

MAINSTREAM

Humans and Water: Our Lifelong Relationship



April 2011

NEWSLETTER

Will The End Be Our Fault?

Our daily routines are destroying the world one species at a time.

Page 2

The Polar Ice Caps

We need to conserve the fresh water stored in the polar ice caps.

Page 3

Is This Extreme Enough For You?

Are we in position to prevent a possible drought, flood or a new ice age?

Page 4

What The Frack is Wrong With My Water?

A brief overview of the extraction of natural gasses and its impact on ground water.

Page 5

Climate Change in Third World Countries

Page 6

Conservation Tillage

An efficient cultivation method that improves the soil while it also improves the water quality .

Page 7

Dams: Good and Bad

There is controversy about the long-term effects of dams.

Page 8



**Thinking outside the bottle at SA
Read about it starting on page 9.**

Water is life's matter and matrix, mother and medium. There is no life without water.

Albert Szent-Gyorgyi

Please visit and leave a comment on our blog at: <http://coinvestigators.wordpress.com/>

Will The End Be Our Fault?

by Avery Schuster

The Earth is rapidly changing. Animals and plants are going extinct at a rate that has been sped up one thousand times faster than the natural extinction rate. With the climate changing, sea levels are rising, which is causing different currents and change in water temperature. In some places droughts are occurring. The carbon dioxide that is being pumped into our atmosphere has messed up the natural carbon cycle, and the Earth can no longer keep its natural balance with all the carbon dioxide we produce. Animals and plants are dying off, seas are changing, and land is drying. We need to act now before it's too late.

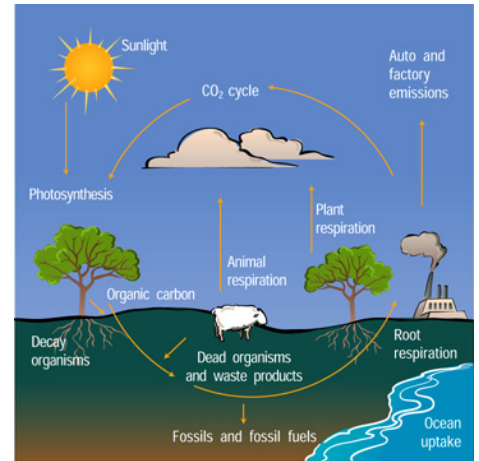
In his book, *Hot, Flat, and Crowded*, Thomas Friedman writes about biodiversity and uses a Chinese Soft-Shell turtle as an example. This turtle is the only female Chinese Soft-Shell turtle people are aware of that is still alive.



The turtle is now in a zoo where they are trying to mate it with a male so they can hopefully save the species. This is just one example of the many endangered species. Animals are not the only ones being affected by climate

change; plants are as well. Since the atmosphere's temperature is rising, droughts are occurring in many areas in the world. Plants are the first affected by this. Plants hold a very important purpose for the rest of life. Some animals eat plants, and then the animals who eat plants are eaten by other animals. The food chain is the basis of life and the carbon dioxide we emit into the air is affecting it. We burn fossil fuel every day. We burn them when we drive our cars, mow our lawns, even dry our hair. Every living thing holds a purpose. When these species are gone, their purpose will no longer be fulfilled. Because the extinction rate has sped up so much, the new species that are developing are not occurring fast enough to stabilize the loss.

Humans need to find a new way to become less dependent on burning fossil fuels. Wilson said, "The organisms most affected are likely to be the largest and most complex, including human beings." (p. 183) Wilson is warning people that in the end humans will be affected greatly by the more and more change we undergo. Before we destroy more living things than we have already, we must find a solution.



- Carbon moves from the atmosphere to plants.
- Carbon moves from plants to animals.
- Carbon moves from plants and animals to the ground.
- Carbon moves from living things to the atmosphere.
- Carbon moves from fossil fuels to the atmosphere when fuels are burned.
- Carbon moves from the atmosphere to the oceans.

