STUDENT WORLD WATER FORUM
2005
UNIVERSITY OF NEVADA, RENO

JOT TRAVIS STUDENT UNION
Alumni Room
NOVEMBER 17th-18th, 2005

PROGRAM

ORAL PRESENTATIONS

THURSDAY, NOVEMBER 17th, 2005
9:15 a.m. to 4:30 p.m.

FRIDAY, NOVEMBER 18th, 2005
9:00 a.m. to 5:00 p.m.

KEYNOTE SPEAKER AND AWARDS

Dr. Ben Crow
University of California, Santa Cruz

“Flying toilets and other trajectories of water and sanitation access”

Friday, November 18th, 2005
4:00 p.m. to 5:00 p.m.
William J. Raggio Bldg.
Rm. 2030

Reception Following (All are invited)
William J. Raggio Bldg.
Alumni Room
STUDENT WORLD WATER FORUM
2005
THURSDAY, NOVEMBER 17th, 2005
JOT TRAVIS STUDENT UNION
Alumni Room

INTRODUCTORY REMARKS 9:15 a.m. to 9:30 a.m.

Dr. Laurel Saito and Dr. Kate Berry

Session I: Water Management I 9:30 a.m. to 10:45 a.m.

Andrew Oxner (Undergraduate)  Physics
“Lethal lakes: the mitigation of dissolved gas hazards in African volcanic lakes”

Sara Sattler (Undergraduate)  Geography
“Desalination and its effects on the northern Red Sea”

Lee Bolling (Undergraduate)  Mathematics
“Constructed wetlands in Nepal: application and community effects”

Emily Reid (Undergraduate)  General Studies
“Impacts of the Southeastern Anatolia Project in the Tigris-Euphrates river basin”

Gerry McCarroll (Graduate)  Geography
“An investigation of drought indices and their relevancy to the Great Basin

Break 10:45 a.m. to 11:00 a.m.

Session II: Water Quality and Health Issues 11:00 a.m. to 11:45 a.m.

Jorge Arufe (Graduate)  Hydrology
“A quantification of the urban gradient of the Lower Truckee River Watershed and of the effects of urbanization on the water quality of the region.”

W. Alan McKay (Graduate)  NRES
“Water resource development in support of Guinea worm eradication”

Amber Long (Undergraduate)  Biology
“The implications of water sanitation on cholera epidemics in Africa”

Break 11:45 a.m. to 1:00 p.m.
### Session III: Urban Water Issues
1:00 p.m. to 1:45 p.m.

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<thead>
<tr>
<th>Speaker</th>
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<tbody>
<tr>
<td>Alexander Kolosovich (UG)</td>
<td>NRES</td>
<td>&quot;Urbanization and water quality on the Yamuna River, India&quot;</td>
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<tr>
<td>Andrea Gehlhausen (Graduate)</td>
<td>Hydrology</td>
<td>&quot;Water infrastructure in Latin America&quot;</td>
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<tr>
<td>Gordon Steinmann (UG)</td>
<td>Chemistry</td>
<td>&quot;The pros and cons of Three Gorges Dam with a focus on hydropower, flood control, and navigation&quot;</td>
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#### Break
2:00 p.m. to 2:30 p.m.

### Session IV: Environmental and Ecology Issues
2:30 p.m. to 3:15 p.m.

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<tr>
<th>Speaker</th>
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<tr>
<td>Jose Antonio Salgado (UG)</td>
<td>Natural Resources</td>
<td>&quot;The effects of water diversion in the Colorado River on the totoaba (Totoaba macdonaldi) and the vaquita porpoise (Phocoena sinus)&quot;</td>
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<tr>
<td>Matt Church (UG)</td>
<td>Forestry &amp; Rangeland Management</td>
<td>&quot;Implications of freshwater lens in small island aquifers&quot;</td>
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<tr>
<td>Monte Sanford (Graduate)</td>
<td>Ecology, Evolution and Conservation Biology</td>
<td>&quot;An assessment of mangrove ecosystems protecting water resources during the Asian tsunami&quot;</td>
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#### Break
3:15 p.m. to 3:30 p.m.

