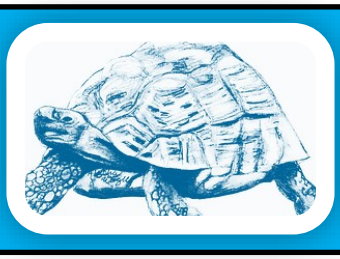
Tortoise Talk

Hello Readers! Great Basin College Nature Club has returned for another season of adventures. We at Nature Club promote physical fitness, collaboration between students, and public education on our local wildlife and environment. This semester our main theme throughout our articles is water and its effects on everyday life. In this issue, you will learn about the water sources, where it travels, how it helps all of us as humans, and how its presence or even absence can also pose both dangers and advantages. Thank you for reading, and enjoy this issue!

Great Basin College Nature Club Fall 2014

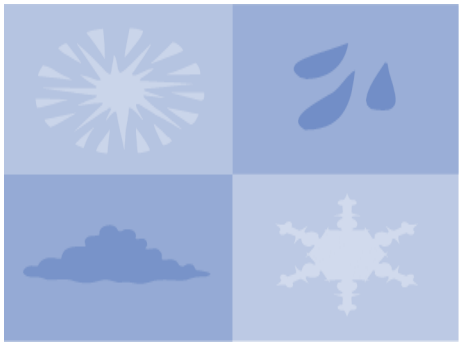


Top Row, Left to Right: Nicole DiCamillo, Tommy Miller, James Russum, William Ortman
Middle Row, Left to Right: Victoria Caristo, Faisal Osman, Kip Magee, Sarah Czipowski, Jessica Ceja, Shelby Harris
Bottom Row, Left to Right: Ed Kluss, Brionna Moore, Dakota Sanders

Inside This Issue

Semester Review

Welcome back readers to Nature Club's second issue of Tortoise Talk! This Fall semester went by almost too quickly it seems. Nature Club was busy as we had many awesome trips, great guest speakers, a successful bake sale, and many members contribute to the research articles in this issue that you are about to read!



A special thanks to this semester's executive board for their efforts, and the SGA for funding one of our educational trips and printing of this newsletter. A special thanks to Kip Magee as he is not only a member of GBCNC but also a senator for SGA. His work during the Oktoberfest event brought Nature Club closer to the SGA family. A huge thank you as well to Jaqueline Lopez for sharing holiday decorations with NC and Janis Collins, for helping with all of the behind the scenes paperwork that needs to be done to go on trips and have our fundraisers. We appreciate and thank Shirley Jones for her help getting IAV and classrooms reserved, David Hernandez for everything that he's done to help out with fliers and posters, Jenny Leung for her interest in beginning a sub chapter in Elko and we can't forget to thank Dr. Rita Bagwe for all of her input and support as our club adviser, and everyone else who supported us.

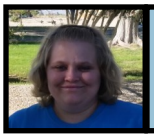
Thanks to all of the other members: Jessica, Shelby, Ed, James, Faisal, Nicole, Dakota, Victoria, and Jose, for their interest in nature, conservation and educational input. Without students who show interest and take part in these activities and events we would not be a club today.

Another special thank you to our speakers Professor George Sausman, Professor Peter Bagley, and Dr. Laurie Walsh for taking time out of their schedules to come educate and enlighten our listeners on their specialized fields. Professor Sausman enhanced our understanding about our theme, "water" into a broad lecture about its properties, uses, and issues. Professor Bagley delivered a thought provoking discussion about the introduction of wolves back into Yellowstone National Park with perspective from his background in Biology. Dr. Walsh prepared an incredible power point presentation that brought us to a time when men and women hunted for their food, gathered local herbs and plants, crafted unique tools, and migrated from season to season.

Nature Club incorporates speaker presentations to enhance college students' (as well as the community's) outlook on the natural world all around us but from a more technical and scientific perspective.

Nature Club had a total of 1 fundraiser, 3 socials, 3 speakers, 1 workshop, 14 meetings, and 6 trips this semester. Nature Club wanted to take more trips but schoolwork was a priority for the members. However, most of the members still managed to find a way to attend a few of the events and also write an article to help enhance our understanding of this semester's theme of water.

Nature Club invites you to sit back, relax and enjoy the content in this issue's newsletter. Prepare yourself for a fun and informative read. Nature Club is proud to share what we have spent this last semester traveling and learning about our theme—water!



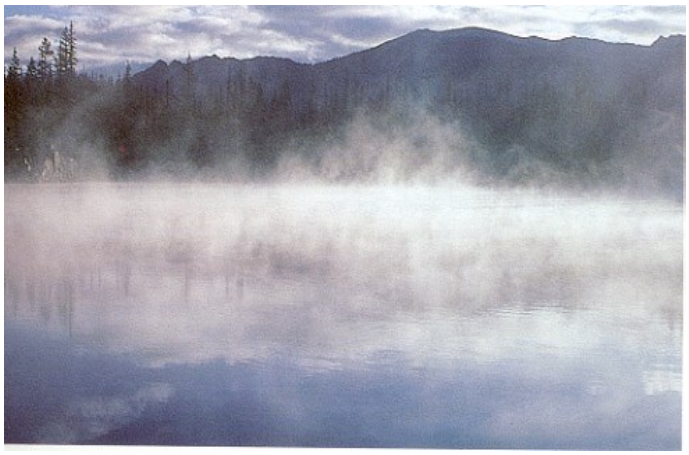
Brionna Moore
Nature Club– Treasurer

The Water Cycle

Water is the very substance that keeps us alive, and without it we and the earth would not exist. It is a substance that is made up of two hydrogen molecules and one oxygen molecule: H_2O. Water can be found everywhere; on the earth and in the atmosphere. The amount of water that was here 10,000 years ago is the same exact amount that is here now[1]. However, this water has been moved around during a process called *The Water Cycle* or *The Hydrologic Cycle.* There are several steps in this process including evaporation (sublimation and transpiration), condensation, and precipitation. The Water Cycle also accounts for the water moving through the land via snow melt runoff, infiltration, and groundwater flow.