Source: www.water2universe.org

The Polar Ice Caps

by Punn Mahaguna

The polar ice caps are melting. We know the reason why they are melting, but there are not enough people who are helping the cause. The world has 97% salt water and 3% fresh water. Of that 3%, 70% is stored in ice.

Many people do not know it, but humans are a major reason why the polar ice caps are melting. We have been emitting too much carbon dioxide by burning fossil fuels. This causes the climate's temperature to increase by a few degrees, which causes the polar ice caps to melt during the summer.

The clear possible solution to prevent climate temperature from increasing is by reducing the amount of carbon dioxide we emit, specifically through fossil fuels. By continuing to burn fossil fuels, we are making the earth inhabitable for humans. Having all the carbon dioxide in the air increases the temperature so that the ice is melting. There have been multiple suggestions for alternative source of energy. One of the more common idea is solar energy. The idea is to suggest putting solar panels on everyone's house instead of using electricity from coal, oil or gas-burning power plants to run appliances in their houses. Although the cost is high to install the panels, they actually pay for themselves in a few years. A more extreme idea is to burn dirty diapers and other trash to create electricity. Through a process called pyrolysis, which is turning garbage into fuel without causing pollution, it could be used to get rid of all the dirty diapers that babies use and produce a cleaner source of fuel while keeping trash out of landfills.

Humans are the reason why the polar ice caps are melting. We are emitting too much carbon dioxide to the point where the climate temperature has increased by 1 degree Fahrenheit within the past decade. We need to find alternative sources of energy that are clean and efficient. If we are not able to decrease the amount of carbon dioxide we emit, we are just leading ourselves to our doom.

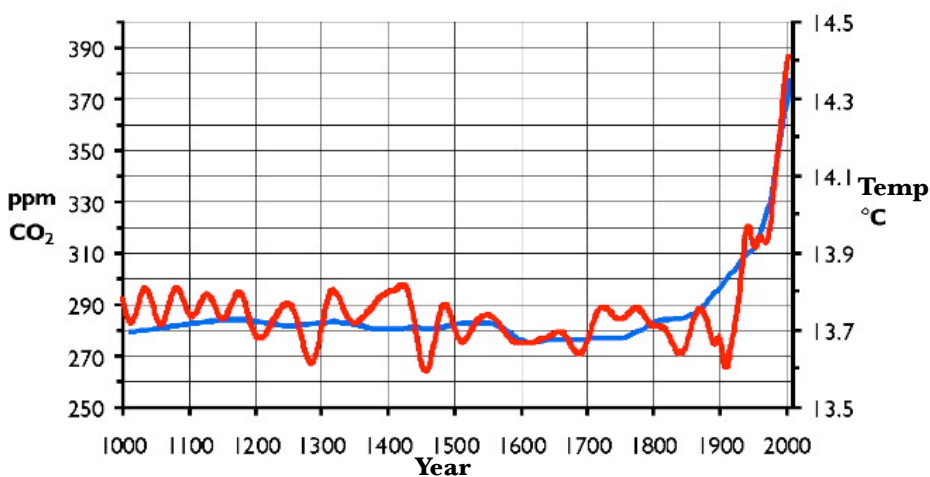


Polar ice caps in 1973

Source: <http://www.nasa.gov/centers/goddard/news/topstory/2003/1023esuice.html>



Polar ice caps in 2003



The amount of CO₂ we have emitted compared to the increase in temperature from 1000-2000

http://www.art.ccsu.edu/Gallery/2008-2009/Sustainable/Sustainable_Essay.html

Climate change is more extreme than just warming

by Karoline Hegbom

We are all aware of that our Earth is going through climate change. However, not all of the humans who walk on it know exactly what that means. Yes, it is getting warmer, and yes, it is getting colder, so what does that mean? Climate is the average weather over a period of time (usually a decade or longer), and climate variability is the different types of weather such as rain, storms, snow and so on. The climate change that our world is going through now is the kind where the weather gets more extreme in the different types of climates.

