V. 1. ACID RAIN BACTERIA pdf

1: The Acid Rain: Causes, Effects and Control Measures (Words)

Light rain can spread soil bacteria far and wide, study finds Global precipitation may account for 1 to 25 percent of bacteria emitted from land.

Introduction[edit] Upon exposure to oxygen O2 and water H2O , metal sulfides undergo oxidation to produce metal-rich acidic effluent. However, favourable geochemical conditions quickly develop with an acidic interface between the bacteria and the mineral surface, and pH is lowered to a level closer to acidophilic optimum. At first colonisation of metal sulfides there is no AMD, and as the bacteria grow into microcolonies , AMD remains absent, then at a certain colony size, the population begins to produce a measurable change in water chemistry, and AMD escalates. Though the genus Picrophilus is not known to be involved in AMD, [19] its extreme acidophily is of interest, for instance its proton-resistant liposomes , which could be present in AMD acidophiles. One mutalistic example is the rotation of iron between species; ferrous-oxidising chemolithotrophs use iron as an electron donor , then ferric-reducing heterotrophs use iron as an electron-acceptor. The community possesses diversity beyond the bacteria and archaea however; the approximately constant pH present during acid mine drainage make for a reasonably stable environment, with a community that spans a number of trophic levels , and includes obligately acidophilic eukaryotes such as fungi , yeasts , algae and protozoa. Principal in these is the necessity of maintaining a large pH gradient, to ensure a circumneutral cytoplasm normally, however not in Picrophilus species. The archaeans have already been discussed above, and further information on their and bacterial adaptations are in basic form in the Figure. To elaborate upon the figure, the bacteria also use membrane proton blocking to maintain a high cytoplasmic pH, which is a passive system as even non-respiring A. A large amount of energy is available to the acidophile through proton movement across the membrane, but with it comes cytoplasmic acidity. Genomic adaptations[edit] Genomic adaptations are also present, but not without complications in organisms like Thermoplasmatales archaea, which is both acidophilic and thermophilic. For instance, this Order expresses an increased concentration of purine -containing codons for heat-stability, whilst increasing pyramidine codons in long open reading frames for protection from acid-stress. Picrophilus torridus, for instance, has the highest coding density of any non-parasitic aerobic microorganism living on organic substrates. Biotechnology applications[edit] Bioremediation is the primary biotech issue created by the AMD acidophiles. Though slower than conventional methods, the microorganisms which can also include fungi enable the exploitation of extremely low grade ores with minimum expense. Future of the technique[edit] AMD continues to be important in the River Rheidol , and in the near future further treatment will be needed in the area around Aberystwyth , which contains 38 of the 50 worst polluting metal mines in Wales. Much preventative work will be required to avoid the AMD associated with the last generation of coal mines. The fast and efficient protein and DNA repair systems show promise for human medical uses, particularly with regard to cancer and ageing. However further research is required to determine whether these systems really are qualitatively different, and how that can be applied from microorganisms to humans. As discussed above, acidophiles can have the option to use electron acceptors other than oxygen. Johnson [8] points out that facultative anaerobism of acidophiles, previously dismissed, could have major implications for AMD control. Further research is needed to determine how far current methods to block oxygen will working, in light of the fact that the reaction may be able to continue anaerobically.

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2: The Global Water and Nitrogen Cycles

Perhaps the most beneficial and well known acid-tolerant bacteria are those responsible for lactic-acid fermentation. This group includes numerous species in such genera as Lactobacillus, Leuconostoc, Pediococcus and Streptococcus.

A Socio, Phil B. History of Acid Rain The gases responsible for acid deposition are normally a by-product of electric power generation and the burning of coal. As such, it began entering the atmosphere in large amounts during the Industrial Revolution and was first discovered by a Scottish chemist, Robert Angus Smith, in In that year, he discovered the relationship between acid rain and atmospheric pollution in Manchester, England. Although it was discovered in the s, acid deposition did not gain significant public attention until the s and the term acid rain was coined in Public attention further increased in the s when the New York Times published reports about problems occurring in the Hubbard Brook Experimental Forest in New Hampshire. Acidic deposition occurs in two ways: Wet Deposition Wet deposition refers to acidic rain, fog, and snow. If the acid chemicals in the air are blown into areas where the weather is wet, the acids can fall to the ground in the form of rain, snow, fog, or mist. As this acidic water flows over and through the ground, it affects a variety of plants and animals. The strength of the effects depends on several factors, including how acidic the water is; the chemistry and buffering capacity of the soils involved; and the types of fish, trees, and other living things that rely on the water. Dry Deposition In areas where the weather is dry, the acid chemicals may become incorporated into dust or smoke and fall to the ground through dry deposition, sticking to the ground, buildings, homes, cars, and trees. Dry deposited gases and particles can be washed from these surfaces by rainstorms, leading to increased runoff. This runoff water makes the resulting mixture more acidic. About half of the acidity in the atmosphere falls back to earth through dry deposition. Sources of Acid Rain: Sources of sulphur dioxide and oxides of nitrogen may be natural such as volcanoes, oceans, and biological decay and forest fires. Acidification of environment is a man made phenomenon. There is now no doubt that most acids come from human activities from cars, homes, factories and power stations etc. The increasing demand for electricity and the rise in the number of motor vehicles in recent decades has increased emissions of acidifying pollutants. Measurement of Acid Rain Acid rain refers to the presence of strong mineral acids like sulfuric acid, Nitric acid and in some locations even hydrochloric and hydrofluoric acids which bring down the pH in the atmospheric precipitation. The pH scale ranges from 0, which is strongly acid, , and strongly alkaline, is 14, the scale point 7 is neutral. Pure water has a pH of 7. Normal rain is slightly acidic because carbon dioxide dissolves into it, so it has a pH of about 5. As of the year , the most acidic rain falling in the US has a pH of about 4. The National Atmospheric Deposition Program measures wet deposition, and its Web site features maps of rainfall pH follow the link to the isopleth maps and other important precipitation chemistry measurements. Effects of Acid Rain The ecological impact of acid rain is quite serious. It is likely to produce irreversible changes. The harmful effects caused by the acid deposition can be categorized under on water bodies, soil, vegetation, health and materials. In Greece and Italy, invaluable stone statues have been partially dissolved by acid rain. The Taj Mahal is one of the seven wonders of the world is in the increasingly danger of being destroyed by the constituents of polluted atmosphere, especially due to the pollutants released from the nearby Mathura Refinery. Also the activity of symbiotic nitrogen fixing bacteria present in the nodules of leguminous family is inhibited, thereby destroying the fertility of the soil. Thus agriculture production is greatly affected by the acidification of farmlands. Human health can also be affected by acidification of air, water and food while the consumption of low PH water in itself in dangerous, it can also release heavy metals from the pipes of the distribution system into the potable water supply. This acidification can play havoc with human nervous system Respiratory system and Digestive system by making the person an easy prey to neurologist diseases. Acid deposition also has an impact on architecture and art because of its ability to corrode certain materials. As acid lands on buildings especially those constructed with limestone it reacts with minerals in the stones sometimes causing it to disintegrate and wash away. Acid deposition can also corrode modern buildings, cars, railroad tracks, airplanes, steel bridges, and pipes above and below ground. Remedial Measures of Acid Rain: There are several ways to reduce acid deposition, more properly called acid

