David Takano

April 21, 2016

ES 473

Restoration Acts of the Pacific Northwest Watershed and Stream Systems

Abstract: For years, Pacific Northwest salmonids have faced endangerment and have had their population size threatened. As a result millions of dollars have be invested annually to restore their natural habitats and means of travel. However, restoration acts for water shed and streams that have already been completed have had little evaluation on effectiveness of treatment. Along with varied results from rehabilitation techniques, there is a large dispute within the scientific community over success and effectiveness. Consequently watershed and stream rehabilitation experts have created a hierarchical strategy for site specific restoration assessment, which are: (1) principles of watershed processes, (2) protecting already existing high-quality habitats, and (3) understanding effectiveness of current techniques for habitat rehabilitation. After assessing the habitat site, there are a number of options. First and foremost, the most important task is protecting current high-quality habitats. Then reopening or repairing high quality habitats that were cut-off through means of artificial blockages. (landslides, fallen trees etc.) At this point, once habitat has been repaired, one should look at the geological (movement of sediment), hydrological, and riparian processes (side bank maintenance, alteration). Only after natural watershed processes have been restored should artificial in-stream enhancements be made (boulders, trees, and additional nutrients). There are many proposed techniques to solving this critical issue. Despite the efforts, it is essential that one evaluates the effectiveness of the alterations for the biological and physical processes of the watershed following restorations methods and techniques that have been made.

Hunter Collins

Earth Science Major

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The Role of Beaver Dams in Riparian Habitat of the Pacific Northwest

This poster presentation will be discussing the impact of having a beaver population in the Pacific Northwest, and how it would affect the Riparian Habitat that is currently the common habitat throughout this region. It will present many different pieces of evidence collected from studies done in America and also in Europe. In order to understand the impact of beavers we have to understand where they all went first. Back when America got colonized there were anywhere from 60-400 million beavers, they were then over trapped for their pelt and such all the way until in current times population ranges from 6-12 million. What trappers did not know is the impact that these beaver dams had on the environment, such as how they made rivers and streams more depositional environments that erosional. Since beaver dams are sediment traps when all of the beavers were removed their dams broke leading to drastically altered fluvial landscape of North America as well as reduction of wetlands environments all together. Another area of life that beaver dams affect America is with fish population. It is well known that fish such as salmon used beaver dams for the ponds that they created. What most do not know is that since the removal of all the beaver dams the population of salmon as well as their production potential or SPP, has lowered by around 61%. In other terms the estimated summer SPP is around 965,000 versus the historic numbers which were up at two and a half million smolts (smolts are young salmon or trout). The impact that beaver dams have on the environment in the Pacific Northwest is far greater than most believe and therefore we must do what we can to reinstate beavers as a population to help create a better environment in our area.

Will Edwards Jr.
Geology & Earth Science
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Hydraulic Connectivity of Floodplains and Channels as Restoration Strategy in the Willamette Valley

This paper summarizes the floodplain processes which create, past and present, the landforms of the Willamette River in northwestern Oregon and the effects human intervention has had on the function of those processes and possible options to restore the Willamette River and its tributaries. In the last 100 years, the Willamette River's sediment load has been reduced substantially, peak flows are now confined to the river's main channel by dams, road cuts, levies, and rail roads which cut off floodplains, and its bank erosion has been brought to a standstill restricting channel migration. The possible courses to fix this issue will be presented in this paper, these courses include; adding tunnels beneath roads to reconnect cross-cut floodplains, removing dams, adding riparian vegetation, and building artificial gravel bars. This restriction in coarse sediment load, floodplains, and channel migration has drastically changed the available terrain for indigenous vegetation and, subsequently, the environments for animals. Forrested area surrounding the river has not been inundated during the river's natural flood stages as often as necessary and so it has not been kept in balance and has overgrown swamps, loosely consolidated gravel bars, interfingering channels, and islands, limiting the available terrain for less dense forestry. The loss in these important river environments means a reduction in fish breeding grounds and the loss of coarse sediment load means a higher rate of erosion- this coupled with channel migration restriction means an eroding river bed, making the channel much deeper and the banks much more susceptible to catastrophic destabilization. Reduction in floodplain connectivity means a narrower floodplain for the river to inundate during flood stage and more sediment to be deposited in a smaller area.