Every season gets more extreme than it has been before. The winter gets colder with more snow, and the summer gets warmer. By the time the summer is over, it has been so warm that ice sheets have been melting more than ever before, and therefore it has forced the sea level to rise. All this snow from the winter, and then the melting in the summer can be a good thing because it allows us to receive more freshwater in the rivers, but the melting ice that raise our sea level can be alarming. We need to help our Earth and find a good balance so that we can prevent or at least buy ourselves more time before the next drought, flood or ice age.

California is a good example of how we can find balance. For years they have been concerned about

drought conditions. Luckily for them, climate change benefitted them and saved them from the drought they were facing. This winter the mountains in California got more snow than normal; that snow melted down to fill the rivers and become water for drinking and irrigation.

An extreme flood made worse by previous drought



<http://premiermeansbusiness.com/wp-content/uploads/2008/11/flood.jpg>

However, by saving California, Mother Nature might have to let go of another state or country. We can't do the same thing around the world, we need to adjust for the different climates and have different plans for different possibilities. Iceland is in the complete opposite situation from California. They need the sun, more heat and more light in order to grow their food and keep their land healthy. Luckily they don't have trouble watering their fields because of all the freshwater they have from the melting snow from their cold winters. Climate change causes many different extreme weather situations, such as

droughts and floods. Often times after a drought has been present, it starts raining it does not stop till it is too late causing a flood. A flood can also appear from a lot of melting snow after an extreme winter. California got what they wanted and needed to end their drought, but what if it had caused a flood? What situation is better – flood or drought? How will climate extremes alter our lives, and what can we do about it?

Drought - drying up all land



<http://www.celsias.com/media/uploads/admin/drought.jpg>

What the Frack is Wrong With My Water?

by Brendan O'Connor

Coal, oil, and nuclear plants are all sources of energy that have been used effectively for years. However, all of these sources of energy are limited, and we are starting to see the bottom of what we thought was an endless supply of energy. So, alternative recourses were sought after. Eventually, shale basins containing burnable natural gas were discovered. These basins are like oceans of natural gas sitting deep underground. Natural gas is relatively clean to use relative to the other fossil fuels, coal and oil. Nevertheless, this is where the benefits stop.

While natural gas is clean to burn, there is no safe and clean way to extract that gas from the ground. Natural gas is commonly extracted through hydraulic fracturing, or *fracking*. A well is drilled deep under the shale basin, and a concoction of hundreds of chemicals are pumped into the well, creating enough pressure to fracture the rocks. This releases the gas, allowing it to be collected. Not all of the gas is collected, however. Instead, some of the gas and fracking chemicals seep into ground water. More often than not, this groundwater is already being used by local residents for everyday life. So, the water that people had been able to safely drink and bathe in for years might suddenly be toxic. The worst part is that federal regulations have made it completely legal for energy companies to use this technology to collect natural gas. This means that the people suffering from

contaminated water have little legal recourse to protect their water supply. There have even been reported cases of people able to burn their tap water on fire because it is so contaminated with natural gas. Footage from the movie *Gasland* shows that gas company representatives, while explaining that the water is safe to drink, will not personally drink when a glass of contaminated water is offered to them.



Tap water catching on fire because of the contamination from fracking.

Image source: <http://www.earthrights.org/blog/fracking-really-freaks-me-out>

Source: <<http://www.gaslandthemovie.com/whats-fracking/#frackingprocess>>

Climate Change Effects Water in Developing Nations

by Ali Sullivan

For some countries, such as the United States of America, the climate change issue will not have as big an impact on its citizens as in many other countries. The countries that will suffer the most are the third world, or developing, nations. Because the climate is changing, it is going to make the water crisis for third world countries much more challenging. The World Bank reports “extreme variability of precipitation is expected to place 2.8 billion people at risk of water shortages.” (1)

The women and children of these countries are already spending many hours of the day walking to gather water for their families. In addition, the water that they gather is very dirty and carries many diseases. The climate

change will directly affect this because there will be less water for the families who already live in a water-stressed country.