Although evaporation can be thought of as the first step in the movement of water, it is important that we talk about condensation first. Take a look at the picture of the glass of water. What do you see? We are all familiar with these small droplets of water on the outside of the glass. These droplets are caused by condensation. What exactly is condensation and how are these small drops so important? Condensation is defined as the process of changing the water vapor into liquid water[3]. The important part is that the same process that causes the droplets on the glass occurs in our atmosphere where clouds form. The clouds are pushed by the wind and the water moves around the world. Now we ask how exactly the water gets in the atmosphere. When we were in elementary school we were taught a basic concept of this process; thinking of the clouds as just coming by, without considering their source, and that we simply drink the water that comes down. However, there is really a cyclical process occurring that is much more complicated than that.

Evaporation is defined as the process in which liquid water becomes water vapor[3]. This is opposite of condensation where vapor becomes liquid. Evaporation needs energy to occur[3], and this energy can be received in several different ways. One way is through higher temperatures[2]. The higher the temperature of the water, the more evaporation occurs. For example, when you put a pot of water on the stove to boil it will get more energy the longer that you leave it on. You may start off with a cup of water, but in the end there is less because some of it has evaporated. That steam you see when something is boiling is caused by evaporation. Other factors such as humidity and wind also bring about evaporation[3]. When this vapor moves into the atmosphere it reaches a point in which the air cools the vapor and changes it back into liquid water droplets causing the formation of clouds[3]. The water condensed into clouds.



There are other forms of evaporation that occur. Not only do bodies of liquid water evaporate, but so does water from plants and the ground. Transpiration is the process that occurs when a plant releases water vapor[3]. When a plant absorbs water through its roots it travels to the leaves. When the plant releases this water as a vapor, thus transpiring, the ground also releases water vapor. There is water in the ground that travels to the surface is released into the air as vapor[3]. The vapor formed from transpiration of the plant leaves and the vapor that is released from the ground are combined together and measured as evapotranspiration[3]. Factors that affect evapotranspiration are similar to that of evaporation of bodies of water. The factors include temperature, humidity, and wind[3]. Factors specific to plant transpiration are the type of plant and the overall moisture of the soil[3].

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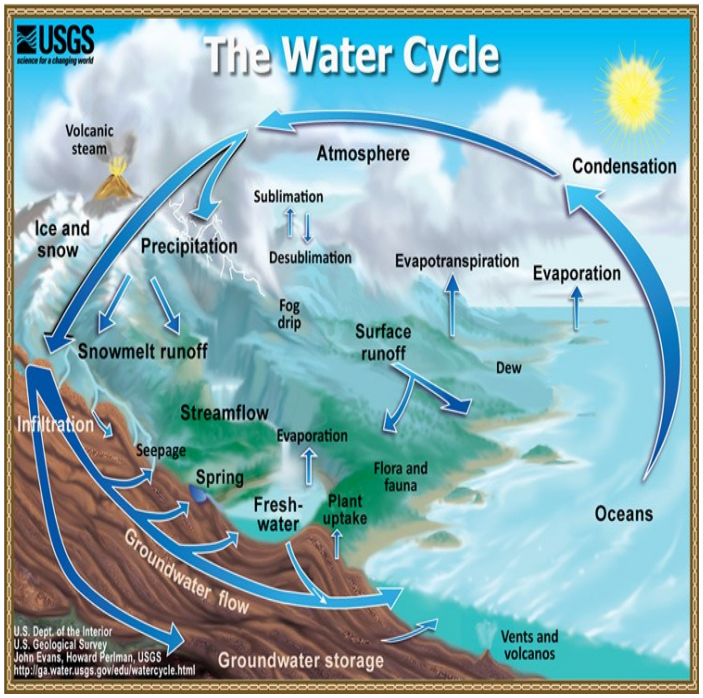
In a similar fashion to the vapor formed from evaporating bodies of water, vapor from evapotranspiration travels to the atmosphere where it is condensed back into liquid water.

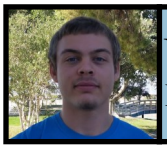


Evaporation can also occur in a process called sublimation. Sublimation is when snow that is on the ground and frozen bodies of water evaporates without first becoming liquid[3]. It goes from a solid to a vapor which then travels into the atmosphere. This process just like evaporation in that it only occurs when there is heat or energy[3]. The heat that usually makes frozen things sublimate is the sun, as it helps bodies of water evaporate. Now let us look at condensation again. Sublimation is the process of vapor being released from ice/snow. There is another process that occurs in the atmosphere that is similar to sublimation. This process is called desublimation or deposition. Deposition is what happens when the vapor that is collected in the atmosphere does not condense into liquid water but into frozen water such as snow and frost[3].

After the evaporative processes next step to occur in The Water Cycle is precipitation. Precipitation occurs when tiny water droplets of water form on other particles in the sky such as dust and smoke[3]. It takes millions of these droplets to form one rain droplet. Once the rain droplets are formed the clouds release them and we have rain. The rain falls from the clouds, sometimes lightly (what we call sprinkling) and sometimes heavily (what we call a monsoon). Rain cannot occur without water from earth evaporating and turning into water vapor, nor can it occur without that water vapor condensing and turning back into water and thus falling back on to earth. Precipitation also occurs in the form of snow, sleet, hail and freezing rain[3]. These do not occur because of condensation as they are solid. Condensation creates liquid water. These forms of precipitation form from deposition, which we learned is vapor turning directly into a solid.