### Session V: Collective Action/Organizations
3:30 p.m. to 4:30 p.m.

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<tr>
<th>Speaker</th>
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<tr>
<td>Melissa Hopkins (UG)</td>
<td>Environmental Engineering</td>
<td>&quot;Mitigation and remediation of Australia’s Great Artesian Basin (GAB)&quot;</td>
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<tr>
<td>Jamie Dermody (UG)</td>
<td>Education</td>
<td>&quot;Comparison of approaches for water education for children&quot;</td>
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<tr>
<td>Antoinette Ortega (UG)</td>
<td>Art</td>
<td>&quot;Environmental Non-Governmental Organizations in Latin America&quot;</td>
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<tr>
<td>Ryan Bartlett</td>
<td>Political Science</td>
<td>&quot;Pollution and water use issues in the developing world: actions of the Coca Cola Company and its subsidiary bottling plants in India&quot;</td>
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#### Break
Until Friday
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<tr>
<th>Session VI: Water Quality</th>
<th>9:00 a.m. to 9:45 a.m.</th>
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<tbody>
<tr>
<td><strong>Alexis Alexander</strong> (Undergraduate)</td>
<td>Education</td>
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<tr>
<td>&quot;Water resource development and malaria in Africa&quot;</td>
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<tr>
<td><strong>Russell Garrison</strong> (Undergraduate)</td>
<td>Forestry Management</td>
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<tr>
<td><strong>Jason Assam</strong> (Graduate)</td>
<td>Hydrology</td>
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<tr>
<td>&quot;Tungstate Adsorption to Ferrihydrite: Laboratory and Field Applications&quot;</td>
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<td><strong>Break</strong></td>
<td>9:45 a.m. to 10:00 a.m.</td>
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<th>Session VII: Agricultural Issues</th>
<th>10:00 a.m. to 11:00 a.m.</th>
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<tr>
<td><strong>Natalie Marinas</strong> (Undergraduate)</td>
<td>Wildlife Ecology &amp; Conservation</td>
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<td>&quot;Minimizing irrigated water for rice production in the Philippines&quot;</td>
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<tr>
<td><strong>Nicole Sallaberry</strong> (Undergraduate)</td>
<td>Civil Engineering</td>
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<tr>
<td>&quot;Sustainable water applications for agricultural purposes&quot;</td>
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<tr>
<td><strong>Ann-Marie Shank</strong> (Undergraduate)</td>
<td>Agricultural Education</td>
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<tr>
<td>&quot;Wastewater reclamation applied to agriculture in India and the United States&quot;</td>
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<tr>
<td><strong>Theresa Bohannan</strong> (Graduate)</td>
<td>Environmental Science &amp; Health</td>
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<tr>
<td>&quot;The use of organochlorine pesticides in Mexican agriculture and its implications on surface and ground water supplies&quot;</td>
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<tr>
<td><strong>Break</strong></td>
<td>11:00 a.m. to 12:30 p.m.</td>
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Session VIII: Water Management Issues II  
12:30 p.m. to 1:30 p.m.

Brittany Reichardt (Undergraduate)  
“Desalination techniques used in the Middle East”  
NRES

Kazuhiro Yamauchi (Undergraduate)  
“Sedimentation and erosion issues due to the High Aswan Dam”  
NRES

Marco Velotta (Undergraduate)  
“Water usage and conservation in the Summerlin master planned community in Las Vegas, Nevada”  
Geography

Dawn Hanseder (Undergraduate)  
“Critical considerations for dam removal”  
Environmental Science

Break  
1:30 p.m. to 2:00 p.m.

Session IX: Water and Conflicts  
2:00 p.m. to 3:00 p.m.

Adam Hutchison (Undergraduate)  
“From war to wealth: restoring the Iraq wetlands”  
Speech Pathology

Lyndsey Langsdale (Undergraduate)  
“Water rituals and their implications in water conflicts”  
Anthropology

Tamara Silvernail Johnston (Undergraduate)  
“Conflict resolution of transboundary watersheds”  
Resource Economics

Kimberly Knudson (Undergraduate)  
“Water and the Israeli-Palestinian conflict”  
Geography

Conclusion of Presentations
Adjournment to William J. Raggio Bldg., Rm. 2030

Awards Ceremony and
Keynote Speaker:

Dr. Ben Crow
University of California, Santa Cruz

“Flying toilets and other trajectories of water and sanitation access”

Reception Following
(All are invited)
ABSTRACTS

Alexis Alexander (Undergraduate) Education

"Water resource development and malaria in Africa"

Over 40% of the world’s population is at risk of contracting malaria, most of whom live in some of the poorest nations. Currently malaria affects nearly 300 million people worldwide and causes death in at least one million people. This presentation will take a closer look at malaria in Africa, where 90% of these deaths occur. The pathogenic microorganisms responsible for the disease are four species of Plasmodium, which uses a vector, the Anopheles mosquito, to transport it to the human host. A portion of this presentation will focus on the life cycle of Plasmodium as it is transmitted from mosquito to human and vice versa, with an emphasis on the effect of water resource development, management, and infrastructure as applied to malaria in Africa. These water management issues influence the transmission of malaria by providing an ideal habitat for the larval mosquito, therefore increasing the adult population. Water resource development projects are frequently performed without regard for such an increase in malaria. The expansion and movement of surface water in Africa leads to an amplified number of vectors, the Anopheles mosquito. If a large portion of habitat for the mosquito can be eliminated through water management, the pathogen-transmitting population can be decreased, thus decreasing the number of malaria incidences in Africa and, in turn, potentially saving millions of lives.

Jorge Arufe (Graduate) Hydrology

"A quantification of the urban gradient of the Lower Truckee River Watershed and of the effects of urbanization on the water quality of the region"

An examination of the effects of urbanization on the water quality and ecosystem health of the Truckee River watershed is being completed. Applying an adaptation of USGS methods, an Urban Intensity Index (UII) for the entire watershed will be prepared using land use, land cover, demographic, landscape configuration, and soil permeability values. Sub-basins will have values between 0-100 that represent levels of urbanization. UII values will be correlated with water quality parameters to quantify the relation between urbanization and water quality and identify the specific organic compounds with the strongest correlation with urbanization. In addition, the variables used to prepare the UII will each be correlated with water quality parameters to determine what urban land use variables have the strongest relation with the water quality of the watershed.