Poor countries also use valuable water resources for irrigation and energy. Perú, for example has glaciers that provide water for hydroelectricity, drinking and irrigation. Global climate change affects the glaciers which begins to melt it at faster rates, causing the locals of Perú to use that water more frequently so the resource is not wasted. They will have to use it more frequently, but it will still be going to waste because there is so much excess water. Climate change in the world is going to affect these glaciers because if they continue to melt and decrease, there is going to be a smaller amount of water resources for the villages supported by that glacier. This condition will cause problems with crops, lack of clean drinking water, and it will force them

to find other resources to fuel and supply their villages.

Perú is just one example of a poor country who will be affected by the climate change. There are many other third world countries who will suffer just like Perú.

1. *The World Bank*. N.p., n.d. Web. 17 Apr. 2011. <<http://water.worldbank.org/water/topics/water-resources-management/water-and-climate-change>>.
2. *msnbc*. N.p., n.d. Web. 15 Apr. 2011. <<http://www.msnbc.msn.com/id/17113441/ns/>>.

Conservation Tillage

by K.T. Kim

“Produce less bottled water” or “conserve water” are the comments that usually pop up during the argument of how to manage water on the Earth. On the bright side, a more efficient method has been discovered. It is called conservation tillage. Conservation tillage is mainly used for cultivation, yet at the same time it helps to conserve water.

Conservation tillage is a method of soil cultivation that leaves behind the previous year’s crop residue on fields before and after planting the next crop. This step helps to reduce soil erosion and runoff. Conservation tillage requires at least 30% of the soil surface to be covered with residue after planting the crop.

The most important point about conservation tillage is that it reduces runoff. Residues protect the soil surface from the rainfall and act like a barrier to slow the water flow. Therefore, the rainfall will stay in the field allowing the soil to absorb it. Crop residue also helps hold soil and associated nutrients and pesticides on the field to reduce runoff into surface water. In fact, this residue can cut herbicide runoff rates in half. Additionally, microbes that live in carbon-rich soils quickly degrade pesticides and utilize nutrients to protect groundwater quality. Pesticides can be toxic to aquatic plants and animals if present at high enough concentrations. Consequently, conservation tillage acts as a filter

paper. First, it traps the water like a dam, then it allows the soil to absorb that water. As the soil absorbs the water, the crop residue separates sediment, nutrients, and pesticides from the water, which eventually produces a clean quality groundwater.

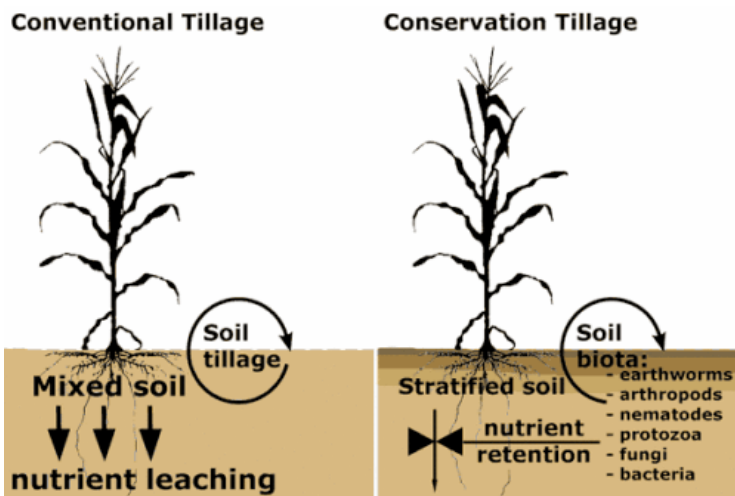
Overall, when compared to conventional farming methods, conservation tillage proves to be the more efficient system for conserving water and saving money at the same time. As shown in the figure below:

requires less human support and rather more of touch from the Mother-Nature.