Once condensation or deposition has occurred, precipitation falls to the earth where it goes back into bodies of water and the ground. Water that falls onto the earth's surface is infiltrated into the subsurface of the earth[3]. The infiltrated water can either stay closer to the subsurface or seep down into the groundwater[3]. When it stays near the subsurface the plants drink the water and release vapor in transpiration, and simultaneously the ground releases water in evaporation. The rest of the water seeps further into the ground. Groundwater is the water that is in the Earth's surface that fills in spaces between rock and dirt[3]. This water can become part of natural aquifers we as humans draw water from using wells, or it can seep further down where it takes many years to work its way back into the environment[3]. The water that seeps into the ground also finds its way into streams, rivers, lakes, and eventually the ocean.

Once the water enters these bodies it is once again subject to evaporation, condensation, sublimation, deposition, transpiration, precipitation, and infiltration, and the cycle continues for eternity until the earth ends. This is how the water that was here 1 million years ago is here today. It is quite possible that the glass of water you are drinking right now contains water particles that were once in the middle of the Atlantic Ocean.



William Ortman
Nature Club– President

Water Use in the West

Without water there is no life and too much water can take life away. Humans have fought to maintain a balance with nature since the beginning. Originally man had to rely on primitive notions of hot and cold. In the case of mankind's relationship with water this meant "head towards rivers to quench the tribe" or "hide in cave to avoid rains" or "don't go near the sea." "Conversion to the management of domesticated animals and cultivation of food crops provided the surpluses that made possible the rise of towns, with populations freed from direct dependence on food getting (1)." This lead to a small victory against nature, and allowed for humans to increase their numbers by staying near rivers. They could farm, fish, and hunt animals that came to fulfill their own needs for water. People realized that they could move water around to feed their crops. However, they still faced the threat of floods, and they still faced the threat of droughts. One day man would rise to meet nature at a point where they could decisively maintain it if they could only see that they had gained the upper hand.

Mankind has steadily observed nature and innovated in order to protect itself. At first, the observations involved using patterns in order to adapt to the whims of nature. For instance, "The Annual Flood of the Nile was the most important event of the year for the Ancient Egyptians. In a land without rain, Egypt's very survival depended on the flood, for without it the crops would fail and the people would starve (2)." They spent their time observing the stars and realized that when one particular star moved behind the sun things would get hotter. Then they would wake up in the mornings to watch for when the star would become visible again and they could predict the flood. The Egyptians formed their culture around these observations and they were able to thrive. Future advancements would lead to the reverse: Nature would have to adapt to the whims of mankind.

In the desert southwest of the United States is the Colorado River system. The river "channels water south nearly 1,500 miles to a vast delta in Mexico and into the Gulf of California.(3)" Natives and settlers moving West during the 19th century settled along the river and reaped the benefits of this freshwater source, especially for farming. However, "The flow of the Colorado River is extremely erratic, varying from 4 to 22 million acre-feet annually at Lees Ferry. There is a tendency for the high years or the low years to be grouped, thus accentuating problems of river use (4)." In order to break free of the river's tantrums man had to use skills it had developed over hundreds of years to manipulate the river and implement measures to maintain the availability of its life-giving resource.

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This is why "In 1928 Congress passed the Boulder Canyon Project Act. The Act authorized the construction of Boulder (now Hoover) Dam, a multipurpose water storage project that was a major engineering feat of its time. The Colorado River system thus was the first drainage basin in which the concept of the multipurpose dam was employed-e.g, for hydroelectric power development, irrigation, recreation, flood control, and navigation (5)." The water source is now pushing mankind ahead rather than dragging it behind.

But is it becoming too much to push? In 2012, a study by the US Bureau of Reclamation concluded that "There are likely to be significant shortfalls between projected water supplies and demands in the Colorado River Basin in the coming decades (6)." Although technology has continued to increase the supply for water, demand seems to be growing even faster than the supply. Now it isn't about keeping track of the time of year as to take advantage of greater water supplies, or staying next to rivers, or even keeping as much water as possible for our own use. People already can predict to a degree where the water will be, and there are way too many people for everybody to crowd next to the rivers. There is more work that can be done to gather water for future use, but that may not be the solution to this supply and demand issue. "[Las Vegas] is one of the largest [cities] in the Colorado River basin, but its share of the river is relatively small; when officials allocated the Colorado's water to different states in 1922, no one expected so many people to be living in the Nevada desert. So Nevadans have gotten used to coping with limitations. They can't water their yards or wash their cars whenever they like; communities follow strict watering schedules. The water authority pays homeowners to replace water-gulping lawns with rocks and drought-tolerant plants. Golf courses adhere to water restrictions. Almost all wastewater is reused or returned to the Colorado River (3)." In order for balance to be instated demand must stop increasing long enough for the supply to catch up, demand must decrease to meet the supply, or supply must increase exponentially to meet the increasing demand. All of these general propositions are currently being investigated by governments, scientists, and individuals alike.

Jenny Leung
Nature Club– Follower

What is an aquifer? & What is groundwater?

What is an aquifer?

An *aquifer* is a body of saturated rock through which water can easily move. *Aquifers* must be both permeable and porous and include such rock types as sandstone, conglomerate, fractured limestone and unconsolidated sand and gravel.

There are two kinds of aquifer: A confined aquifer is a water supply which is sandwiched between two layers of soil or rock that water cannot pass through (impermeable layers), an unconfined aquifer is a water supply that has an impermeable layer below it, but not above it. A confined aquifer that is under pressure is an **artesian aquifer**.

