range in temperatures recorded on Earth has been found in the Sahara Desert, where daytime highs can reach 120 °F and temperatures at night might fall near 32 °F. Other examples include the Arabian Desert, the Great Sandy Desert in Australia, and the Thar Desert in western India. As previously discussed, proximity to large bodies of water and ocean currents strongly influences the existence of deserts. Of course, most people prefer to live in a moderate environment.

Mid-Latitude Climates

The **mid-latitude climates** fall between 30° and 60° N/S of the Equator. This is where the majority of people live as well as the biomes that support a variety of vegetation. Climate has a significant role in both biomes and population clusters, and the following climate sub regions are critical to understanding geographic patterns.

The Mediterranean climate is so named for the source—the region around the Mediterranean Sea. The same climate characteristics can also be found along coastal areas in central and southern California, western and southern Australia, the southwestern tip of Africa, and throughout most of Chile. The temperatures are very moderate, and the average annual rainfall of 20–30 inches is mostly confined to a wet season. The vegetation varies based upon precipitation, but this region has a fair amount of trees and shrubbery.

The next climatic subregion in the mid-latitudes is called humid continental. It contains the second most populous region in the world, including the US cities New York City and Chicago and the world cities of Toronto, Moscow, and Pyongyang. In this subregion, there is a greater variance in both temperature and precipitation. This is the climatic subregion in which there are usually four very distinct seasons—winter, spring, summer, and fall. The length of each season depends greatly upon the latitude of the location.

Humid subtropical is one of the most important climatic subregions of the mid-latitude climates because this region contains the largest number of inhabitants on a global basis. Characterized by long, hot, and humid summers and mild winters, this area will rarely experience a hard freeze (temperatures that stay below the freezing point for more than 4–6 hours). As a result, this region is heavily populated because humans prefer a moderate climate to one that is more extreme (too hot or cold, too wet or dry). It is an excellent climate region in which to grow crops such as rice, cotton, and soybeans. Places that have this type of climate include the southeastern United States, East China, eastern Australia, and northeastern Argentina.

High-Latitude Climates

High-latitude climates are found between 60° and 90° N/S. The two subregions, subarctic and tundra, are differentiated based primarily upon temperature. The subarctic region covers most of northern and all of central Canada, northern Europe, and northern Russia. The summers may be cool and short and the winters long and bitterly cold, during which time temperatures will be at or below the freezing point for up to 8 months at a time. The tundra subregion is even more extreme. The land has permafrost, where the soil is constantly frozen. The tundra is located mostly inside the polar region of northern Canada and Siberia and also covers Greenland.

The highland climate zone does not fit neatly into one specific climate region. Rather, the highlands can be found in both low-latitude and mid-latitude regions. The highland climatic subregion is characterized as having high enough peaks that human habitation is restricted on a permanent basis. The temperatures and other conditions vary greatly depending upon which direction the mountain peak is facing as well as its elevation. Various types of vegetation can be found in the highland climate subregion, but elevation dictates how lush or sparse the trees and shrubs grow. The vegetation becomes less dense the higher the elevation. The highland climate subregion, however, plays a vital role for human beings. As the seasons change and some of the snow and ice in the highland regions begin to melt, there is more freshwater for humans to consume. This newly available freshwater moves downstream during a time of year when farmers need water to irrigate crops.