Conservation Tillage from a wide view.

<http://www.treehugger.com/terraces-buffers-conservation-tillage.jpg>



Conservation tillage compared to conventional tillage shows high protection against sediments, pesticides, and nutrients.

<http://eorganic.info/sites/eorganic.info/files/u141/tillage.gif>

conventional tillage removes the previous residue on the field and replace it with new plants. This unnecessary action requires more hands on work and tractor support. In other words, it limits the support from nature. On the other hand, conservation tillage keeps the previous residue, which saves money and requires less hands-on work. This means that conservation tillage

Sources

- www.allenswcd.org/cp_tillage
- www.extension.purdue.edu/extmedia/WQ/WQ-20.html
- www.mda.state.mn.us/protecting/conservation/practices/constillage.aspx#Similar
- www.conservationinformation.org/resourcedisplay/293/
- www.ag.ndsu.edu/pubs/h2oqual/watnut/ae1072w.htm

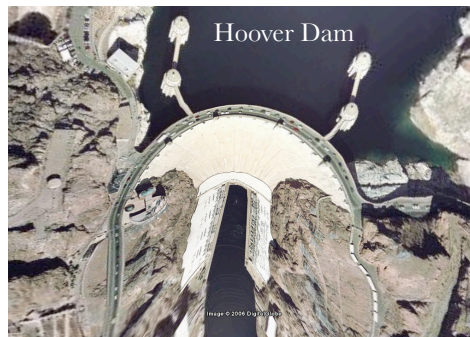
Dams: Good and Bad

by Gerry LaPlante

The U.S. Army Corps of Engineers (USACE) regulates work in the nation's wetlands and waters, with a goal of protecting the aquatic environment, promoting responsible development, and working to ensure no net loss of wetlands while issuing about 90,000 construction permits a year¹. About a decade ago, a Suffield organization, whose property borders Muddy Brook, used a creative plan to circumvent the water-controlling regulations of the USACE. This organization wanted to dam up the brook to create a pond for irrigating its land, but did not want to undergo the USACE approval process. So they imported and released a family of beavers. The plan worked beautifully; the beavers built a dam in the brook creating the desired irrigation pond, and pumping activity began. Curious neighbors, who had watched and wondered about the construction of the pumping and irrigation system, enjoyed watching the beaver activity as the plan came to fruition. Unfortunately, after five years, the beavers moved on to another spot in the brook, and the organization had to resort to other irrigation plans.

For a very long time, humans and other animals have been piling all sorts of materials into the path of flowing water in order to control that precious resource. Whether the damming material is dirt, wood, stone, or concrete, this behavior has certainly had a major impact on the natural water cycle and river-based ecosystems. Many of those impacts have been positive. Dams have been used for

hydroelectric power generation, flood control, and to create reservoirs for drinking water, irrigation, recreation, and transportation.² Often times, dams are multi-purpose. For example, Hoover Dam^{3,4} on the Arizona/Nevada border is a major power station in the Southwest. It controls flood water flows of the Colorado River and creates Lake Mead, the largest reservoir in the United States (247 square miles and 550 miles of shoreline). This 112 mile long reservoir provides multiple irrigation and recreation opportunities for residents and visitors to the area.



The United States has about 75,000 dams blocking 600,000 miles of what was free-flowing water on 17% of the nation's rivers.⁵ While these dams are providing much positive benefit to the human population, there are many significant negative impacts, as well.