The parameters used in this study are: 1. Semi-Permeable Membrane Devices (SPMDs); 2. Polar Organic Chemical Integrative Samplers (POCIS); 3. Aquatic food web carbon and nitrogen stable isotope values; and 4. Index of Biological Integrity (IBI) values for the Truckee River. SPMDs and POCIS are passive samplers that collect hydrophobic and hydrophilic organic compounds in water, respectively. SPMDs also mimic the bioaccumulation of toxins in fish and other aquatic biota. Stable isotope values may be indicative of anthropogenic influences on the aquatic food web and IBI values are indicative of the ecological health of a stream. Together, these variables are possible indicators of urbanization and of its possible effects on stream water quality and ecosystem health.

Preliminary results show that water quality is somewhat degraded near the Reno/Sparks metropolitan area based on data obtained from the deployment of SPMDs and POCIS, IBI data, and stable isotope aquatic food web signatures. With the completion of the UII, a more detailed quantification of possible relations between urbanization and water quality can be demonstrated.
Jason Assam (Graduate)  
Hydrology  

“Tungstate Adsorption to Ferrihydrite: Laboratory and Field Applications”

Adsorption onto mineral surfaces is an important mechanism that controls aqueous heavy metal concentrations. Tungsten (W) concentrations in groundwater are a recent concern due to possible links between W and human health in Fallon, NV. Recent literature proposed W adsorption on Fe/Mn oxyhydroxides as a control on W groundwater concentrations. We aim to test this hypothesis by: 1) determining an experimentally determined adsorption constant for W (as tungstate, WO$_4^{2-}$) onto ferrihydrite over a range of potential groundwater chemistries, and 2) comparing W concentrations determined with our constant to known Fallon aquifer concentrations.

Preliminary adsorption experiments investigating the reaction between W and a ferrihydrite surface were performed. Bulk chemical analyses and sequential extractions of samples from the shallow and intermediate Fallon aquifers were performed to quantify aquifer W concentrations and provide evidence for W association with Fe/Mn oxyhydroxide fractions.

Preliminary batch experiments indicate for WO$_4^{2-}$/ferrihydrite ratio of 50:1, 100% adsorption occurs between pH 3-7, drops sharply for pH > 7, and is negligible at pH >10. Bulk aquifer sediment analyses indicate 3% Fe content, and W concentrations ranging between 3-6 mg/kg.

Experiments are underway investigating the effects on adsorption of: ionic strength 0.01-0.5 M NaNO$_3$, pH 3-12, adsorbate/adsorbent ratios 1-100:1, and the role of competing adsorbates. Experimental results will be modeled with FITEQL 4.0 and the Diffuse Double Layer Model to determine the best-fit adsorption constant. The adsorption constant will be used with MINTEQ to estimate W concentrations at equilibrium in chemical conditions characteristic of the Fallon aquifers.

Ryan Barlett (Undergraduate)  
Political Science  

“Pollution and water use issues in the developing world: actions of the Coca Cola Company and its subsidiary bottling plants in India”

This presentation will address the actions of the Coca Cola Company in relation to water use and pollution in multiple regions across India. Subsidiary bottling plants have been widely accused by local populations and local NGOs in four specific areas of excessively drawing from common pool aquifers, and polluting local water supplies through sludge and effluent deposits. A subsidiary company admittedly continued to provide “fertilizer” chemically proven to contain high levels of toxic metals to local farmers until the plant was shut down by state pollution board officials. Coke continues to deny other allegations of abuse such as excessively overdrawing aquifers, polluting farm land, and contaminating local water supplies. As the company continues to deny any wrongdoing, it is also important to address what benefits, economic or social, it has created in these regions, and whether or not they overshadow the problems. Also addressed will be the local grass roots movement that has spawned against the company, and what effect NGOs, both local and international, have had on this movement and the issue in general.
Theresa Bohannan (Graduate)  
Environmental Science & Health

“The use of organochlorine pesticides in Mexican agriculture and its impacts on surface and ground water”

A large part of Mexico’s growing economy is based on traditional and large-scale agriculture. Roughly 14% of Mexico’s total land area is arable and permanent cropland. Pesticide use among agribusiness is common practice and it is also common for vector borne disease control. During the 1950s, DDT and other newly developed organochlorine pesticides were introduced to Mexico and have been used extensively throughout the country. Organochlorine pesticides are chlorinated hydrocarbons that include, but are not limited to: DDT, methoxychlor, chlordane, heptachlor, aldrin, dieldrin, lindane and others. Once pesticides are applied, they runoff during irrigation and storm events and end up in surface and ground water supplies. Although many organochlorines have been banned throughout the world, they are still used illegally, and because they are persistent, they can still be found in water samples. An example of this is demonstrated by a study done in the Bay of Chetumal, Mexico, where organochlorine residues were found in high concentrations near the freshwater inputs of the Rio Hondo. These high concentrations are of public concern because of the threat to human health and ecological impacts. The main objective of this presentation will be to link the use of organochlorine pesticides in agriculture to their fate in surface and groundwater, and the toxicological impacts to humans in areas of Mexico where pesticides are used heavily.