What are the uses of aquifers? We use aquifers as a source of drinking water and of water to irrigate crops or to use in industry, pumping water from the aquifer using a well.

Some notable aquifers in the United States:

1. The Ogallala Aquifer of the central United States: *one of the world's great aquifers, but it is being rapidly depleted by growing municipal use and continuing agricultural use.*

2. The Floridan Aquifer of Florida and southern portions of Alabama, Georgia and South Carolina: *one of the world's most productive aquifers.*

3. The Edwards Aquifer of Texas: an important water supply aquifer and the source of major springs.

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4. The Basin and Range Carbonate Aquifer: *an important and unique aquifer that it covers several western states and basins.*
5. The Kirkwood-Cohansey Aquifer of southern New Jersey: *some of the purest water in the United States.*

Excessive pumping can lower the water table if water is withdrawn from the ground at a faster rate than it is replenished. The wells can go dry and can no longer supply water. Groundwater is a valuable resource both in the United States and throughout the world. It is the source of drinking water for about half the total population and nearly all of the rural population. It also provides over 50 billion gallons per day for agricultural needs. Groundwater depletion can cause drying up of wells, reduction of water in streams and lakes, deterioration of water quality, and increased pumping costs land subsidence.

The EPA has created various types of protection measures such as Regulatory (e.g. zoning, subdivision controls, health-related restrictions), Non-regulatory (e.g. land acquisition, voluntary restrictions), and Legislative (e.g. wellhead protection areas, special management areas such as a Sensitive Resource designation). However, protecting the underground water supply is a difficult and time-consuming process in which many people must become involved. They must become responsible for and aware of the water supply situation.

What is groundwater?

Groundwater is used for drinking water by more than 50 percent of the people in the United States, including almost everyone who lives in rural areas.
Groundwater can be found almost everywhere, it is an important part of the hydrologic cycle as water evaporates, forms clouds, and returns to earth as precipitation. Some precipitation moves from high areas to low areas on the earth's surface and into surface water bodies, known as "surface runoff". Other precipitation seeps into the ground and is stored as groundwater.

Groundwater supplies are replenished or recharged by rain and snow melt that seeps down into the cracks and crevices beneath the land's surface. In some areas of the world, people face serious water shortages because groundwater is used faster than it is naturally replenished. In other areas groundwater is polluted by human activities.

What are some of the threats related to groundwater?
Contamination: Groundwater contamination occurs when man-made products such as gasoline, oil, road salts and chemicals get into the groundwater and cause it to become unsafe and unfit for human use. Drinking contaminated groundwater can have serious health effects. Diseases such as hepatitis and dysentery may be caused by contamination from septic tank waste. Poisoning may be caused by toxins that have leached into well water supplies. Wildlife can also be harmed by contaminated groundwater.

Depletion: Groundwater depletion is primarily caused by sustained groundwater pumping. Some of the negative effects of groundwater depletion are: Lowering of the Water Table,, Increased Costs, Reduced Surface Water Supplies, and Land Subsidence and saltwater contamination.
How can we conserve groundwater?

Don't Let It Run!

Fix the Leak—A leaky faucet can waste 10 gallons of water every day. On a toilet, an average leak can add up to 60 gallons per day! Replace worn sink washers or valve seals to get rid of the drip, and check for leaks in a toilet's tank or replace old toilets with low-flush units.

Close the Hose - A ½ inch garden hose under normal water pressure pours out more than 600 gallons of water per hour and a ¾ inch hose delivers almost 1,900 gallons in the same length of time.

Check the Plumbing,

Take 5 Minute Shower—A quick shower uses 20-30 fewer gallons of water than a bath.

And last but not least, **teach your community!** Take little steps each day to reduce the amount of water you use, you will help ensure that the water available now continues to meet the growing water needs of the future.

Sarah Czipowski
Nature Club– Secretary

How the Movement of Water Dictates Shelf Life

When one thinks of food preservation, some of the most modern examples might be putting food in the refrigerator or the freezer. But such examples of temperature control have only become popular in the 19th century, and extended to American households in the 1930s (1). Before the age of the common refrigerator and freezer, there were several other methods of preserving food to increase shelf life and prevent spoilage: pickling, salting, curing, and spicing to name a few. Many of these methods have to do with killing bacteria on a molecular level, as well as the movement of water on a cellular level. Several of the most popular methods of food preservation destroy or inhibit bacterial cells in several different ways, and many of them utilize water as their basic mechanism of preservation.

Refrigeration, for example, creates what is called a **bacteriostatic** state for the bacteria living inside of food, slowing the rate of multiplication of bacterial cells. This is due to the slowing of the metabolic rate of most pathogens within the temperature range of 0-7°C (3). Refrigeration does not necessarily *kill* bacteria, as spoilage does still occur to food items while refrigerated, due to some bacterial species being able to reproduce in the colder environment.

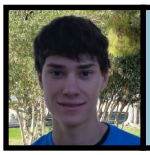
Freezing manipulates the state of any water inside of the food, as well as inside of the bacterial cells, changing that water to ice. What this does to the bacteria is it forms ice crystals which impale and perforate the outer membrane of bacterial cells, essentially resulting in holes in the membranes. The frozen state of the bacteria prevents any metabolic processing or multiplication, and once thawed, the ice crystals melt, leaving holes in the microbial membrane to leak out cellular fluids, killing the bacterial cells.