Alicia Hubbard
Dr. Taylor
Environmental Geology
25 April 2016

AEG Abstract – The Geomorphic effects of Dams on River Systems

There are an estimated 75,000 dams in the United States of America. Dams have been important in the industrialization of our nation because they provide drinking water for people, water for irrigation, water for industries, water for fishing and recreation, they produce hydroelectric power, and they help reduce the likelihood of a flood occurring. Dams do cause issues though especially on our river systems. The larger dams of America, have been heavily studied and research reveals that the dams commonly alter natural sediment and hydrologic processes that are critical for the rivers environment and often affect landscapes hundreds of kilometers downstream of the dam. Changes in channel width, water discharges, channel bed elevation, bed material sizes and vegetation will occur. It is hard to predict which of the varied ways downstream reaches will respond to altered flow regimes and reduced sediment supply. Common responses include incision, the lowering of the channel and armor, the development of a course grained surface layer. Pre-dam concentration of sediment and suspended loads downstream are not equal to the post dam concentrations, this is known as bed degradation and varies as time progresses. Upstream from the dam, a sequence of geomorphic processes may ultimately lead to a new equilibrium channel depending on the mass and grain size of the sediment. This study will go over the importance of these geomorphic effects that dams have on our river systems.

Dam Removal and River Restoration in the Klamath Basin

Down on the Klamath River there is a war going on. The parties involved in this free for all have different views for the usage of the Klamath River. There are several dams along the Klamath that have altered the physical properties of the river system. Pacific Power, and companies like them, see them as beneficial sources of clean and renewable energy. The farmers that cultivate the area see the dam as flood control for their fields. The farmers that first settled in the region approved of the draining of the basin in order to gain valuable nutrient- rich land that was once a lake bottom. The excessive use of river water to irrigate fields has led to the drying up of some wetlands. The nutrient rich peat is decomposing and releasing high amounts of salts and ammonia into the river system. These dissolved ions prove hazardous for organisms in the ecosystem. The next party involved is the fishermen. Fishermen see the dam as disrupting the fragile ecosystem of salmon because the dam blocks the fish from swimming up-stream. The warming of the river due to global climate change has resulted in the abundant growth of blue-green algae. This type of algae releases toxins that have resulted in massive fish kills. The final party involved is the Native Americans that call the basin their home. They see the river as a sacred being that benefits their way of life.

Some of the farmers, fishermen, and natives have joined forces to remove some of the dams in order to restore the river to its natural state. Pacific power and their associates are trying to find ways to reinvent the dam into a more environmentally friendly structure in order to keep the 70,000 plus customers that rely on this energy source. Thus, the battle continues. Farmers have also worked to mitigate water usage by establishing more conservative irrigation practices and by creating a water budget. The fight for an equalized and healthy river system continues.

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The Occurrence of Arsenic in Groundwater Systems of Western Oregon

David Solvedt

Environmental Chemistry

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Abstract

Each day, all across the world, millions of people are exposed to hazardous and potentially deadly concentrations of arsenic in drinking water taken from groundwater. Arsenic (As) is a naturally occurring element found in rocks, sediments and soils that nearly all humans are exposed to via food, air, water, and soil. Although exposure is inevitable, the highest potential for health effects has been identified as arsenic found in drinking water. Arsenic has been widely recognized as highly toxic and carcinogenic to humans and other organisms when consumed in an inorganic form, such as that found in groundwater. Here in the Willamette Basin of Western Oregon, there exists a variety of regions that possess levels of arsenic in drinking water many times higher than that of the allowed value for arsenic that has been established by the U.S. Environmental Protection Agency as ten micrograms per liter. Analyzing the specific characteristics of the areas where high levels of arsenic have been identified has helped to identify the factors that contribute to the presence of arsenic in a system. Throughout the course of this presentation, the factors and conditions that contribute to the presence and mobilization of arsenic in groundwater at specific regions of Western Oregon will be examined. In addition, the toxicology of the substance, as well as the types of prevention and mitigation of high arsenic levels in drinking water will be discussed. This information will help to establish an in depth understanding of this deadly chemical that exists in the drinking water that each and every one of us ultimately consume.

