



Environmental Trends and Hypotheses About Causes - Possible Answers

Graph	Trend	Cause
1 - Climate Factors		
Carbon Dioxide Concentration in Air	<i>Every year the air has more CO₂ in it. It keeps increasing faster – it went up only 10 ppm in the 1960s but more than 20 between 2000 and 2010</i>	<i>People are burning more coal and oil. That releases carbon dioxide into the air</i>
Mid-level air Temperature	<i>Very erratic, but the general trend is a higher temperature overall.</i>	<i>The higher concentration of carbon dioxide in the atmosphere has prevented outgoing radiation, causing the temperature to rise.</i>
2 – Oceans		
Average Ocean Temperature	<i>There is some year-to-year variation, but in general the ocean temperature has gone up every decade since 1960</i>	<i>Carbon dioxide in the air blocks the radiation that could take heat away from the ground surface and ocean</i>
Production of Shrimp near Greenland	<i>Production of shrimp has increased, most dramatically since 1980. It seems to have leveled off after 2000</i>	<i>The ocean temperature has risen (see above), allowing shrimp to survive in more northern waters than previously, causing an increase in production</i>
Mean Sea Level	<i>The average sea level has increased by 3 inches in the last 50 years; nearly an inch in just the last 10 years</i>	<i>If the average ocean temperature has increased, less of the ocean water is frozen, causing more water in the ocean; therefore higher levels</i>
3 – Cold Temperatures		
Extremely Cold Days	<i>The number of cold days has gone down in all three of these important cities</i>	<i>Earth's temperature is increasing, due to the increased burning of fossil fuels; these cities are manufacturing centers.</i>
Sightings of Ring-Neck Ducks in Alaska	<i>In the last 20 years, there have been many more sightings, although there is not a clear trend.</i>	<i>More snow melt (due to higher temperatures) could cause a better food supply for ducks</i>
Snow-melt date at Barrow, Alaska	<i>Snow has been melting earlier in many of the last 15 years. As with the previous graph, there is much variation.</i>	<i>Earth's temperature is increasing, causing earlier snow-melt.</i>
4 – Seasonal Extremes		
Dangerously High Night-time Temperature	<i>The number of dangerously hot nights has gone up since 1960; if anything, more rapidly since 1990.</i>	<i>Greenhouse gases have prevented longwave radiation from escaping, causing higher temperatures.</i>
Forest Fires on National Forest Land	<i>Since 1985 there have been many more forest fires on National Forest Land.</i>	<i>This could be caused by more lightning storms (see next graph) or extremely high temperatures that dry out vegetation to fuel fires. It could be caused by more careless human activity by visitors to National Forests</i>



Extreme Rain Storm Frequency	<i>There has been a slightly increased trend until about 2000; then a significant increase.</i>	<i>Dangerously high temperatures might cause more thunder storms.</i>
5 – Temperature Effects		
Growing Season in Upstate New York	<i>The frost-free or growing season has gotten longer, although there are year-to-year variations.</i>	<i>Generally higher temperatures make frost less likely in both late spring and early fall.</i>
Ice Dates, Grand Travers Bay	<i>The date that Grand Traverse Bay freezes has been later in the winter, especially in the 1990's. The date that the ice breaks up has been getting earlier, meaning that ice does not stay on the Bay as long as it did 50 years ago.</i>	<i>Higher temperatures mean that it takes longer for the water to cool enough to freeze, and then allows the ice to melt sooner.</i>
Great Lakes Winter Ice Cover	<i>The percent of winter ice cover on the Great Lakes varies widely from year to year. Since 1998 there have been lower percentages, but the variation is still great.</i>	<i>From the previous graph, the freeze date and breakup date of ice on one part of Lake Michigan has become closer in general, decreasing the possibility of ice cover. Both graphs, however, show great variability.</i>
6 – Glaciers and Ice		
Change in Mountain Glacier Volume	<i>Glaciers have gotten smaller on nearly every continent. The rate of shrinkage is different, however.</i>	<i>Warmer temperatures have increased the rate of snow melting. This is most pronounced in the Arctic region; warming is greater near the poles.</i>
Change in European Glacier Volume	<i>Glaciers in Norway* have increased in volume and stayed relatively stable in Switzerland. In other areas of Europe, the volume has decreased. *The two lines for Norway are for different glaciers; one is growing, one is not.</i>	<i>Switzerland has very high mountains (Alps) and Norway is farthest north. It is possible that warmer temperatures near the poles are causing more snow to develop, allowing glaciers to grow.</i>
Arctic Ocean Minimum Annual Ice Cover	<i>The minimum annual ice cover of the Arctic Ocean is decreasing at a fairly steady rate</i>	<i>The average ocean temperature is rising, causing melting of ice cover.</i>
7 - Carbon Dioxide in the Ocean		
CO₂ in Air and Ocean Water	<i>CO₂ in air has gone steadily upward. CO₂ in ocean water has also gone up, but with a lot of variations.</i>	<i>CO₂ moves from the air to the ocean, but it goes in the top layer of water, and the mixing depends on waves, storms, and ocean currents.</i>
Ocean pH Near Bermuda	<i>The pH is decreasing (Note: the lower the pH the higher the level of acid)</i>	<i>Chemists say that CO₂ dissolving in water tends to make it more acid.</i>
New Growth on Coral Reefs	<i>About 40% of the surface of coral reefs showed new growth in 1980. Only about 10% showed growth in 2010</i>	<i>The ocean water is more acidic, limiting the ability of corals to make new reef. Note: coral reefs help mitigate storm damage.</i>