Conversely, **boiling** food increases the movement and kinetic energy of the water molecules as opposed to slowing them down, as in refrigeration or freezing. The rapid movement of these water molecules causes damage to bacterial cells by denaturing their proteins, which are required for cellular metabolism and maintenance. Denatured proteins have an altered molecular structure, and have lost their original function as a result, as the three-dimensional structure of these proteins is destroyed via the breaking of hydrogen bonds (3). Boiling also has the ability to destroy the cellular membranes holding the bacterial cells together.

Salting, or curing food is typically done by adding salt, sugar, nitrites and nitrates to meat, fish, or vegetables. Salting produces what is called a **hypertonic** environment for the bacterial cells living in the food, causing **osmotic pressure** to draw water out of the cells, to slow their growth, multiplication, and functioning (2). The movement of the fluids inside of cells is called **plasmolysis.**

Pickling in an acidic medium such as vinegar results in the foods sitting in an environment of high pH. Each species of bacteria has its own optimum pH level that it thrives in. When this level gets too high or too low, depending on the species of bacteria, it can interfere with basic cellular functions as well as the molecular structure of some proteins found inside bacterial cells.

All of these preservation techniques have one thing in common: the basic mechanism behind their functioning is caused by water. Whether it's the movement of water, or the absence of it, these little H_2O molecules are not only responsible for many of *our* bodily processes as humans, but for the life of bacterial cells as well. Aware of it or not, one is controlling water-based mechanisms on a molecular level when preserving food in any of these ways.



Dakota Sanders
Nature Club– Member

Water Purification Techniques

Water has always been the single most important resource for life on earth. For centuries, all living organisms have relied on it for survival, and humans are no exception. Although our planet is covered in water, it is difficult to realize just how little is available for human consumption. This small amount of water is often taken for granted with little thought on how it gets to your faucet. It turns out that the majority of people receive their water from a complex industrialized operation, performed by large corporations. But what would happen if they stopped supplying the water? Some may be able to obtain water from natural sources, yet how can you know if it is safe to drink? This is where various forms of water purification and filtration come in. Many of these procedures can be performed by an individual with limited supplies; this is especially useful if you were to find yourself in an unfavorable disaster situation.

Both purification and filtration can be effective methods of producing clean drinking water. The main goal of this process is to remove dangerous microorganisms such as Cryptosporidium, E. coli, and Hepatitis A, all of which can cause intestinal diseases. Other waterborne contaminants such as heavy metals and pesticides can cause illness as well; however, these problems usually arise over lengthy exposure times and do not cause the immediate discomfort of a digestive tract infection. Therefore, the immediate concern becomes the removal of waterborne organisms.

Preparation: No matter which form of purification is used it is extremely important to keep the purified water separate from the contaminated water and equipment. This is easily done by using different colored containers for untreated and treated water sources. It also helps to have color-coded hoses to differentiate where they have been. The first step to any filtering process is a simple filter to remove large visible contaminants. Reducing the sediment and other types of debris in the water will increase the efficiency of both physical and chemical purification techniques. Reduced amounts of debris will keep physical filters clog and break free longer while allowing chemical processes to occur quicker. A purpose built filter such as a large coffee filter is ideal, yet an old cotton t-shirt folded over a couple of times will usually suffice in a tough situation. It is best to repeat this process until the water is free from visible impurities. Once this is achieved the actual purification process can begin.

Boiling: As mentioned before many various forms of purification can be implemented. The easiest method is to simply boil the water. When done correctly this easily kills the common micro-organisms that cause disease. Boiling water is for all intents and purposes, indefinitely repeatable; there are no chemicals or filters that need to be replaced. Water should be brought to a rolling boil for several minutes to ensure all organisms are killed and then cooled to room temperature before drinking. Bringing the water to a rolling boil insures that the temperature reaches at least 212°F, which is far beyond the survivable levels of any commonly found micro-organism. The only disadvantage to boiling water is that any non-organic contaminants will not be removed; these are things aforementioned such as heavy metals and pesticides, which are not the major concern.

Chemical Purification: Chemical purification can be broken down into two categories based on the substance used to kill contaminants. Both sodium chlorite and iodine serve as common water treatment chemicals and are available as pre-prepared over-the-counter products. All of these products have easy to follow instructions. All chemical purification methods include slight healthy risks to the users, especially over long periods of time. They also tend to add undesirable tastes to the treated water. This is easily combated by using common drink mixes which contain Vitamin C.

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The most universal option, sodium chlorite, purifies by destroying the cell wall of the waterborne contaminants, leaving them harmless. Chlorine based chemicals can be harmful to humans; luckily the small quantities used in purification are easily absorbed by the digestive tract. The down side to chlorine base purification is the fact that it takes a significant amount of time to react in comparison to the common alternative, iodine. The chlorine based reactions often take upwards of 4 hours, a long wait for someone on the verge of dehydration.

Iodine works in a similar fashion, by replacing cellular components of bacteria with iodine ions, the cells of bacteria become unable to function and die. It is to be noted that extended consumption of iodine can lead to serious health problems especially in young children and older adults; therefore it should not be relied on for long term purification. Some individuals are also allergic to iodine; in this case chlorine based chemicals should be used instead. Iodine purification is simple and usually yields water safe to drink within 30 minutes.

Household Alternatives: It's impossible to be prepared for everything, especially an unseen disaster situation. Thankfully, there are household alternatives to the approved over the counter treatment options mentioned above. These household tricks lack the ease of use associated with pre-measured portions and also carry a higher risk of illness. Therefore extra caution should be taken when using these methods. Bleach can act as an alternative for chlorine based purification. Using 8 drops of bleach per gallon of water will kill microorganisms after sitting for 4 hours. Iodine solutions can be substituted by common household iodine tincture. Around 30 drops will purify a gallon of clear water, while doubling the amount of iodine tincture for unfiltered water. Similar to the prepackaged solutions water purified by iodine tincture needs to sit for 30 minutes or so before drinking.