deposition, ranging from societal changes to individual action. They collect air and water samples and measure them for various characteristics like pH and chemical composition, and they research the effects of acid deposition on human-made materials such as marble and bronze. Finally, scientists work to understand the effects of sulphur dioxide SO2 and nitrogen oxides NOx â€" the pollutants that cause acid deposition and fine particles â€" on human health. To solve the acid rain problem, people need to understand how acid rain causes damage to the environment. They also need to understand what changes could be made to the air pollution sources that cause the problem. The answers to these questions help leaders make better decisions about how to control air pollution and therefore how to reduce â€" or even eliminate â€" acid rain. Since there are many solutions to the acid rain problem, leaders have a choice of which options or combination of options is best. The next section describes some of the steps that can be taken to reduce, or even eliminate, the acid deposition problem. Clean up smokestacks and exhaust pipes Almost all of the electricity that powers modern life comes from burning fossil fuels like coal, natural gas, and oil. Sulphur is present in coal as an impurity, and it reacts with air when the coal is burned to form SO2. In contrast, NO2 is formed when any fossil fuel is burned. There are several options for reducing SO2 emissions, including using coal containing less sulfur, washing the coal, and using devices called scrubbers to chemically remove the SO2 from the gases leaving the smokestack. Power plants can also switch fuels; for example burning natural gas creates much less SO2 than burning coal. Certain approaches will also have additional benefits of reducing other pollutants such as mercury and carbon dioxide. Each of these options has its own costs and benefits, however; there is no single universal solution. Similar to scrubbers on power plants, catalytic converters reduce NOx emissions from cars. These devices have been required for over twenty years in the US, and it is important to keep them working properly and tailpipe restrictions have been tightened recently. EPA has also made, and continues to make, changes to gasoline that allows it to burn cleaner. Use alternative methods for power generation There are other sources of electricity besides fossil fuels. Of these, nuclear and hydropower are used most widely; wind, solar, and geothermal energy have not yet been harnessed on a large scale in this country. There are also alternative energies available to power automobiles, including natural gas powered vehicles, battery-powered cars, fuel cells, and combinations of alternative and gasoline powered vehicles. All sources of energy have environmental costs as well as benefits. Some types of energy are more expensive to produce than others, which means that not all Americans can afford all types of energy. Nuclear power, hydropower, and coal are the cheapest forms today, but changes in technologies and environmental regulations may shift that in the future. All of these factors must be weighed when deciding which energy source to use today and which to invest in for tomorrow. Restore a damaged environment One of the simplest solutions to the problem is to neutralize the acid with lime. But it is quite expensive, especially when large areas of water bodies have to limed. Further large scale lime treatment may create its own ecological problems. Acid deposition penetrates deeply into the fabric of an ecosystem, changing the chemistry of the soil as well as the chemistry of the streams and narrowing, sometimes to nothing, the space where certain plants and animals can survive. Because there are so many changes, it takes many years for ecosystems to recover from acid deposition, even after emissions are reduced and the rain becomes normal again. For example, while the visibility might improve within days, and small or episodic chemical changes in streams improve within months, chronically acidified lakes, streams, forests, and soils can take years to decades or even centuries in the case of soils to heal. However, there are some things that people do to bring back lakes and streams more quickly. This process, called liming, has been used extensively in Norway and Sweden but is not used very often in the United States. Liming tends to be expensive, has to be done repeatedly to keep the water from returning to its acidic condition, and is considered a short-term remedy in only specific areas rather than an effort to reduce or prevent pollution. Furthermore, it does not solve the broader problems of changes in soil chemistry and forest health in the watershed, and does nothing to address visibility reductions, materials damage, and risk to human health. However, liming does often permit fish to remain in a lake, so it allows the native population to survive in place until emissions reductions reduce the amount of acid deposition in the area. Look to the future As emissions from the largest known sources of acid deposition â€" power plants and automobiles-are reduced, EPA scientists and their colleagues must assess the reductions to make sure they are achieving the results

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Congress anticipated. If these assessments show that acid deposition is still harming the environment, Congress may begin to consider additional ways to reduce emissions that cause acid deposition. They may consider additional emissions reductions from sources that have already been controlled, or methods to reduce emissions from other sources. They may also invest in energy efficiency and alternative energy. The cutting edge of protecting the environment from acid deposition will continue to develop and implement cost-effective mechanisms to cut emissions and reduce their impact on the environment. Take action as individuals It may seem like there is not much that one individual can do to stop acid deposition. However, like many environmental problems, acid deposition is caused by the cumulative actions of millions of individual people. Therefore, each individual can also reduce their contribution to the problem and become part of the solution. One of the first steps is to understand the problem and its solutions. Individuals can contribute directly by conserving energy, since energy production causes the largest portion of the acid deposition problem. For example, you can: Keep your thermostat at 68 F in the winter and 72 F in the summer. You can turn it even lower in the winter and higher in the summer when you are away from home. Because of these problems and the adverse effects air pollution has on human health, a number of steps are being taken to reduce sulphur and nitrogen emissions. Most notably, many governments are now requiring energy producers to clean smoke stacks by using scrubbers which trap pollutants before they are released into the atmosphere and catalytic converters in cars to reduce their emissions. Additionally, alternative energy sources are gaining more prominence today and funding is being given to the restoration of ecosystems damaged by acid rain worldwide.

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3: IP Water Quality in Kentucky: Cisterns for Kentucky

What is acid rain? What are its causes and effects? Learn about the role of fossil fuels and pollution, where acid rain occurs, and solutions to reducing the amount of sulfuric and nitric acids in.