Lee Bolling (Undergraduate)  
Mathematics

“Constructed wetlands in Nepal: application and community effects”

Surface water pollution is a serious problem in developing countries due to the discharge of untreated wastewater into river systems. A promising low technology solution to treat wastewater is constructed wetlands. Constructed wetlands are important because they utilize natural processes, are simple to construct, involve simple operation and maintenance, and are usually cost effective. In Nepal, two constructed wetlands have been created to treat grey water and wastewater. First, a two-stage constructed wetland treats wastewater from the Dhulikhel hospital with a horizontal flow bed as the first stage and a vertical flow bed as the second stage. Second, a constructed wetland is used to treat grey water from a single household. These two constructed wetlands will be analyzed with respect to their design and performance. The overall success of the projects will be looked at in terms of their performance and disadvantages. Finally, significant results from the Nepalese projects will be extended to evaluate their utility for addressing water pollution problems in other developing nations.
Matt Church (Undergraduate) Forestry & Rangeland Management

“Implications of freshwater lens in small island aquifers”

Many small islands sit on top of a freshwater aquifer, which itself sits on top of saltwater. The only barrier between the two is a freshwater lens held together by various physical and chemical processes. This lens is fragile; breaking it would result in an irreversible blending of salt and freshwater. This has major implications for island nations, who typically do not have easy access to freshwater aside from these freshwater lenses. This presentation will discuss the physical characteristics of the freshwater lens in oceanic carbonate islands, primarily those in the Pacific. It will also discuss ways of determining the amount of groundwater available in these aquifers, factors affecting their recharge, and different strategies for groundwater management. Social and economic ramifications, along with climate change, will be briefly touched on.

Jamie Dermody (Undergraduate) Education

“Comparison of approaches for water education for children”

Project WET (Water Education for Teachers) is a nonprofit water education program in the United States for educators and young people ages 5-18. Project WET is known around the world for the numerous projects that they have completed. The United Nations Classroom Resource Guide is about how everybody counts and every drop matters. This guide also contains other helpful resources for water education. This presentation will compare and contrast the differences between Project WET and United Nations Classroom Resource Guide and the different ways that they teach children about water.

Russell Garrison (Undergraduate) Forestry Management

“Uthålligt skogbruk (sustainable forestry practices) in Sweden to protect water quality”

This presentation will describe a case study in the Västra Götaland region in Southwestern Sweden on a demonstration of sustainable forestry practices that protect water quality and aquatic biodiversity. The Skogsvårdsstyrelsen (Swedish Regional Board of Forestry), in conjunction with the Forestry Commission in Scotland, began the project in 1999 in the two water catchment areas of Bålån and Ljungaån, which are part of the main water catchment of the River Viskan, to disseminate ideas and information on the effects of forestry procedures by watercourses. Different demonstration sites were set up in several environments. The presentation will focus mainly on riparian watercourse protection, such as creating buffer zones by thinning and laying in-stream structures and woody debris in the water. The results of follow-up measures such as taking water chemistry tests in response to the above-mentioned methods will also be presented.
Andrea Gehlhausen (Graduate)  
Hydrology  

"Growing Populations Without Water: Monterrey and Mexico City"

The urbanization of Mexico has been a rapid and recent event, with the percentage of population that is urban soaring from 35 to 75% in the last 50 years. Mexican cities were unprepared for this population increase, resulting in unplanned growth without adequate water services and infrastructure. The analysis of two major cities, Mexico City and Monterrey, offer a picture of the salient water issues facing Mexican urban areas.

Mexico City’s water issues have been influenced by its geologic location, rate of growth, and poor infrastructure planning. These issues have left the rich population with access to the municipal water system and the poor population relying on water trucks to deliver water. The entire city is facing severe subsidence from groundwater overdraft.

The city of Monterrey experienced similar rapid urbanization during the last 50 years, however, water shortages are faced by the entire population. In the early 20th century Monterrey had an enviable and productive water system, yet a series of setbacks has left this water system continually inadequate since 1940.

The water inadequacies for both cities reached a crisis point in the late 1970’s and early 1980’s when individuals began protesting and the government was forced to begin restructuring and undertaking large scale planning for water infrastructure. This included privatization of services and changes in government organization of water services. As the urban population continues to increase, Mexico must continue its preparations for the future to ensure adequate water supplies for all.