- Bleach—2 Drops per Liter/Quart, 8 drops per Gallon
- Iodine Tincture- 5 drops per liter/quart, 30 drops per Gallon.

Kip Magee
Nature Club– Member

Tsunamis

What is a Tsunami? It's a large sea wave produced by a seaquake or underwater volcanic eruption, also called seismic sea wave (1905-10). Everyone should be familiar with the Japan Island earthquake that triggered the Tsunami of 2014, which displaced thousands of people. A large magnitude quake, depending on its size, could imbalance the nature of the sea bed and creates huge shock waves. The sea floor looks for a place to relieve the pressure by expanding its geography and moving a lot of water. The seaquakes change the land structure creating its new regional boundaries along with the tsunami. The oceans' bottoms are full of underwater volcanoes that have a high potential to create a large magnitude effect of sea waves.

Scientists have seen how devastating a tsunami impact can be and plotted the NOAA mapping of the aftermath of coastal regions. Tsunami forces destroy and spatially inhabit the areas in which they overcome.

So we know that it takes some disruption to trigger such force and with the ocean covering most of the planet's surface disruptions are likely to hit there. We have early warning systems that watch areas in distress and predict possible events. But as in the case of the tsunami of Japan, it wasn't enough of an early warning for the inhabitants.

Tsunamis also affect the sea with debris from inland structures washing out to the sea, in some cases creating a mound island of debris like the one off the coast of California. Tsunami debris hinder fisherman and makes it so they have to find different areas to fish. No marketing strategy has been put in to place to help the sea with clean up from an impact of tsunami forces. One reason is that the ocean is too vast to clean and monitor.

Victoria Caristo
Nature Club– Member

Water Pollution

It's something we're aware of and responsible for, but not something humanity is seriously willing to change. Water pollution- it effects not only humans, but aquatic animals and plants. Although a big portion, pollution isn't the only problem our water zones are facing. It's important to also consider the other factors that contribute to contaminated water as well as whom it's effecting, and the ways we as a society can take better precautions.

To begin, as most of us know, just about any bed of water can become tainted when *any* harmful particle finds its way into the water; it's a pretty simple process. Usually we hear about how some company dumped trash into the ocean, or oil spills, but these aren't the only ways that chemicals can spread into the ocean. In doing research, it seems as though some of the causes are more *natural* and less chemical-related. Water, rain, and melting snow are equally responsible because when these hit the ground, and start spreading out, they begin to pick up germs and disease-carrying organisms that will eventually run into a water bed, whether it's the ocean or a local lake. In an article from Science Daily's website, it is made clear that if the sewage and farm waste come in contact with water, oxygen depletion of the water source can occur which could then lead to a "potentially severe impact on the whole ecosystem" (ScienceDaily).

It seems as though our water resources are lacking basic protections which would prevent the chemicals from spreading so fast; there's little to no regulation. In the past five years, over one-hundred issues regarding water pollution have been filed; this is relatively low, but unfortunately and more recently, four states, such as Pennsylvania, Ohio, Texas, and West Virginia have confirmed that their water has been contaminated due to oil or gas drilling (Begos).

In noticing that this topic is not being taken seriously by those who could prevent this issue from causing huge problems, I had to wonder what it was that could be standing in the way of the world having pure bodies of water. Then I stumbled across some information that stated how "hydraulic fracturing" has lead to a boom in oil and natural gas production. While this increase has lead to a higher revenue for companies and land owners, the industry is careless with understanding that their decision to make more money is drastically hurting certain populations. Luckily this isn't a huge issue for us in America, but there are some countries where people have no choice in the water they're drinking. Apart from the human populace, there's definitely a good amount of animals that either drink the water or live in the water, but both will suffer because there's not much that they can do- they could migrate, but they can't dehydrate themselves. Therefore, either way, both will eventually die essentially because some company wants to make money.

Preventing water pollution can actually start at home with a few simple changes. The major trash source to avoid putting anything into would be the sink of the toilet; things to avoid would be cleaning agents, oils, grease, and medicine/drugs. Companies could even start by purchasing remote land to use as a waste land instead of letting chemicals run off into our oceans and lakes.

Essentially water pollution is ultimately our fault because it's been brought on by our society. Our carelessness as a whole is slowly, but surely destroying natural life and the beauty it offers. If we can take these steps and think about where what we're throwing away will end up, then eventually our water sources could clear up, which could lead to a happier ecosystem.

Nicole DiCamillo
Nature Club– Member

Acid Rain

Acid rain (also called acid deposition because it includes other forms like snow) is defined as water droplets that are highly acidic from atmospheric pollution, usually because of large amounts of sulfur and nitrogen which is released by cars and industry. Acidic rain comes in two forms: wet and dry. Wet is any variation of precipitation that takes acids from the atmosphere and drops them on Earth's surface. Dry is polluting particles and gases that stick to the ground because of dust or smoke in the absence of precipitation. This particular form of deposition is very dangerous because normal precipitation can wash these pollutants into streams, lakes, and rivers.

Acid rain is determined on the pH level of the droplets. PH is the measure of the acid in the water. The pH scale goes from 0 to 14. Lower pH is more acidic while higher pH is alkaline; seven is neutral. Normal rain water is only slightly acidic with a normal pH range of 5.3-6.0. Acid rain is anything below that. One important thing to remember is that on the pH scale each whole number on the scale represents a 10-fold change. Acid rain occurs in the northeastern part of the United States, southeastern Canada, and a lot of Europe including parts of Sweden, Norway, and Germany. Parts of South Asia, South Africa, Sri Lanka, and Southern India are likely to be impacted by acid rain in the future.