This level of free chlorine will leave a taste that may be unacceptable. Public water supply systems use a concentration of 0. In this case, the contact time will be at least 20 minutes. The cistern owner can use activated carbon to remove the excess chlorine before the water is used for drinking or cooking. If an automatic chlorination system was available to treat rain water as it entered the cistern, contact time would not be a problem. However, the fluctuation of rainfall volume has so far prevented uniform automatic treatment. The owner can test cistern water for the concentration of free chlorine and pH using a kit available where swimming pool supplies are sold. Batch Treatment Process Batch treatment, an alternative to chlorine injection, is usually done manually as new water from precipitation or hauled water is added to the cistern. To use the batch chlorination system, first determine the cistern water volume by measuring depth, width and length for a circular cistern, measure the depth and diameter. Then use Table 2 or 3 to determine gallons of water in the cistern. Since free chlorine dissipates with time, weekly treatment is necessary if new water is not added to prevent high bacterial population from returning. This gives a maximum disinfectant concentration of 2 mg. This concentration leaves a chlorine taste to the water which dissipates with time. Batch treatment requires agitation to thoroughly mix the water with the chlorine. Bacteria are eliminated from the water, but sediments in the cistern bottom still contain very high bacterial populations that can contaminate the water above when the free chlorine dissipates. Cistern water that was superchlorinated 3 to 5 mg. Since this sediment mixes with the fresh water each time hauled water is dumped into the cistern, contamination of this water is possible. A baffle or splashplate will help but not completely eliminate this risk. A splashplate breaks the force of water entering the cistern through the inlet during a rainfall event or while filling the cistern with hauled water. Other Sources of Contamination Today we read much about water pollution from chemicals, industrial waste, acid rain, etc. It is possible for these to get into any water source, but with a well-designed cistern that prevents surface or groundwater from entering, chemical contamination can only come from air pollution through wet or dry deposition on the rainwater catchment area or from hauled water that was contaminated before reaching the cistern. While there is no detailed study of the chemical composition of cistern water in Kentucky, a study under way for monitoring acid rain precipitation throughout the state should tell us something about the water going into our cisterns. Precipitation rain or snow is the prime source for cistern water. So far, precipitation has been found to have a highly acidic pH of about 4. Trace amounts of heavy metals have also been identified. The higher concentrations are found around industrial areas. Since cistern water comes from a roof, contamination could be greater than that found by measuring only precipitation composition. Between precipitation events, dry deposition sometimes called dry fall can settle on the roof and add to that caught by the wet deposition. This is a prime reason for a roof washing mechanism such as the one shown at Figure 4. A study in the Virgin Islands where families are heavily dependent on cisterns found no significant contamination from roof paints or roof materials. Most of these roofs were galvanized metal. An Arizona study found no evidence that deterioration of such catchment material as common asphalt and fiberglass roofing contaminated runoff water. No information was found involving asbestos. The National Sanitation Foundation is evaluating paints, coatings, sealants and synthetic liners for use in potable water systems for the EPA. An updated list of this evaluation is available from the local Cooperative Extension office or the University of Kentucky, Department of Agricultural Engineering. One cistern water study designed to compare acidic deposition in Kentucky and Tennessee an area known to receive acid rain with that in St. Maarten, Netherlands Antilles an area far removed from any industrial area , sampled 25 masonry cisterns at each location and found concentrations of metals in all the cisterns below the recommended safe level. However, water that remained in the home plumbing system overnight exceeded the proposed drinking water standards in 18 homes in Kentucky-Tennessee and 10 homes in the Antilles. The study found no relation between roof materials, plumbing and metal concentrations. As would be expected, the

mean pH was more acidic 7. Sodium content of the cistern water was more than three times as high in the Antilles. This was explained as being caused by ocean spray. The Kentucky acid rain study sampled 15 lakes and found a slight variation in pH but none too far from neutral pH 7. This was explained by the alkaline soil constituents. Another significant observation was that many of the emission sources deposited the contaminants within a mile radius of the source. During precipitation rain or snow , the air is stripped of much of the sulfates, nitrates and heavy metals. Particulates greater than one micron will deposit within 20 miles and become part of the dry deposition between precipitation events. A Pennsylvania study analyzed cistern water in two rural areas thought to be receiving air pollutants from the industrialized Ohio River Valley. In some 12 of the 83 samples analyzed, the cistern sediment water contained lead and cadmium at levels exceeding mandatory drinking water limits established by the National Academy of Science. A few samples of tap water also exceeded the limits. In the bulk precipitation samples collected, all failed to meet EPA drinking water limits for pH and corrosivity. The seriousness of these findings merit such a study in Kentucky, especially near urban and industrial areas as well as near large point sources of air contaminants. In a Texas study, acid rain sampling found sulfuric and nitric acids near lignite power plants. Sand, gravel and charcoal filters, as used in the past, were found to be ineffective in removing these contaminants because the acid water would still leach them into the cistern water from the particles previously trapped in the filter. The National Acid Precipitation Assessment Program studied wet deposition of nitrates and sulfates in the eastern half of the U. A five-year average annual deposition of sulfate was 25 Kg. The highest annual deposition was in the Henderson-Owensboro area and the northeastern tip at 30 Kg. For nitrates the southwest tip was The total deposition, including wet and dry deposition, is estimated to be twice the wet deposition. Based on these estimates, the NO3-N in cistern water would range from 0. The SO4 concentration is estimated to range from 4 to 9 ppm, also well below the ppm recommended health standard. No maximum wet or dry deposition standards have been established at this time although atmospheric concentration standards have been set. No detailed data relative to heavy metal deposition is available for Kentucky, but a study in New York does offer some insight. This study correlated elevated heavy metal deposition with elevated levels of regional sulfate deposition. The study reported the source of the heavy metal and sulfates to be from coal-burning activities. Effects of Burning Wood and Coal in the Home Acid precipitation may contribute only a small fraction of the contaminants deposited on a cistern catchment area if there are nearby contaminant sources from coal- or wood-burning fireplaces and stoves. No data has been found to identify the amounts of chemicals that can be deposited from these sources, but observations around the outside of houses burning coal or wood in a stove will show ash, soot or oily substances as a result. The chimney exhausts have ash particles which contain heavy metals, organic particles and condensables which contain polyaromatic hydrocarbons PAHs. Many of the PAHs will condense on the particulate matter. Many PAHs are carcinogenic and one in particular, benzo-a-pyrene BaP , has been shown to be highly carcinogenic. These substances can deposit on a nearby cistern catchment area and wash into the cistern during the next precipitation. The BaP emissions from coal stoves have been measured as high as 2. This is almost 20 times that of burning wood in a stove and almost 60 times that of burning wood in a fireplace. The exhaust emissions from wood stoves vary with type of stove, wood seasoning and type of wood. One study compared these factors on the exhaust particulates, particulate organic matter and condensable organics. The highest particulate emissions a weight equivalent to 0. These values were about three to four times higher than seasoned oak in the same type stoves. Green oak and seasoned pine had particulate emissions two to three times that of seasoned oak in a baffled stove, but in an unbaffled stove these woods had lower particulate emissions and were similar to particulate emissions of seasoned oak in both stoves. The large particulates settle out quickly while the 1 m particulates stayed suspended in the air unless captured by precipitation. The condensable organics in the stove exhaust were comparable in baffled and unbaffled stoves for seasoned oak and pine and green oak a weight equivalent of 0. In general, hard woods and seasoned pine had the lowest emissions from stoves used for space heating, while a coal stove contributes the most emissions, by a large margin, that would potentially deposit on a cistern catchment area. Removing Undesirable Taste, Odor and Color Eliminating musty taste and odor as well as color and suspended matter from cistern water is a concern of cistern owners. These problems are particularly

associated with organics and the byproducts of microorganisms growing in the cistern water. Automatic treatment of water as it is drawn from the cistern is recommended if odor and organic compounds become the concern. A recommendation in the past was to allow water entering a cistern to pass through activated carbon which has the ability to absorb organics. Further research has shown that when untreated water water that is not decontaminated to eliminate pathogenic microorganisms and reduce total microorganism counts passes through a carbon filter, microorganism and pathogenic organism counts increase. Furthermore, without regular replacement, activated carbon filters become saturated with organics and are no longer effective. Bacteria growing on carbon filters clog the microscopic pores of activated carbon and therefore reduce its effectiveness. At present, activated carbon is not recommended for use in treating water entering a cistern. Activated carbon filters could be used if the water is decontaminated before reaching the activated carbon. Proper use and maintenance of activated carbon become important to obtain the maximum effect. Treatment capacity cannot be assured in the same manner as when a carbon filter is used on regulated public water supplies. Further information concerning activated carbon filters can be obtained through your local Extension office Carbon Filters, Cooperative Extension Publication IP A batch treatment can be used for reducing taste and odor in cisterns. The following treatments are recommended: The first step is purification by chlorination as previously described. The taste of chlorine should disappear in 24 to 36 hours after treatment. If the taste of lime is not removed by cleaning the new cistern see section on cleaning cisterns , use baking soda. Apply at the rate of 2 pounds of soda in 2 gallons of water for each 1, gallons of water in the cistern.

