

Contaminating the Arctic

Our perception of the Arctic region is that its distance from industrial centers keeps it pristine and clear from the impact of pollution. However, through a process known as transboundary pollution, the Arctic is the recipient of contaminants whose sources are thousands of miles away. Large quantities of pollutants pour into our atmosphere, as well as our lakes, rivers, and oceans on a daily basis. In the last 20 years, scientists have detected an increasing variety of toxic contaminants in the North, including pesticides from agriculture, chemicals and heavy metals from industry, and even radioactive fall-out from Chernobyl. These are substances that have invaded ecosystems virtually worldwide, but they are especially worrisome in the Arctic.

Originally, Arctic contamination was largely blamed on chemical leaks, and these leaks were thought to be “small and localized.” The consensus now is that pollutants from around the world are being carried north by rivers, ocean currents, and atmospheric circulation. Due to extreme conditions in the Arctic, including reduced sunlight, extensive ice cover and cold temperatures, contaminants break down much more slowly than in warmer climates. Contaminants can also become highly concentrated due to their significantly lengthened life span in the Arctic.

Problems of spring run-off into coastal waters during the growth period of marine life are of critical concern. Spring algae blooms easily, absorbing the concentrated contaminants released by spring melting. These algae are in turn eaten by zooplankton and a wide variety of marine life. The accumulation of these contaminants increases with each step of the food chain or web and can

potentially affect northerners who eat marine mammals near the top of the food chain. Pollutants respect no borders; transboundary pollution is the movement of contaminants across political borders, whether by air, rivers, or ocean currents. The eight circumpolar nations, led by the Finnish Initiative of 1989, established the Arctic Environmental Protection Strategy (AEPS) in which participants have agreed to develop an Arctic Monitoring and Assessment Program (AMAP). AMAP establishes an international scientific network to monitor the current condition of the Arctic with respect to specific contaminants. This monitoring program is extremely important because it will give a scientific basis for understanding the scope of the problem.

In the 1950's, pilots traveling on weather reconnaissance flights in the Canadian high Arctic reported seeing bands of haze in the springtime in the Arctic region. It was during this time that the term "Arctic haze" was first used, referring to this smog of unknown origin. But it was not until 1972, that Dr. Glenn Shaw of the Geophysical Institute at the University of Alaska first put forth ideas of the nature and long-range origin of Arctic haze. The idea that the source was long range was very difficult for many to support. Each winter, cold, dense air settles over the Arctic. In the darkness, the Arctic seems to become more and more polluted by a buildup of mid-latitude emissions from fossil fuel combustion, smelting and other industrial processes. By late winter, the Arctic is covered by a layer of this haze the size of the continent of Africa. When the spring light arrives in the Arctic, there is a smog-like haze, which makes the region, at times, looks like pollution over such cities as Los Angeles.

This polluted air is a well-known and well-characterized feature of the late winter Arctic environment. In the North American Arctic, episodes of brown or black snow have been traced to continental storm tracks that deliver gaseous and particulate-associated contaminants from Asian deserts and agricultural areas. It is now known that the contaminants originate largely from Europe and Asia.

Arctic haze has been studied most extensively in Point Barrow, Alaska, across the Canadian Arctic and in Svalbard (Norway). Evidence from ice cores drilled from the ice sheet of Greenland indicates that these haze particles were not always present in the Arctic, but began to appear only in the last century. The Arctic haze particles appear to be similar to smog particles observed in industrial areas farther south, consisting mostly of sulfates mixed with particles of carbon. It is believed the particles are formed when gaseous sulfur dioxide produced by burning sulfur-bearing coal is irradiated by sunlight and oxidized to sulfate, a process catalyzed by trace elements in the air. These sulfate particles or droplets of sulfuric acid quickly capture the carbon particles, which are also floating in the air. Pure sulfate particles or droplets are colourless, so it is believed the darkness of the haze is caused by the mixed-in carbon particles.

The impact of the haze on Arctic ecosystems, as well as the global environment, has not been adequately researched. The pollutants have only been studied in their aerosol form over the Arctic. However, little is known about what eventually happens to them. It is known that they are removed somehow. There is a good degree of likelihood that the contaminants end up in the ocean, likely into the North Atlantic, the Norwegian Sea and possibly the Bering Sea — all three very important fisheries.

Currently, the major issue among researchers is to understand the impact of Arctic haze on global climate change. The contaminants absorb sunlight and, in turn, heat up the atmosphere. The global impact of this is currently unknown but the implications are quite powerful.

Read the passage about alternative farming methods in Oregon again and look at the statements below.

In boxes 15 - 21 on your answer sheet write:

TRUE if the statement is true

FALSE if the statement is false

NOT GIVEN if the information is not given in the reading passage.

15 Industry in the Arctic has increased over the last 20 years.

16 Arctic conditions mean that the breakdown of pollutants is much accelerated

17 Pollution absorbed by Arctic algae can eventually affect humans.

18 The AEPS has set up scientific stations in the Arctic to monitor pollution.

19 Arctic pollution can sometimes resemble US urban pollution.

20 Evidence that this smog has only occurred in the 20th Century has been found in the ice on the polar ice cap.

21 Research has shown that aerosol arctic pollutants remain the air indefinitely.

Questions 22 – 27

Complete the summary relating to Arctic Haze below.

Choose your answers from the box below the summary and write them in boxes 22 – 27 on your answer sheet.

NB There are more words than spaces, so you will not use them at all.

Example

Answer

..... that the origins of spring, arctic haze,

Theories

first seen over the ice cap...

(eg) _____ that the origins of spring, arctic haze, first seen over the ice cap in the 1950s, came from far away were at first not (22) _____ . This haze is a smog formed in the dark, arctic winter by pollution delivered to the Arctic by storms (23) _____ in Europe and Asia. It is known to be a recent phenomenon as proof from (24) _____ shows it only starting to occur in the 20th Century. The smog consists of sulphates and carbon, the latter creating the (25) _____ of the haze. Due to lack of research, the final destination of the pollution is unknown but it probably ends up in the (26) _____ and therefore into the food chain. Scientists are presently more worried about the (27) _____ effect it has on climate change.

burning	terrible	ice cores	valid	certain
originating	sea	destroying	theories	unknown
agriculture	decided	bird life	dissipating	accepted
gases	darkness	air	density	

ANSWER
15. NOT GIVEN 16. FALSE 17. TRUE 18. NOT GIVEN 19. TRUE 20. FALSE 21. FALSE 22. certain 23. originating 24. ice cores 25. darkness 39. 26. sea 27. unknown