Acid deposition can happen naturally from sources like volcanoes, but is predominantly caused from the release of sulfur dioxide and nitrogen oxide from the combustion of fossil fuels. "When discharged into the atmosphere they react with the water, oxygen, and other gases already present there to form sulfuric acid, ammonium nitrate, and nitric acid." They then spread over large areas from wind patterns and fall back to Earth as acid rain or other forms of precipitation. The gases responsible are usually because of electric power generation and burning of coal. Scottish chemist, Robert Angus Smith, in 1852 discovered the relationship between acid rain and pollution during the Industrial Revolution. Although discovered in the 1800s it did not gain real public attention until the 1960s and the term acid rain came into use in 1972. Public attention increased more in the 70s when New York Times published articles about problems in the Hubbard Brook Experimental Forest in New Hampshire.

After studying the Hubbard Brook Forest and other areas today, there are several important impacts of acid deposition on both natural and man-made environments. Aquatic environments are the most distinctly impacted by acid rain; since acidic rain falls directly into them. Both dry and wet deposition runs off of forests or roads and flows into lakes, rivers, and streams. Acidic liquid then flows into the larger bodies of water. It becomes diluted this way, but over time, acids congregate and lower the overall pH of that body of water. Acid rain can also make clay soils release aluminum and magnesium which also lowers the pH in areas. When the pH of a body of water drops below 4.8, the plants and animals are at risk of dying. It's estimated that approximately 50,000 lakes in the US and Canada area have a pH below average (about 5.3). Hundreds of them have a pH too low to support any form of aquatic life.

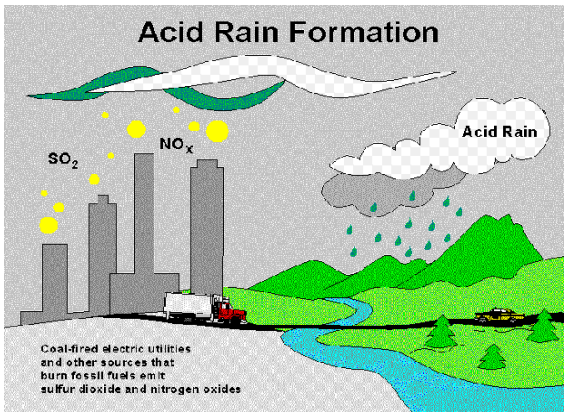
Aside from aquatic life acid rain can impact forests as well. When acid rain falls on trees, it makes them lose leaves, damages their bark, and stunts their growth. Because of this damage, it makes them susceptible to disease, extreme weather, and bugs. When acid rain falls on the soil it disrupts soil nutrients, killing the organisms in the soil, and can occasionally cause calcium deficiency. Trees at higher altitudes can also suffer problems because the acidic cloud blankets them and the moisture hits them.

Continued on page 13

Continued from page 12

Finally, acid rain also has an impact on buildings because it can corrode certain materials. As it lands on buildings (especially those built with limestone) it reacts with the minerals causing them to break and wash away. Acid rain can corrode modern buildings, cars, railroad tracks, airplanes, steel bridges, and pipes above and below ground as well.

Acid rain is a very serious issue in our modern day world. The best thing we can do to combat it is to cut back on our consumption of fossil fuels and try to reduce the sulfur and nitrogen that is put out into the atmosphere. The damage being done in some places is not able to be reversed. Our best combat for this is switch to eco-friendly fuels which don't expel these toxic chemicals into the air.



Fun Pictures

FIND IT!

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acid rain
aquifer
China Ranch Date Farm
Condensation
contaminated water
contamination
evaporation
Grapevine Canyon
groundwater
Hoover Dam
hydraulic cycle
Lake Mead
nature club
ocean
ph
precipitation
purification
River
sea
Tsunami
water
water cycle

TRIP AND ACTIVITY REPORT

Trip Report

This semester the Nature Club had many fun and educational adventures. We went to Mt. Charleston, Wheeler Pass, China Date Ranch, Spring Mountain, Christmas Tree Pass, and Grapevine Canyon. The club participated in SGA's Oktoberfest and the WRAN workshop. Nature Club also went bowling and took a tour of Hoover Dam.

Mt. Charleston

-Nature Club's first trip
-A short hike up the mountain
-It was very mild that day up in the mountains, a relief from the Pahrump summer heat.
-Local bird species, such as blue jays, were spotted by Dr. Bagwe and others.

Future Visits

The trail explored on this trip was much longer and there were many other trails also. Nature club looks forward to future visits to explore additional trails.

Wheeler Pass

-A long drive on dirt roads
-Short, dry greenery and an occasional cactus.
-Beautiful canyons
-Landscape began to be littered with cedars as the elevation increased
-After a good while of hiking, members sat down and had a small picnic.

Future Visits

The clouds looked like it might rain so the group retreated to the trucks. The road also goes farther up the foothills into the mountains.

TRIP AND ACTIVITY REPORT (Continued)

Hoover Dam

A major trip was taken to Hoover Dam, a large concrete structure built in boulder canyon with many purposes. The dam helps control water flow in the western U.S. and allows water to be efficiently appropriated primarily for agricultural purposes. The dam also houses two power plants, one on the Nevada and one on the Arizona side, which use water released from Lake Mead to supplement power production in those states. The dam is constructed of lego-like pieces that are held together by the water pressure of Lake Mead. It sits in slots blasted into the canyon walls by dynamite. The final function of the dam is to contain Lake Mead as a recreation area for the Citizens of the country. Following the tour there, the group went to eat lunch on a beach at Lake Mead.