Dawn Hanseder (Undergraduate)  
Environmental Science  

"Critical considerations for dam removal"

Dams are blamed for a host of social, economic, and ecological damages. In the last few decades, dam removal has often been proposed as a solution to the ecological destruction waged by the installation of dams, as well as a way to dispose of old and/or dysfunctional dams. In the United States, over 1000 dams of significant size have been successfully removed. However, the rest of the world remains slow to follow suit. This paper explores the question Why aren’t more countries removing dams in an effort to counter the ecological damage? by examining the most critical considerations for potential removals. Most often, the reason is an issue of economics, yet dam removal also poses a number of noteworthy social and ecological difficulties that should be considered. For further insight, the paper reviews a case study of the considerations, decision process, and expected outcome of the removal of the Arase Dam in Japan.
Melissa Hopkins (Undergraduate)  Environmental Engineering

"Mitigation and remediation of Australia’s Great Artesian Basin (GAB)"

The Great Artesian Basin (GAB) was discovered in 1878 and extends over 1/5 of the Australian continent. This basin is one of the most plentiful water supplies known and it is able to supply up to 15 million mega-liters of groundwater over the span of a year. This water supply is very important to Australia’s population of 18 million people. Because this aquifer is so precious to its people, this presentation will focus on how this water resource is being protected and rationed out. It will look at the uses and threats to the aquifer. The Great Artesian Basin Sustainability Initiative (GABSI) and the Great Artesian Basin Coordinating Committee (GABCC) are organizations that are making efforts to rebuild old bore holes and well sites to prevent, reduce, and mitigate contamination from entering the aquifer. These organizations will be recognized and analyzed in this presentation based on how they are helping with the aid of government and private funds.

Tamara Silvernail Johnston (Undergraduate)  Resource Economics

"Conflict resolution of transboundary watershed"

There are 261 watersheds in the world shared between two or more nations. Forty percent of the world’s population resides within these transboundary watersheds. Given the growing scarcity of clean water as an irreplaceable resource for drinking, sanitation, agriculture, and industry, there is a reasonable prediction that conflict among nations sharing water basins will increase as populations continue to expand. Most international water disputes have been settled with détente, with 1228 cooperative settlements and 507 events containing negative actions. The world does not have an ultimate governing body to mediate transboundary water conflicts and enforce the international water laws, treaties, and policies. The United Nations (UN) is the world’s sole governing agency. Several of the sub-agencies within the UN assist with water conflict, but the UN has limited authority to settle international water disputes. I will explain UN’s limited authority in water disputes, and how the UN aids in settling international water conflicts through international water treaties. I will define international water law, why it is considered “soft law” and not a form of strict international legislation, and how it is used to guide nations in water disputes. The cooperation between disputing nations over shared transboundary freshwater resources will require further support by the international community as the need for clean water increases.
Kimberly Knudson (Undergraduate) Geography

"Water and the Israeli-Palestinian conflict"

Water tensions between Israel and Palestine can be traced back to the 1967 Arab-Israeli War, which led to Israeli control of the West Bank and the Gaza Strip, important Palestinian land areas. Initially, Israel avoided establishing settlements in the predominantly Palestinian West Bank, until urban sprawl demanded its economic and political integration. The Israeli government instituted severe water limitations on existing Palestinian communities in the West Bank in order to make water more readily available, and settlement more attractive, to Israeli citizens. Israel regulated Palestinian water usage, implemented strict agricultural limitations, and forced Palestinians to pay subsidized water prices. Today, Palestinians receive only 20 percent of the water from the West Bank aquifer; the rest is pumped to Jewish settlements. The purpose of this presentation is to analyze the implications of Israeli water restrictions on Palestinian communities, looking specifically at how Israeli regulations have contributed to the Israeli-Palestinian conflict.

Alexander Kolosovich (Undergraduate) NRES

"Urbanization and water quality on the Yamuna River, India"

Urban areas can have negative effects on water quality downstream. The way in which an urban area is developed determines the impacts on water quality. The western world has taken hundreds of years to reach its present state of urbanization and many areas continue to have problems with water quality downstream of urban areas. In developing countries, rapid urbanization with insufficient planning has had measurable consequences for the plants, animals, and people downstream from urban areas. More people living in an urban area generally results in poorer water quality downstream. An analysis of the Yamuna River in Delhi, upstream and downstream of the urban areas, should yield some answers as to why and to what extent urbanization affects water quality in rivers.
Lyndsey Langsdale (Undergraduate)  Anthropology

“Water rituals and their implications in water conflicts”

It can be argued that water is perhaps the most highly ritualized and sacred entity on Earth, beginning with the first alliance of Homo sapiens, through the cultures and societies of antiquity, and even into the contemporary Western World. Humans recognize their absolute dependence upon water and have therefore often raised this element to an elevated status. However, the ways and means of this respect, via worship and ritual, is extremely varied throughout the world’s cultures. With water being of such extreme importance, and the cultural rituals surrounding it being so specific and sanctified, could looking at these rituals provide a new approach to the study of international water relations? I will discuss how water rituals, including water’s ethical value and different cultural interpretations, affect contemporary water relations. For example, how do multiple groups approach the sharing of a single water resource: through peaceful negotiations, or through war? Does the reasoning for their approach have to do with their “water culture”? I will also examine how the Berbers of the Atlas Mountains and the Bedouin of the Negev Desert continue to use their indigenous water rituals and practices to deal with their local water issues. Then I will apply this cultural lens to an enduring water conflict, the Nile River watershed. Can we look at these water issues from this angle, focusing on water ritual and the differing cultures involved in these disputes, and can this insight shed light on the foundation of these conflicts, offering alternate means of conflict resolution?