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4: Acid rain - Wikipedia

Abstract Acid rain is a growing problem in industrialized nations. This highly acidic precipitation is due in large part to human activities, and has been shown to have disastrous effects on.

He knew it was the top floors because the expansive windows that showed the raining and dangerous landscape of the planet were a lot higher off the mountainside. Also, Luke could sense the troopers and security officers and people who worked on the floors below. Their imprints on the force were delicate and bright against the bleakness of the landscape and the situation. He tried very hard not to sulk, surrounded as he was by the most lavish and opulent suite he had ever seen. It seemed a shame to ruin the aesthetic with a whiney attitude. However, even books and holo-films combined with mechanical manuals of all kinds and droid schematics could not distract him from the fact he was a prisoner. Vader, who had managed to subdue him in an embarrassingly short duel on Hoth following the Imperial invasion, had rendered him unconsciousness. Luke had woken in the suite more suited for royalty like Leia just days later with none of the aches and pains of his wampa encounter. Luke sighed and sank into the pale blue couch and stared out the window. Even Artoo had been removed, sitting away with a restraining bolt probably fuming. His captor, Vader, had remained curiously absent. Though the supernova of dark power skirted just on the edge of his perception as if Vader, like Luke, did not want to confront the other. In great contrast to the previous impression of Vader when they had been dueling or engaged in a dogfight, there was no anger or bitter fury. As untrained as he was it was impossible to ignore the presence of the Sith Lord. Even if he was the length of a castle away. Luke, having already exhausted his efforts to escape, tried to stave off his anger. Bad enough to have been bested so easily and in full view of a squad of Stormtroopers he was locked away by the very man who had killed his father. For all his adventures and by-the-seat-of-his-pants plans he had never expected to end up like one of the Princesses in the old stories. His face contorted into confusion when no one stood in the open door. R2 rolled into his view and beeped furiously. Where have you been? The door, which remained open, revealed nothing beyond except a long empty hallway. No one was anywhere near. Down the hallway, which seemed both opulent and cold, Luke went. Past two doors which did not open at his approach until he came upon a turbolift. A projected blue map came to life a moment later with dots across it. In a sight that made the rebel pilots stomach twist, a large black dot stood amongst a group a blue. His best inference was that Vader was a in a conference with his officers. The map, which lead him to the hanger bay, seemed so simple when he was looking at it. Moments later he was crawling along an access duct that squeezed his shoulder his blood pounding in his ears. Excitement thrummed through his veins while fear, an ever present clinging black parasite, whispered that he would not succeed. Luke ignored the claim and continued onward hoping against hope that Vader and his cronies would take no notice of his absence. Luke, who had been confined for the past week, should have no reason to be so pleased. A fact that pained Vader yet he was unwilling to confront the youth and introduce him to the castle staff until he knew the boy was not about to attack them. So, when a sudden thrill ran through the Force he left his superfluous meeting. Captain Tang, a dark skinned woman with pleasing competence who stood in as the majordomo of the palace knew to fall silent when he stood. I believe a prisoner has escaped. No doubt he is attempting to reach the hanger. If the prisoner is outside after they are dropped there is little chance we would be able to retrieve them alive. That he should be allowed out of his chambers in the first place was already a great annoyance. When Vader discovered the traitor who had aided him for he knew Luke could not have escaped on his own they would curse they day they had been born. All troopers set for stun. Anyone who brings harm to the boy will be dealt with. Without a doubt Luke would be looking to escape on a ship and it as far too dangerous with the incoming storm for him to do so. A low, sweeping net settled over the castle; searching for him and his hiding place. He could not get caught! Clinging to the idea of invisible and silent, Luke felt the dark side pass over him without a twitch of attention to his precarious perch in the hanger rafter. Somehow the boy was shielding himself. The previously bright spot in the force that was pulsing with life and energy had vanished. Vader felt his shriveled soul keen in misery at the disappearance of that warmth. While impressive for such an untrained

student it was unnatural for something so wholesome to become nothing. It pained Vader to admit a small amount of pride even as he huffed in irritation. The dim signature was still near the hanger and he could not allow Luke to venture into such danger. The fact Luke had faced such dangers that made flying through an acid storm seem tame was conveniently ignored until the time at which he could punish the Rebellion for such crimes. If Luke was not in the middle of a daring escape he would have taken more time to gape and oogle the Starfighters assembled. Some were so rare and ancient that only the obscenely wealthy could have possibly afforded them. Even the modified TIE fighter only caught his attention for a moment. This was the hanger that serviced the troopers ships or the pilots stationed at the castle. It seemed, with each ship he passed, it was the private collection of the Sith Lord himself. Artoo, just meters away, twittered away while rolling happily in front of his x-wing. A few choice huttese curses filtered through his mind as he raced to come up with a working escape plan. Indignation smothered the fear for a brief moment. One capable of dissolving human flesh and rendering ship useless do you wish to be caught in the midst of such a tempest? Why would he live in castle on a planet that suffered from acid storms? Vader was almost feet away and marching around the expansive form a clone wars Jedi Starfighter. He was not some reluctant child to be dragged anywhere. There were just six ships between him and the hanger doors and Vader was stalking close his respirator somehow making the expansive room seem smaller and smaller with every exhale. Swallowing down the sudden rise in feat he nodded to Artoo who shot from beneath the x-wing toward the opposite wall, shrieking the entire way. With Artoo hopefully a successful distraction and knowing that his window of opportunity to escape was closing fast Luke shot from beneath the green ship and toward the landing pad. Which was why his sprint toward the doors, still closing, was interrupted by a flying red lightsaber that had been thrown by a fast approaching Sith Lord. Luke threw himself downward to avoid the swing saber blade, crashing ungainly into the floor as the red lightsaber sailed just inches from his head. He landed in a tangled heap of limbs on the duracreet floor, his Imperial style clothes offering no resistance or padding to the ache of his collapse. Fury swelled around the Sith Lord as the insolent droid shocked him. He struggled to stand with his knee prosthetic protesting the sudden electrical charge. Luke swept around him shouting at the impertinent droid only for his commands to turn to shocked swearing. Even partially immobile he had little concern with the boy escaping. He would not be swayed from his mission to find his son. Nothing would stand in his way. Fury, a kind he had never experienced before, born from the deliberately foolish actions of the boy ignited in his chest. Reaching out with the dark side he wrapped Luke in tendrils of the dark side, freezing him where he stood. Luke must have sensed his rising anger as he quieted but his bright blue eyes so much like his own blazed with righteous fury. I have apprehended the prisoner. His anger, which moments ago had put volcanos and supernovas to shame, now quieted. It burned in his chest and levelled out to allow for almost clam deliberation. Vader would never approach his child if the anger that had prompted the death of his beloved mother was a danger to the young blond.