When dams are used to create large reservoirs, there are usually small towns buried under the rising water. This creates major upheaval for the residents of those towns, who need to find a new place to live. Famous examples of buried towns include St. Thomas, NV (under Hoover Dam's Lake Mead), Enfield/Greenwich, MA (under Boston's Quabbin Reservoir), and Barkhamsted Hollow, CT (under Hartford's Barkhamsted Reservoir).

Dams hinder the downstream flow of water, and water removed

from reservoirs limits the available water for downstream ecosystems. The use of Colorado River water, made easier by reservoir impoundment, regularly prevents the river from flowing all the way to its mouth at the Gulf of California.

Dams severely impact the ability of migratory fish, such as salmon, to swim upstream for their annual reproductive activities. Fish ladders and elevators are sometimes used to help fish continue their upstream journeys around the dammed barriers, but this adds another severe stress to an already very stressful journey.

Dams also have impacted river transportation; human engineering has been able to construct canals and locks to circumvent some of those barriers, but this adds greatly to the cost of building and maintaining the infrastructure.

Finally, dams are a part of the major infrastructure problem that exists in the United States and other countries. The power of water puts tremendous strain on constructed dams. Even though quality engineering has allowed most dams to survive and function effectively for many years, the possibility of failure over time produces great risks for downstream residents.⁶

While dams provide important advantages for human society, there has been quite a bit of controversy and worry about their usage and their long-term impacts. As we continue forward with a more environmental awareness, the future of dams will be under close scrutiny.

¹ <https://environment.usace.army.mil>

² <http://ussdams.com/ussdeducation/benefits.html>

³ <http://www.youtube.com/watch?v=n4o8NISa4Hs>

⁴ <http://video.pbs.org/video/1309911294/#>

⁵ <http://www.pcffa.org/dams.htm>

⁶ http://www.nytimes.com/2011/02/22/science/22dam.html?_r=1

Could Suffield Academy Think Outside the Bottle?

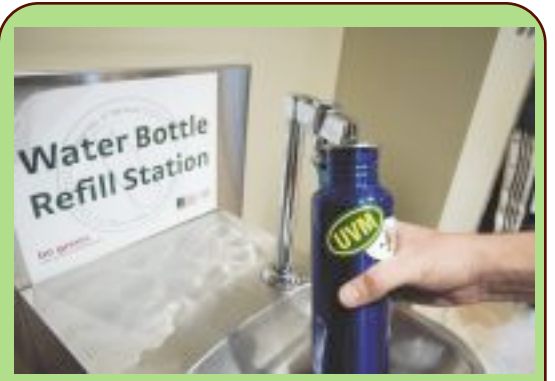
by Bill Sullivan

With its laptop and leadership initiatives, Suffield Academy rightly takes pride in blending innovative programs within a traditional independent school environment. Could a small step in our water drinking habit evolve into a larger innovating step for our community's stewardship? Given the trend on many college campuses to ban bottled water consumption, should we consider a "boycotting the bottle" campaign or "tap it" enterprise on our campus? As some seniors report from their college visits about how exciting some campus sustainability programs are at different schools, would it be cool for us to be part of this momentum in the independent school world?

If we were to move forward with this awareness about our water consumption, how do we change human behavior? Perhaps we should first explain it simply in dollars and sense. Delineating how much money people waste on bottled water may be the easiest way to get folks to change. "The price mark-up on bottled water is as much as 10,000 times more per gallon than tap water" [1]. In the history of retail, bottled water companies have created a most lucrative profit margin. Explaining to community members that they are participating on the unfavorable side of this history may make them rethink the money and the intensive labor required to carry water from Highland Park, CVS or out of the back of your advisor's or a parent's

trunk. Most interesting is the fact that a large percentage of bottled water comes from tap water sources in the first place.