Amber Long (Undergraduate)  Biology

“The implications of water sanitation on cholera epidemics in Africa”

Water sanitation is a widespread international issue and is often the cause of water related epidemics such as cholera. Unsafe water sanitation and poor hygiene cause over a hundred thousand cases of cholera a year, killing over 2,000 people. Cholera outbreaks in Africa account for 94% of the total reported cases worldwide. At the current rate, slightly more than half the African population lives within thirty minutes of potable water sources and only 36% have a basic toilet. Cholera is a bacterial germ (Vibrio cholerae) that is found in the feces and vomit of infected people. It tends to occur in underdeveloped countries that lack adequate water treatment and sewage disposal. The disease is spread through fecal contamination of the water and can become an epidemic when the limited amount of drinking water becomes polluted. The recent outbreak of cholera in West Africa, with 43,279 cases and 724 deaths this year, provides an example of how poor sanitation infrastructure results in pervasive health issues. The aim of this presentation is to raise awareness of cholera epidemics that cause serious health problems in Africa due to poor water treatment and sanitation. By providing sustainable approaches to water treatment, sewage removal, and knowledge of hygiene, affected countries can improve water disease transfer. Protecting wells from fecal contamination, building toilet facilities, and improving local water infrastructure could reduce the growing occurrence of cholera.
Natalie Marinas (Undergraduate) Wildlife Ecology & Conservation

"Minimizing irrigated water for rice production in the Philippines"

This presentation will discuss water usage in irrigated rice and ways to reduce water usage with a focus on the Philippines. Irrigation is used to grow rice in many countries. This becomes a problem when water is scarce and rice is a major economic commodity for the country. Irrigated water is being diverted more and more to metropolitan areas for personal consumption, so farmers are receiving less water to grow their crops. Farmers rely on the money made from their yields, and rice is an essential food item for most of Asia. Farmers need to look at better farming methods to reduce water and increase rice production. The difference in the water needed to sustain a rice paddy and the average amount used will be established. Current methods for growing rice will be looked at and compared to new studies on minimizing water input. Various methods can be applied to reduce the water input and save up for dry seasons. Some of these methods include dry seeding versus wet-seeding, and intermittent irrigation. Using a few case studies in the Philippines, effects of these methods on rice production, water consumption, and the economy will be addressed.

Gerry McCarroll (Graduate) Geography

"An investigation of drought indices and their relevancy to the Great Basin"

Drought has been defined in many ways, but typically it is thought of as the prolonged absence of precipitation that results in severe impacts on activities or needs dependent upon a certain amount of moisture. Since the early part of the 20th Century, researchers and meteorologists have studied drought in terms of its impact on those activities or needs, and have developed indices that not only quantify those impacts, but qualify them as being either hydrological, agricultural, socio-economic, or meteorological or climatological. This proposal will examine currently recognized indices, determine their flaws and advantages, and will ascertain which, if any, would be most ideal when evaluating and/or modeling drought conditions in the Great Basin.
Between January-June 2004, there were over 5,000 cases of guinea worm disease (dracunculiasis) reported in the West African country of Ghana. Ghana’s Northern Region is most endemic, accounting for 70% of the country’s case load. Geographical analysis of reported cases indicates that four key areas had been chronic in the disease and responsible for most of the cases. Because they serve as market centers as well as health centers where major activities converge, people travel there for economic, health and social activities, only to return to their villages with the disease after drinking the contaminated local water. All impacted areas share at least one thing in common, and that is inadequate access to safe drinking water. Most impacted areas rely on a combination of open “dug-outs”, stagnant streams and unsanitary hand-dug wells for their domestic water needs. A large water, sanitation and hygiene promotion program comprised of UNICEF, the Carter Center and the Desert Research Institute is in its nascent stages. At the inception of this project, linkages between guinea worm occurrence in Ghana and access to safe water will be explored. Additionally, technical challenges related to water resource development are discussed, particularly within the framework of physical setting, climatic factors and in-country capacity for water development.

My presentation will focus on environmental NGOs in Latin America and their role in the global water crisis with options for aid in local level management. I will discuss the scarcity of freshwater due to lack of infrastructure, pollution, and policy and how NGOs play a part in creating a solution (or lack of) to these community problems. Part of my focus will also be in describing the various roles of environmental NGOs in connection to a local perspective. Through the use of case studies from Latin America, this presentation will provide a better understanding of the presence and participation of NGOs in relation to local communities.
Andrew Oxner (Undergraduate)  Physics

“Lethal Lakes: the mitigation of dissolved gas hazards in African volcanic lakes”

On August 26, 1986, 1700 people suddenly perished in the valleys surrounding Lake Nyos in northwest Cameroon. Scientists soon traced the disaster to an unusual geological hazard specific to volcanic lakes in the region. Dissolved carbon dioxide accumulates in the deep cold waters of these lakes, eventually reaching the point of supersaturation. This creates an unstable water column that can suddenly turn over and release a suffocating cloud, fatal to every animal in a 10-km radius. In addition to Lake Nyos, nearby Lake Monoun has also claimed lives through this mechanism. Along the border of the Democratic Republic of the Congo and Rwanda exists a similar lake, charged mainly with methane, a valuable but potentially explosive gas. This presentation will examine the history of the Lake Nyos disaster, and the subsequent international engineering and modeling efforts to help mitigate the hazards of these peculiar lakes. Computer models have been developed to better predict the behavior of large bodies of water saturated with gases, and devices are now functioning that are hoped to avert another catastrophe. Methane extracted from Lake Kivu has proven to be a useful fuel and could provide a source of power for much of Rwanda, relieving the demands on its diminishing forest resources.