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5: Acid Rain | Dr. V.K. Maheshwari, Ph.D

Yuri's Revenge - 4 Brutal AI vs 1 - Acid Rain zoom Loading Unsubscribe from zoom? Cancel Unsubscribe. Working Subscribe Subscribed Unsubscribe K. Loading.

A more precise term is acid deposition, which has two parts: Wet deposition refers to acidic rain, fog, and snow. As this acidic water flows over and through the ground, it affects a variety of plants and animals. The strength of the effects depend on many factors, including how acidic the water is, the chemistry and buffering capacity of the soils involved, and the types of fish, trees, and other living things that rely on the water. Dry deposition refers to acidic gases and particles. About half of the acidity in the atmosphere falls back to earth through dry deposition. The wind blows these acidic particles and gases onto buildings, cars, homes, and trees. Dry deposited gases and particles can also be washed from trees and other surfaces by rainstorms. When that happens, the runoff water adds those acids to the acid rain, making the combination more acidic than the falling rain alone. Prevailing winds blow the compounds that cause both wet and dry acid deposition across state and national borders, and sometimes over hundreds of miles. Scientists discovered, and have confirmed, that sulfur dioxide SO2 and nitrogen oxides NOx are the primary causes of acid rain. Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds. Sunlight increases the rate of most of these reactions. The result is a mild solution of sulfuric acid and nitric acid. Pure water has a pH of 7. Normal rain is slightly acidic because carbon dioxide dissolves into it, so it has a pH of about 5. As of the year , the most acidic rain falling in the US has a pH of about 4. The National Atmospheric Deposition Program measures wet deposition, and its Web site features maps of rainfall pH follow the link to the isopleth maps and other important precipitation chemistry measurements. Its web site features information about the data it collects, the measuring sites, and the kinds of equipment it uses. Effects of Acid RainAcid rain causes acidification of lakes and streams and contributes to damage of trees at high elevations for example, red spruce trees above 2, feet and many sensitive forest soils. Prior to falling to the earth, SO2 and NOx gases and their particulate matter derivatives, sulfates and nitrates, contribute to visibility degradation and harm public health. They collect air and water samples and measure them for various characteristics like pH and chemical composition, and they research the effects of acid deposition on human-made materials such as marble and bronze. Finally, scientists work to understand the effects of sulfur dioxide SO2 and nitrogen oxides NOx â€" the pollutants that cause acid deposition and fine particles â€" on human health. To solve the acid rain problem, people need to understand how acid rain causes damage to the environment. They also need to understand what changes could be made to the air pollution sources that cause the problem. The answers to these questions help leaders make better decisions about how to control air pollution and therefore how to reduce â€" or even eliminate â€" acid rain. Since there are many solutions to the acid rain problem, leaders have a choice of which options or combination of options are best. The next section describes some of the steps that can be taken to reduce, or even eliminate, the acid deposition problem. Clean up smokestacks and exhaust pipesAlmost all of the electricity that powers modern life comes from burning fossil fuels like coal, natural gas, and oil. Sulfur is present in coal as an impurity, and it reacts with air when the coal is burned to form SO2. In contrast, NOx is formed when any fossil fuel is burned. There are several options for reducing SO2 emissions, including using coal containing less sulfur, washing the coal, and using devices called scrubbers to chemically remove the SO2 from the gases leaving the smokestack. Power plants can also switch fuels; for example burning natural gas creates much less SO2 than burning coal. Certain approaches will also have additional benefits of reducing other pollutants such as mercury and carbon dioxide. Each of these options has its own costs and benefits, however; there is no single universal solution. Similar to scrubbers on power plants, catalytic converters reduce NOx emissions from cars. These devices have been required for over twenty years in the US, and it is important to keep them working properly and tailpipe restrictions have been tightened recently. EPA has also made, and continues to make, changes to gasoline that allows it to burn cleaner. Use alternative energy sources There are other sources of electricity besides fossil fuels. Of these, nuclear and hydropower are used most widely; wind, solar, and geothermal energy have not

yet been harnessed on a large scale in this country. There are also alternative energies available to power automobiles, including natural gas powered vehicles, battery-powered cars, fuel cells, and combinations of alternative and gasoline powered vehicles. All sources of energy have environmental costs as well as benefits. Some types of energy are more expensive to produce than others, which means that not all Americans can afford all types of energy. Nuclear power, hydropower, and coal are the cheapest forms today, but changes in technologies and environmental regulations may shift that in the future. All of these factors must be weighed when deciding which energy source to use today and which to invest in for tomorrow. Restore a damaged environment Acid deposition penetrates deeply into the fabric of an ecosystem, changing the chemistry of the soil as well as the chemistry of the streams and narrowing, sometimes to nothing, the space where certain plants and animals can survive. Because there are so many changes, it takes many years for ecosystems to recover from acid deposition, even after emissions are reduced and the rain becomes normal again. For example, while the visibility might improve within days, and small or episodic chemical changes in streams improve within months, chronically acidified lakes, streams, forests, and soils can take years to decades or even centuries in the case of soils to heal. However, there are some things that people do to bring back lakes and streams more quickly. This process, called liming, has been used extensively in Norway and Sweden but is not used very often in the United States. Liming tends to be expensive, has to be done repeatedly to keep the water from returning to its acidic condition, and is considered a short-term remedy in only specific areas rather than an effort to reduce or prevent pollution. Furthermore, it does not solve the broader problems of changes in soil chemistry and forest health in the watershed, and does nothing to address visibility reductions, materials damage, and risk to human health. However, liming does often permit fish to remain in a lake, so it allows the native population to survive in place until emissions reductions reduce the amount of acid deposition in the area. Look to the future As emissions from the largest known sources of acid deposition â€" power plants and automobiles-are reduced, EPA scientists and their colleagues must assess the reductions to make sure they are achieving the results Congress anticipated. If these assessments show that acid deposition is still harming the environment, Congress may begin to consider additional ways to reduce emissions that cause acid deposition. They may consider additional emissions reductions from sources that have already been controlled, or methods to reduce emissions from other sources. They may also invest in energy efficiency and alternative energy. The cutting edge of protecting the environment from acid deposition will continue to develop and implement cost-effective mechanisms to cut emissions and reduce their impact on the environment. Take action as individualsIt may seem like there is not much that one individual can do to stop acid deposition. However, like many environmental problems, acid deposition is caused by the cumulative actions of millions of individual people. Therefore, each individual can also reduce their contribution to the problem and become part of the solution. One of the first steps is to understand the problem and its solutions. Individuals can contribute directly by conserving energy, since energy production causes the largest portion of the acid deposition problem. For example, you can: Only use electric appliances when you need them. Keep your thermostat at 68 F in the winter and 72 F in the summer. You can turn it even lower in the winter and higher in the summer when you are away from home. Insulate your home as best you can. Carpool, use public transportation, or better yet, walk or bicycle whenever possible Buy vehicles with low NOx emissions, and maintain all vehicles well. Acid rain causes acidification of lakes and streams and contributes to the damage of trees at high elevations for example, red spruce trees above 2, feet and many sensitive forest soils. Prior to falling to the earth, sulfur dioxide SO2 and nitrogen oxide NOx gases and their particulate matter derivativesâ€"sulfates and nitratesâ€"contribute to visibility degradation and harm public health. Effects of Acid Rain â€" Surface Waters and Aquatic Animals The ecological effects of acid rain are most clearly seen in the aquatic, or water, environments, such as streams, lakes, and marshes. Acid rain flows into streams, lakes, and marshes after falling on forests, fields, buildings, and roads. Acid rain also falls directly on aquatic habitats. Most lakes and streams have a pH between 6 and 8, although some lakes are naturally acidic even without the effects of acid rain. Lakes and streams become acidic i. In areas where buffering capacity is low, acid rain releases aluminum from soils into lakes and streams; aluminum is highly toxic to many species of aquatic organisms. Acid rain causes a cascade of effects that harm or kill individual fish, reduce fish