Moving beyond the pocket book issues about bottled water, the real opportunity to help people change their habit is by educating them on how the pros outweigh the cons. We could have a campus video competition where students make public service style commercials (30 seconds) involving real Suffield students creating funny and informative points about the bottled water story in the context of our community. One category of video could humorously inform us about how bottled water companies demonize tap water to increase their sales. In fact, these clever advertising campaigns, worthy of studying to promote critical thinking skills, also make bottled water seem healthier and glamorous. The winners could get a case of very cool water canteens for their friends. Another educational component about bottled water could be the environmental impact. One set of videos could try to convey the pollution problem associated with plastics. In our second edition of our class newsletter, *Mainstream*, Ali Sullivan explained the plastic garbage area that is the size of the state of Texas in the Pacific Ocean. Click here to read her article again: [<http://coinvestigators.files.wordpress.com/2011/02/water-newsletter-2.pdf>]. Another video category could try to communicate the carbon footprint as well as the petroleum origins associated with the plastic bottle in the consumer's hand.



The University of Vermont is trying to decrease the use of disposable water bottles in favor of reusable ones. Here, a student refills his bottle at one of the university's refilling stations.

Source: <http://chronicle.com/article/>

Click below to view one of the Story of Stuff viral videos about bottled water. Note the change in our culture because bottled water sales are lower and canteen use is on the rise. There has been a similar trend on our campus where many students have new, cool water canteens that even have an attached filter.

<http://storyofstuff.org/bottledwater/>



In order to make a transition away from bottled water, we could consider other campus transition plans and install special water stations where it would be easy to fill up a water canteen. We could also install state of the art dispensers so that they are sanitary as well. Given that most environmental decisions require a long view, we could take the money that is spent on bottled water and invest in these special water stations in the dorms, the field house and the classroom buildings. There have been recent additions of filtered water stations in the union and in the faculty room. Do you ever use them?

We can tap into our community's pride for the innovations in our school's history. We were pioneers in 2000 when began to teach leadership deliberately at each grade level. We also possess great infrastructure for our technology program and are proud of the fact that we were the first laptop program in the country. Given that "Boycott the Bottle" and "Tap It" campaigns are gaining momentum at educational communities across the country, don't we want to tap into our innovative spirit and join sooner rather than later? Do you want to be part of a legacy for positive change? Have you ever seen images of Suffield students in the 1990s using the Mac laptops and wondered what it was

like to be part of a new movement? Don't you want to be part of a legacy and be the one in the picture filling your canteen at a new campus water station?

Sources: [1] http://www.chow.com/info_7942872_economics-bottled-water-industry.html

[2] <http://www.nrdc.org/water/drinking/qbw.asp>

Nota Bene:

Tap It Campaigns: <http://www.nwf.org/campusecology/climateedu/articleView.cfm?iArticleID=85>

Boycott the Bottle: <http://www.facebook.com/pages/Boycott-The-Bottle-20102011/116050455126446>

Youtube: <http://www.youtube.com/watch?v=4HJZGCK6lg>

The image shows a screenshot of a Facebook page for the organization "Ban the Bottle". The page header includes the Facebook logo, a "Sign Up" button, and the tagline "Facebook helps you connect and share with the people in your life." The main content area features a "Cause" profile for "Ban the Bottle" with a "Like" button. Below the profile name is a row of five images: a cartoon character holding a bottle, a group of people holding signs, a large stack of blue plastic bottles, a water tap, and a group of people at a water station. The "Wall" section shows a post from "Ban the Bottle" with the text: "Don't blow it - good planets are hard to find." ~Quoted in Time. The post is dated "Friday at 9:01am" and has "Like" and "Comment" options. Below the post, a notification says "Tracie Douglas, Kevin Carlton, Eastern Water Solutions, Inc. and 5 others like this." The left sidebar contains navigation links for "Wall", "Info", "Photos (3)", and "Discussions", along with an "About" section that describes the organization as promoting the environment by advocating for water solutions.

Source: <http://www.facebook.com/banthebottle> There are many facebook sites. Which one is the best model for our community? Please leave us a comment on our class blog: <http://coinvestigators.wordpress.com/>