Brittany Reichardt (Undergraduate)  NRES

“Desalination techniques used in the Middle East”

Desalination is a method used to remove dissolved solids in water that usually cannot be seen by the human eye, and is used to produce potable water from salt water. The water produced can be used for human and industrial uses. Desalination is widely used in Middle Eastern countries. Focusing mainly on Saudi Arabia, Pakistan, Egypt, and the countries bordering the Mediterranean sea, this presentation will discuss reverse osmosis, thermal processes, and electrodialysis, which are various techniques of desalination. This paper will explain why different desalination techniques are used in different areas. The purpose of this paper is to make the public aware of desalination techniques and the positive aspects of desalination for countries with water crisis in the Middle East.

Emily Reid (Undergraduate)  General Studies

“Impacts of the Southeastern Anatolia Project in the Tigris-Euphrates river basin”

The Tigris-Euphrates River Basin is one of the most important water ways of the Middle East. The limited resource has led to tension and issues on the use of this water system. The Southeastern Anatolia Project or Guneydogu Anadolu Projesi (GAP) involves the construction of 22 dams and 19 hydroelectric plants on the Tigris-Euphrates River and tributaries in an area that has been historically an underdeveloped plateau lying at the base of the Taurus Mountains. This region of Turkey has been behind the rest of the country in various developments. By implementing water structures, the project hopes to raise the standards of living and quality of life. This presentation will explore the geography of Turkey, the benefits of economics, water resources, and the standard of living, and the environmental concerns that are associated with the Southeastern Anatolia Project.
José Antonio Salgado (Undergraduate) Natural Resources

“The effects of water diversion in the Colorado River on the Colorado River on the totoaba (Totoaba macdonaldi) and the vaquita porpoise (Phocoena sinus)”

The diversion of water from rivers in the world has reduced and destroyed habitat for numerous species that have direct or indirect dependence on river systems. My objective is to show how the diversion of water in the southwestern United States from the Colorado River has created many problems for species that depend in the estuaries formed at the delta where the Colorado River meets the Gulf of California. My presentation will focus on the totoaba (Totoaba macdonaldi) and the vaquita porpoise (Phocoena sinus), two endemic species to the Colorado River Delta that have experienced serious habitat loss due to the low flow that reaches the Gulf of California. The consequences from the water diversion are that both of these species are currently listed as endangered species in Mexico and the United States. Work has been done to reduce the high salinity of the estuary, decrease the amount of erosion that is occurring, increase the fresh water inflow, and increase the nursery habitat needed by these species. The area is now considered a biosphere reserve and biologists from both countries have joined forces with environmental agencies to ensure the well being of the habitat and the species that depend on it.

Nicole Sallaberry (Undergraduate) Civil Engineering

“Sustainable water applications for agricultural purposes”

Worldwide, seventy percent of human controlled fresh water supply on earth is consumed in the application of agricultural irrigation. Not only does mainstream irrigated agriculture create food and livelihoods, it also commonly leaves its traces in the land, water, and tissues of organisms. These residues, which much agriculture has become dependent on, include nitrates, phosphates, salts, pesticides, biocides, chemical fertilizers and an array of other contaminants that exist in soils and groundwater due to leaching. Naturally occurring diverse forests are often cleared in agriculture’s name, which only further alters the local hydrologic cycle. These variables, with their high-energy inputs and large amounts of waste, pose a significant problem to sustaining our food and water supplies. Urban and rural people from all over the globe have and are adopting practices that shift from linear systems of agriculture to closed loop practices. This presentation will explore the potential of agricultural practices to reverse the short- and long-term negative effects of mainstream agricultural practices. Mainstream agricultural practices will be discussed and compared to water and resource management techniques that rejuvenate degraded agricultural lands by improving fertility of the soil and the soil’s capacity to retain moisture. P.A. Yeoman’s Keyline Plan, permaculture techniques including swales, and case studies of each from around the globe will illustrate results of these sustainable agriculture techniques. Both approaches will be analyzed to determine which practices provide the greatest benefit for human consumption and sustainability.
Monte Sanford (Graduate) Ecology, Evolution Conservation Biology

"An assessment of mangrove ecosystems protecting water resources during the Asian tsunami"