population numbers, completely eliminate fish species from a waterbody, and decrease biodiversity. As acid rain flows through soils in a watershed, aluminum is released from soils into the lakes and streams located in that watershed. So, as pH in a lake or stream decreases, aluminum levels increase. Both low pH and increased aluminum levels are directly toxic to fish. In addition, low pH and increased aluminum levels cause chronic stress that may not kill individual fish, but leads to lower body weight and smaller size and makes fish less able to compete for food and habitat. Some types of plants and animals are able to tolerate acidic waters. Others, however, are acid-sensitive and will be lost as the pH declines. Generally, the young of most species are more sensitive to environmental conditions than adults. At pH 5, most fish eggs cannot hatch. At lower pH levels, some adult fish die. Some acid lakes have no fish. The chart below shows that not all fish, shellfish, or the insects that they eat can tolerate the same amount of acid; for example, frogs can tolerate water that is more acidic i. Together, biological organisms and the environment in which they live are called an ecosystem. The plants and animals living within an ecosystem are highly interdependent. For example, frogs may tolerate relatively high levels of acidity, but if they eat insects like the mayfly, they may be affected because part of their food supply may disappear. Because of the connections between the many fish, plants, and other organisms living in an aquatic ecosystem, changes in pH or aluminum levels affect biodiversity as well. Thus, as lakes and streams become more acidic, the numbers and types of fish and other aquatic plants and animals that live in these waters decrease. Nitrogen plays a significant role in episodic acidification and new research recognizes the importance of nitrogen in long-term chronic acidification as well. Furthermore, the adverse impact of atmospheric nitrogen deposition on estuaries and near-coastal water bodies is significant. Scientists estimate that 10 to 45 percent of the nitrogen produced by various human activities that reaches estuaries and coastal ecosystems is transported and deposited via the atmosphere. For example, about 30 percent of the nitrogen in the Chesapeake Bay comes from atmospheric deposition. Nitrogen is an important factor in causing eutrophication oxygen depletion of water bodies.

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6: How bacteria can survive in acidic, metal rich environments

The primary component of acid rain appears to be sulfuric acid, formed from sulfur dioxide by a series of complex photochemical and catalytic reactions. 3 Recent studies 4 indicate that nitric acid.

Distilled water , once carbon dioxide is removed, has a neutral pH of 7. Liquids with a pH less than 7 are acidic, and those with a pH greater than 7 are alkaline. A common example is nitric acid produced by electric discharge in the atmosphere such as lightning. History The corrosive effect of polluted, acidic city air on limestone and marble was noted in the 17th century by John Evelyn , who remarked upon the poor condition of the Arundel marbles. At first the main focus in research lay on local affects of acid rain. Public awareness of acid rain in the U. S increased in the s after The New York Times published reports from the Hubbard Brook Experimental Forest in New Hampshire of the myriad deleterious environmental effects shown to result from it. These areas all burn sulphur-containing coal to generate heat and electricity. The use of tall smokestacks to reduce local pollution has contributed to the spread of acid rain by releasing gases into regional atmospheric circulation. An example of this effect is the low pH of rain which falls in Scandinavia. In , a group of scientists including Gene Likens discovered the rain that was deposited at White Mountains of New Hampshire was acidic. The pH of the sample was measured to be 4. Acid rain that mixed with stream water at Hubbard Brook was neutralized by the alumina from soils. Experimental research was done to examine the effects of increased acidity in stream on ecological species. There was a decrease in species diversity, an increase in community dominants, and a decrease in the food web complexity. Congress passed an Acid Deposition Act. NAPAP looked at the entire problem from a scientific perspective. It enlarged a network of monitoring sites to determine how acidic the precipitation actually was, and to determine long-term trends, and established a network for dry deposition. It looked at the effects of acid rain and funded research on the effects of acid precipitation on freshwater and terrestrial ecosystems, historical buildings, monuments, and building materials. It also funded extensive studies on atmospheric processes and potential control programs. From the start, policy advocates from all sides attempted to influence NAPAP activities to support their particular policy advocacy efforts, or to disparage those of their opponents. In , the panel of scientists came up with a draft report, which concluded that acid rain is a real problem and solutions should be sought. In May , the House of Representatives voted against legislations that aimed to control sulphur emissions. There was a debate about whether Nierenberg delayed to release the report. Subsequent Reports to Congress have documented chemical changes in soil and freshwater ecosystems, nitrogen saturation, decreases in amounts of nutrients in soil, episodic acidification, regional haze, and damage to historical monuments. Meanwhile, in , the U. Congress passed a series of amendments to the Clean Air Act. Title IV called for a total reduction of about 10 million tons of SO2 emissions from power plants. It was implemented in two phases. Phase I began in , and limited sulphur dioxide emissions from of the largest power plants to a combined total of 8. Phase II began in , and affects most of the power plants in the country. During the s, research continued. This rule provides states with a solution to the problem of power plant pollution that drifts from one state to another. In , by which time the cap and trade system had been augmented by the George W. The first recorded example of the use of the term is from , describing how volunteers across the US collected rain samples to assist the Audubon Society in an acid-rain awareness raising campaign. The volunteers collected samples, checked for acidity, and reported back to the organization. The information was then used to demonstrate the full extent of the phenomenon. Emissions of nitrogen oxides which are oxidized to form nitric acid are of increasing importance due to stricter controls on emissions of sulphur containing compounds. Acid-producing gasses are also created by biological processes that occur on the land, in wetlands , and in the oceans. The major biological source of sulphur containing compounds is dimethyl sulfide. Nitric acid in rainwater is an important source of fixed nitrogen for plant life, and is also produced by electrical activity in the atmosphere such as lightning. Human activity The coal-fired Gavin Power Plant in Cheshire, Ohio The principal cause of acid rain is sulphur and nitrogen compounds from human sources, such as electricity generation , factories, and motor vehicles. Electrical power generation using coal is among the greatest contributors to gaseous

pollutions that are responsible for acidic rain. The gases can be carried hundreds of kilometers in the atmosphere before they are converted to acids and deposited. In the past, factories had short funnels to let out smoke but this caused many problems locally; thus, factories now have taller smoke funnels. However, dispersal from these taller stacks causes pollutants to be carried farther, causing widespread ecological damage. Chemical processes Combustion of fuels produces sulphur dioxide and nitric oxides. They are converted into sulphuric acid and nitric acid.