China Date Ranch

-Visited by Nature Club last semester
-Caves were explored and canyons were climbed.
-The group ended the adventure with one of the delicious date shakes back at the farm.

Future Trips

Alternative trails are known to some current Nature Club members, and new members would surely enjoy an experience hiking there as well as the famous date shakes offered by the ranch.

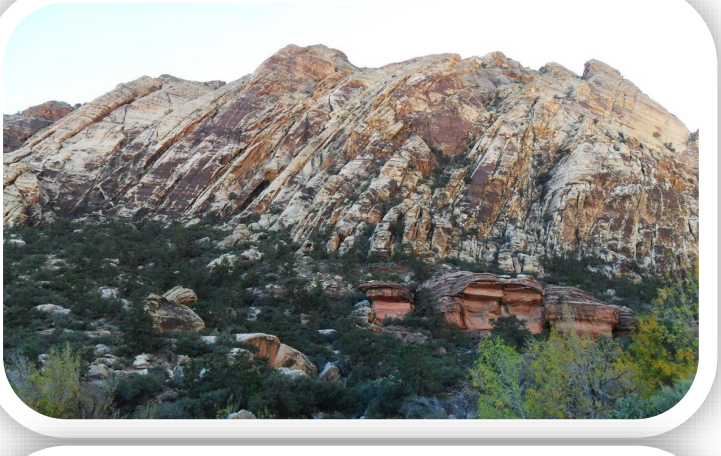
TRIP AND ACTIVITY REPORT (Continued)

Spring Mountain

-Located in the same place as Red Rock State Park, but has very different characteristics
-the park had a wide open grass field where families were hanging out and one man was exercising with a giant tree trunk
-A historical building atop the hill overlooking the field
-A rare rendezvous of 17th century mountain men, which included tee-pees, children playing games invented by Native Americans, and all sorts of crafts being sold by people who were fully invested in dressing up and showing the importance of this culture
-A large lake close to the foot of the mountains

Future Trips

This was a very pretty area and worth returning to. Nature Club could have a picnic/social at the large open grass field located in the center of the park. New members would enjoy the trails visited by current members but there are also trails that current members did not go on.



Christmas Tree Pass and Grapevine Canyon

-Located in the Spirit Mountains by Laughlin, NV
-a scenic drive where locals decorate a bunch of pine trees every year
-Giant rocks the size of football fields full of caves were explored
-The Native Americans had carved glyphs into the rocks along the side of a large canyon/river bed.
-A few members climbed to the top of a mountain

Future Trips

There was far more exploring to do in the Spirit mountains. The path in Grapevine canyon continued much further and there were other named canyons to investigate. Nature Club could also consider decorating one the trees in the pass.

TRIP AND ACTIVITY REPORT (Continued)

Oktoberfest

Oktoberfest was an event held by SGA in Pahrump in the last week of October. There was food, games, and exciting contests. SGA mixed Halloween elements into the traditional European holiday. Nature Club set up cut outs depicting traditional Oktoberfest clothing that students got to take pictures with.

The WRAN Workshop

The Western Rivers Action Network held a workshop that focused on 1) Water in the Southwestern US, 2) Supply and Demand of the Water, and 3) Current efforts being made to protect plant and animal life along the rivers from drought and invasive species. Considering that people flew in from across the U.S. to attend Nature Club was very lucky to be there.

Looking Ahead

Nature Club looks ahead to the Spring semester with a warm heart. Our newsletter will facilitate an in depth look at Flora and Fauna.

Nature Club in Pahrump would like to work on conservation efforts at Ash Meadows and Lake Mead to do our part for the environment. We are interested in using some ingenuity to make recycling easier in certain parts of the community here in Pahrump.

Partnerships with other organizations such as Red Rock Audubon Society will continue to grow and Nature Club will continue our interest with the Willow Creek Restoration Project, now renamed **Discovery Park**.

Nature Club plans to have a booth at the Earth Day event again in Pahrump as it was an excellent outreach event last year for a great purpose.

There is also talk about a Nature Club subchapter in Elko to begin. We would be excited to have a sister chapter in another location that could share their own articles and trips with us in our newsletter as well as extend our thirst for knowledge and conservation to new places.

We don't have a schedule in place as of yet for the Spring semester but we know wherever we go and whatever we do it will be a lot of fun! We will see you all next semester and hope you have a great holiday vacation!

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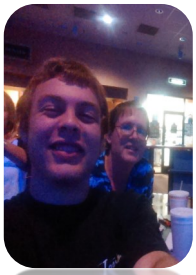

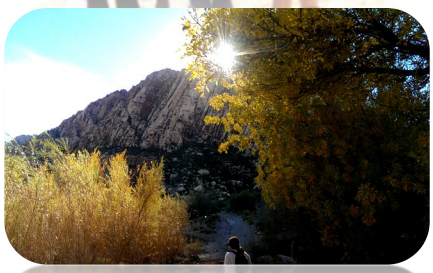
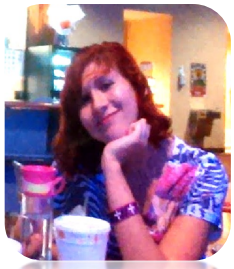
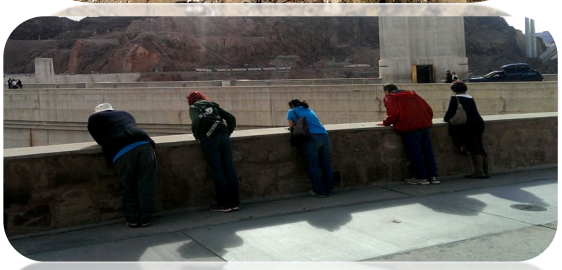


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