Coastal mangrove ecosystems provide substantial ecosystem services that translate into economic and human welfare benefits. The combination of mangrove loss worldwide and occurrences of natural disasters leads to the question of whether mangrove ecosystems buffer effects of natural disasters such as tsunamis. Despite recent natural disasters such as hurricanes and tsunamis, little research has addressed this important issue. This presentation examines the freshwater and subsequent human-related consequences from the Asian tsunami of 2004 due to coastal mangrove loss. This comparative study assesses the tsunami impacts of water contamination, water pollution, and lost lands due to the lack of mangrove forest buffer in South Asia. I use the Phang Nga Province, Thailand, to illustrate specific tsunami impacts by employing before and after IKONOS satellite imagery and other digital data. I use post-tsunami Human Health Reports and Rapid Ecological Assessments to assess water-related problems within the study area. From these data, I assess the potential reduced destruction, water contamination, and water pollution in areas with coastal mangrove forests. I discuss the ecosystem service of mangroves forests as tsunami or hurricane buffers that prevent freshwater damage and their economic and human health benefits.

Sara Sattler (Undergraduate) Geography

"Desalination and its effects on the northern Red Sea"

Desalination of seawater for freshwater drinking is a viable water resource for many arid countries. In 2002, over half of the world’s desalinated seawater came from the Arabian Gulf. These desalination plants also generate residual compound waste in the process of producing fresh water. This presentation will focus on a case study about seawater desalination wastewater that is discharged in the northern Red Sea, and the effects it has on the marine ecosystem. In response to some of these effects, many plants have tried new pretreatments instead of conventional pretreatments that use chemicals. This presentation will discuss the ability of these new pretreatments to meet water supply needs while resulting in fewer impacts on the marine ecosystem.

Ann Marie Shank (Undergraduate) Agricultural Education

"Wastewater reclamation applied to agriculture in India and the United States"

This presentation will discuss wastewater treatment and the use of reclaimed water in agricultural applications. Using case studies, a comparison will be made between India’s system for recycled water use and that of the United States, focusing on more arid regions. Not only will standards be addressed, but also the technology that is required for these wastewater treatment programs and the promise these systems have on future applications. This will be presented with an agricultural focus showing the importance of such programs for world agriculture implications and the dangers to the water supply if such technology is not implemented.
**Marco Velotta (Undergraduate)  Geography**

“Water usage and conservation in the Summerlin master planned community in Las Vegas, Nevada”

Las Vegas, Nevada is one of the fastest growing cities in the United States, with a sizable percentage of its population living in master planned communities within the metropolitan area. These communities and their residential populations are faced with a geographical dilemma that is a result of living in the arid American West: as the city’s largest communities use a substantial share of water in the valley and the fact that the city has limited water resources, there have been major effects on various uses of water. Landscaping irrigation and home consumption are the largest types of water consumption in Las Vegas, followed by commercial water use and golf course irrigation. Local governments have taken steps to increase the capacity of the Las Vegas Valley’s water resources and have promoted various measures for conserving water. With the onset of a recent drought and the realization that they are major water consumers, Las Vegas’s master planned communities have taken steps to encourage their residents to conserve water and have even gone as far as touting themselves as water conservationists. While it is true that most communities, such as Summerlin, the largest in the Las Vegas Valley, have launched initiatives to conserve water within their respective communities, and the conservation measures enacted by local governments have affected water usage, it is debatable as to whether their differences have made much of an impact. Policies such as xeriscaping along with increased incentives to generate more appreciation for conservation could further reduce their share of water, but Las Vegas’s master planned communities could do much more to make greater differences in water use.

**Kazuhiro Yamauchi (Undergraduate)  NRES**

“Sedimentation and erosion issues due to the High Aswan Dam”

The High Aswan Dam (HAD) on the Nile River is one of the major reservoirs in Egypt. The lake behind the dam is called Lake Nasser and expands to the border of Egypt and Sudan. The HAD was built in 1970 to satisfy primary growth objectives in Egypt including hydroelectric power generation, water storage for irrigation, industry and domestic use, flood control, and regulation of river flow for navigation. Although HAD has brought benefit to communities such as increasing crop production, the effect of the HAD has been controversial discussion for decades. The sedimentation of the Lake Nasser is one of the major concerns of the HAD. Erosion and loss of sediment also creates negative results such as impacts on the delta and Mediterranean seashore. This presentation will evaluate the causes, effects of sedimentation and compare the damage and loss to the local communities and economical values of the HAD.
Keynote Speaker:

Dr. Ben Crow
University of California, Santa Cruz

“Flying toilets and other trajectories of water and sanitation access”

In the Nairobi slum of Kibera, in which 750,000 people live, innovations for water and sanitation are very simple. Many people defecate into plastic bags – then cast the bag onto one of the numerous heaps of garbage scattered throughout the slum. There is no garbage collection in Kibera. Clean water comes from exposing contaminated water in a plastic bottle to sunlight for six hours. Ultraviolet rays penetrate PET plastics and disinfect the water. These innovations illustrate the constraints on access to water and sanitation in Kibera. In this talk I want to examine how near universal access to water and sanitation was achieved in the industrialized west and the lessons this might have for what could be done in the non-industrialized world, particularly poor areas like Kibera.