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7: Acidophiles in acid mine drainage - Wikipedia

Researchers dissecting hailstones found high levels of bacteria in their centers. They suggest that the bacteria play an important role in the formation of hail, rain and snow in cloud formations.

But what causes it? As it turns out, the smells people associate with rainstorms can be caused by a number of things. One of the more pleasant rain smells, the one we often notice in the woods, is actually caused by bacteria! Actinomycetes, a type of filamentous bacteria, grow in soil when conditions are damp and warm. When the soil dries out, the bacteria produces spores in the soil. The wetness and force of rainfall kick these tiny spores up into the air where the moisture after a rain acts as an aerosol just like an aerosol air freshener. The moist air easily carries the spores to us so we breathe them in. These spores have a distinctive, earthy smell we often associate with rainfall. The bacteria is extremely common and can be found in areas all over the world, which accounts for the universality of this sweet "after-the-rain" smell. Another sort of smell is caused by the acidity of rain. Because of chemicals in the atmosphere, rainwater tends to be somewhat acidic, especially in urban environments. When it comes in contact with organic debris or chemicals on the ground, it can cause some particularly aromatic reactions. It breaks apart soil and releases minerals trapped inside, and it reacts with chemicals, such as gasoline, giving them a stronger smell. Like the smell caused by the bacteria spores, the smell of chemical reactions is most noticeable when it rains following a dry spell. Another after-the-rain smell comes from volatile oils that plants and trees release. The oil then collects on surfaces such as rocks. The rain reacts with the oil on the rocks and carries it as a gas through the air. This scent is like the bacteria spores in that most people consider it a pleasant, fresh smell. It has even been bottled and sold for its aromatic qualities! These are a few common rain smells, but there are also all sorts of other scents after it rains. There is lots of aromatic material that the moisture and impact of rain can stir up, and the moist atmosphere following a downpour is particularly good at carrying these particles through the air. So, when you talk about the after-the-rain smell with a friend, you may mean one thing while your friend is thinking of something else.

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8: What causes the smell after rain? | HowStuffWorks

Acid rain refers to the presence of strong mineral acids like sulfuric acid, Nitric acid and in some locations even hydrochloric and hydrofluoric acids which bring down the pH in the atmospheric precipitation.

Read this article to learn about the causes, effects and control measures of acid rain! Acid rain is a rain or any other form of precipitation that is unusually acidic, i. It can have harmful effects on plants, aquatic animals, and infrastructure through the process of wet deposition. Acid rain is caused by emissions of compounds of ammonium, carbon, nitrogen, and sulphur which react with the water molecules in the atmosphere to produce acids. The various gases like sulphur dioxide and nitrogen dioxide react with water vapours in presence of sunlight and form sulphuric acid and nitric acid mist. The reaction takes place in the following manner. The condensation begins with the fall of temperature and it mingles with the rain, fog or snow and this increases its acidity Causes of Acid Rain: The oxides of nitrogen, or NOx, and sulphur dioxide, or S02, are the two main sources of acid rain. Sulphur dioxide, which is a colourless gas, is given off as a by-product when fossil fuels that contain sulphur are burned. This gas is produced due to various industrial processes, like the processing of crude oil, utility factories, and iron and steel factories. On the whole, industrial combustion is responsible for Nitrogen oxide is the other chemical that acid rain is made up of. Any nitrogen compound that contains oxygen atoms of any amount is known as oxides of nitrogen. For example, nitrogen dioxide and nitrogen monoxide are oxides of nitrogen. These gases are produced in firing processes which involve extremely high temperatures, e. Five per cent of nitrogen oxide is emitted by natural processes like lightning, volcanic eruptions, forest fires, and action of bacteria in the soil. Nitrogen oxide, which is a dangerous gas in itself, causes damage to the respiratory organs by attacking the membranes in them, thus increasing the chances of respiratory diseases. It also causes smog and is a contributory factor for the damage of the ozone layer in the atmosphere. When there is acid rain, the nitrogen oxide can be carried far away from the original location of the rain. Effects of Acid Rain: Acid rain has serious implications for continuation of life on this planet. The main acid rain problems are: Effects on Water Bodies: Most rivers and lakes have a pH that ranges between 6 and 8. Acid rain that may fall directly in these water bodies or may be washed into them as surface runoff, alter their chemical environment. The flora and fauna in these water bodies are adapted for life in the original pH value of the water. Altered acidity of their environment may be a threat to their survival. Although, some soils are capable of buffering increase in acidity, water bodies that have soil with poor buffering capacity may release aluminium ions from the soil which is toxic for aquatic life forms. Read more on water pollution. Effects on Soil and Forests: Acid rain is being cited as one of the major causes of degradation of the forests at higher altitudes of the Appalachian Mountains from Maine to Georgia. Forests are affected directly as well as indirectly by acid rain. When leaves are frequently exposed to acid rain they are stripped off the essential nutrients present in them. Acid rain falling on the soil, change soil acidity. In its bid to neutralize this change in pH, soil releases substances that are toxic for trees growing on it. Acidic water also dissolve nutrients in the soil and as it runs off the surface, it carries these essential minerals away with it, before they can be absorbed by flora growing on the forest floor. Acid rain has a long term can directly effect on the aquatic life, as the high amount of sulphuric acid and nitric acid levels in acid rains are directly consumed by aquatic animals and plants. The harmful acids affect the ability of fish to take in nutrients, salt, and oxygen. Aquatic animals intake oxygen from the water through their gills, but harmful acids leads to mucus formation in the gills, which hinders their ability to respire. Acid rains affect the pH level of the water which reduces the absorption capacity of essential nutrients of the aquatic life. This also hampers the reproduction process in fish leading to weak or brittle eggs. Effects of Acid Rain on Humans: Most of all, acid rain affects human health adversely. It has the ability of harming us via the atmosphere as well as the soil where the food we eat is grown. Acid rain results in toxic metals breaking loose from the chemical compounds they occur in naturally. While toxic metals may be dangerous, but as long as they exist in combination with other elements, they are not harmful. Once acid rain causes these toxic metals to be released they can infiltrate into the drinking water, and the animals or crops that humans use as sources of food. This contaminated food can damage the nerves in

children, or result in severe brain damage, or even death. Another adverse health effect of acid rain on humans is the respiratory problems it causes. The emissions of nitrogen oxide and sulfur dioxide cause respiratory problems like throat, nose and eye irritation; headache; asthma; and dry coughs. Acid rain is particularly harmful for those who have difficulty in breathing or suffer from asthma. In fact, even the lungs of healthy people can be damaged by the pollutants in acid air. Acid Rain Effects on Historical Monuments: Acid rain destroys stained glass windows, corrodes metal and also ruins the paint colour. Acid rain reacts with calcium to form calcium bicarbonate, which can be easily washed away. The marble walls and pillars of this great man-made monument are found to be getting eroded by acid rains. The numbers of possible solutions for acid rain that are available to us are aplenty: One of the most fundamental acid rain solutions is to utilize fuels that burn more cleanly, or to burn coal more efficiently. This will greatly reduce the possibilities of acid rain developing in the atmosphere. Vehicles and cars must be mandatory required to comply with very tight and efficient emission standards. Fitting catalytic converters into the exhaust pipes of vehicles also reduces the amount of sulfur dioxide produced by the vehicles. For industrial power plants, there are many more acid rain solutions that must be enforced, as they are clearly the biggest contributors to the formation of acidified water droplets in the atmosphere. Industries must regularly inspect and clean all their emission equipment and chimneys and pipes. All these acid rain solutions will be pointless unless people are informed and educated about the ill-effects and harms of acid rain. A widespread and nationwide effort must be made to make people aware. Only after that is done will all the acid rain solutions actually make a difference. Acid rain is one of the biggest environmental hazards that we are facing today, and strong measure must be taken to prevent it, before it is too late. Governments need to sit up and take notice, and do much more than what they are already doing. Acid rain adversely affects plants, animals and human beings, and as a result it is not something that we can afford to ignore. It is our duty towards ourselves and towards our fellow human beings to do all we can to prevent and reduce the presence and increase of acid rain in our environment.

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9: Acid Rain : Causes, Effects and Solutions | Rashid's Blog: An Educational Portal

Acid Rain planningconquest. Summary: Luke, captured and imprisoned at Bast Castle, attempts to escape. His plan is foiled by an acid storm and an angry Sith.

As you can see from the Table and from Figure 2, most of the water on earth is tied-up in rocks and unavailable. Of the water that is at the surface of the earth and available for cycling, only a very small percentage is fresh water. Cycling There are 4 major pathways of cycling in the global water cycle Figure 3: The following gives the flux of these different pathways: Controls There are several major controls on the water cycle, including human consumption, temperature increases, and land use changes. The consumption of water by humans has increased dramatically since the industrial revolution, and today water is a critically lacking resource in certain areas such as deserts and semi-deserts. In addition to this local vulnerability, it is quite likely that water shortages due to human consumption will occur at the regional scale in the near future. For example, the southwestern United States in all seriousness has proposed to "buy" water from the Great Lakes states and build a pipeline from Lake Michigan -- so far Michigan, Wisconsin, and other nearby states and Canadian provinces have declined such offers. The second major control on the cycling of water on earth is temperature. Increasing temperature increases the rates of evaporation and ice melting, and causes sea level to rise. Severe droughts, like in the Sahel in Africa, are caused by small changes in the geographical distribution of water that are in turn caused by changes in temperature. In Figure 5 below there are some examples of the effect that increased global temperatures have had on glaciers in recent years. Glacier melting in the French Alps and Alaska. This situation of recent retreat of ice sheets has occurred and is documented in many parts of the world. For example, in Alaska Exit Glacier lower left has retreated from where the photographer was standing to its current location within the last years, and a coastal glacier right used to fill the entire valley to the sea. Sea level has been rising in the world in recent years. Figures 6 and 7 below show first how large these changes have been in various parts of the world, and second how much of this increase is due simply to the thermal expansion of water as temperature Increases. Figure 8 shows the effect of a rise of 4. Note that while 4. Sea level rise and impacts of temperature above. Impact of sea level rise on low-lying areas of Florida left. The conveyor belt circulation right of the ocean may be altered by increasing freshwater inputs to the Arctic ocean. As more and more of the ice caps on land melt, there will be an increased river flow of freshwater from land to the ocean, and especially to the Arctic ocean. This flow of water will place a less dense, freshwater "cap" on the surface water of the ocean, and could prevent sinking of cold, salty water "deep water formation" that drives ocean currents Figure 9 above; see lectures on ocean circulation for review of this topic. Interactions in the hydrological cycle. One of the important aspects of the hydrological cycle is how temperature will interact with other factors. For example, in the lake levels in the Laurentian Great Lakes were extremely low, and these low levels had a great impact on shipping and recreation see pictures below. However, that year the precipitation and temperature were about average, and initially it was unclear just why the lake levels were so low. Based on your knowledge of the main factors involved in the hydrological cycle, can you suggest what might have occurred to cause the lake levels to be so low? This will be discussed in lecture. Currently most of the land use changes on earth, such as deforestation, are at a local scale. However, it may soon become important at regional scales and for the entire globe in the future. Nutrient cycles are strongly linked to hydrologic cycle, and so nutrient export was also increased. These increases are only temporary, however, and the likely end result of such land use changes is that precipitation will be decreased this will be discussed in more detail in the upcoming lecture on the Tropical Rainforest , and soils will become less fertile. This illustrates one of the key points about element cycles, which is that they are most often linked and it is difficult to study them in isolation. In this example, we found that the water cycle strongly controls the nutrient cycling due to the transport of nutrients in runoff. In the next section we will examine the nitrogen cycle specifically as an example of a global cycle of an important nutrient. The Global Nitrogen Cycle The cycling of nitrogen is different from the cycling of water in at least one important area, which is that the "forms" of nitrogen are more varied than the form of water, which is always H2O and in either a liquid, gas, or

solid form. The nitrogen cycle is complex then in part because of the many chemical forms of N such as: Figure 10 below gives an overview of the global nitrogen cycle. The Global Nitrogen Cycle Accounting Just as we did for the water cycle, or first step in understanding the nitrogen cycle is to examine the distribution of N on earth. The Table below gives the distribution of N in x grams. Notice that the largest pool of available N is in the atmosphere.

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Managerial Accounting 1e with Xanedu Password Set Traditional theories of intelligence The Accidental Vampire (Argeneau Vampires, Book 7) Proportionality in the morality of war. The book of awesome espaÃ±ol Transformation of Life Specification and informational issues in credit scoring The Future of Moral Values Week 4 : Miracles Hydrology and water chemistry of shallow aquifers along the upper Clark Fork, western Montana Brain dysfunction in children Origins of Christendom in the West The Richardson-Stinstra correspondence Stephen King universe Secret wounds: the bodies of fascism in Giorgio Bassanis Dietro la porta Derek Duncan From inquiry to academic writing 4th edition Works by Sylvia Plath N.F.P.A. Inspection Manual The Atlas of Medieval Europe Australian-Japanese business transactions Traditionalism in the works of Francisco de Quevedo y Villegas A wonderful March, 212 B.C. Plum River Fault Zone of northwestern Illinois Jesus Loves Me! (Baby Flap Book) An Atari for kids The Transputer Handbook The Immigrant. The Judge Fisher Story A Letter Addressed to the Rev. R. W. Jelf, Canon of Christ Church: In Explanation of No. 90 in . Discharge certificates. The neo-Confucians (16th-17th centuries and the representatives in this study My Little Blue Tattoo Handbook on Old High German literature Atmospheric Water Vapour Measurement at Maitri, Antarctica British flora medica, or, History of the medicinal plants of Great Britain Morgan, Sister Gertrude Monarchy and Religious Institution in Israel under Jeroboam I Philippine cookbook The chess sacrifice: technique, art and risk in sacrificial chess Langenscheidt universal Finnish dictionary No. 32. The shiftless father myth