Name: Connor Pomeroy

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Topic Title: The Effects of Forest Roads on Hillslope Hydrology and Sedimentation in the Western Cascades

Abstract

Every year, improper construction and maintenance of roads on both public and private timberland contribute to clogging water channels with sediments that impede migration of local fish species as well make the hillslopes unstable. Many of these early forest roads were constructed in ways that over steepened slopes and removed nearly all of the natural barriers protecting against these issues. Roads when placed in the wrong location on the slope of a hill disrupt the natural flow of groundwater and can make the slope immediately above and below the road cut unstable. If ditches and culverts are not properly placed they constrict a majority of the water into narrow channels which dramatically increase erosion in key locations that will lead to a possibly catastrophic failure of the hillslope, mainly along the uphill side of the road, under the roadways, and down into the canyon drainages below. Improper maintenance of the logged land and ditches can also contribute to this problem when the supporting groundcover is completely removed, which would decrease the strength of the hillside while allowing the loose sediment to travel almost unhindered through the eroding channels. These matters can pose a very serious threat to local peoples and native fish species, however, through applying area-specific mitigation techniques many of these concerns may be alleviated for a majority of locations in the Western Cascade Range.

Spencer Welter

25 April 2016

ES 473

Hydrogeomorphic Response to Forestry Practices: Mountainous Watersheds in Western Oregon

ABSTRACT

Forestry practices in western Oregon, especially clear cutting and road construction, have had significant, dynamic and occasionally detrimental impacts on watersheds. Increased soil erosion in the form of landslides have been shown to occur far more frequently in heavily logged areas and cause dramatic changes in watershed yields and water conditions. Additionally, in the instances of clear cutting, slash-burning, and road construction, the thorough removal of vegetation has caused especially prevalent ecosystem upheavals where initial replacement vegetation can change water temperatures, oxygen levels and flow peaks. As longer and supplementary studies are conducted on these diverse relationships, the collected reports point toward an increasingly complicated series of influences. Short term studies often come to vastly different conclusions than long term studies regardless if the subject is streamflow yield or regional landsliding. At risk are the species of wildlife that rely on relatively consistent local conditions such as salmonids and old growth riparian vegetation. As they are now, allowed forestry practices have harmful and long term effects on wildlife sustainability and in order to combat these issues, serious considerations regarding forestry regulations need to be made. If Oregon forests are to be conserved and utilized efficiently, further studies and collaborative efforts need to be made so as to quantify the impacts of logging methods in various environments.

Jacob Higgins

ES 473: Environmental Geology

AEG: Abstract Proposal.

The Influence of Timber Harvest on Sediment Transport in the Western Cascades

As timber harvest continues to be one of our primary land uses in the Pacific Northwest of the United States of America. It is important for us to understand the potential affects it can have on the environment. One important way that timber harvest can affect the environment is by increasing sediment transportation. Increase sediment erosion and transportation can have serious effects on water quality of rivers/streams, channel stability, and riparian ecosystems which are important to many organisms. Previous studies have shown that sediment yields are much higher, in areas that have experienced recent clear cutting events and that have timber roads associated with them. If timber harvest does cause sediment transportation and erosion to occur more rapidly, and if sediments can have an effect on water quality and river integrity it is important to find new ways in which we harvest our timber, that way we are not effecting our river systems that provide many ecological and recreational services to us.

Nicole Inman

Interdisciplinary Studies

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Debris Flow Hazards in the Central Oregon Coast Range

Abstract:

Debris flows are dangerous natural disasters that are difficult to predict. They are complicated events with many factors influencing their size and power, and every year they affect thousands of Oregonians (Benda, 1990). The importance of accurately creating a prediction model and educating the public as to their risk and options cannot be understated. It is especially imperative that the Central Oregon Coast be aware of and prepared for debris flows as they statically have a higher rate of incidence than the rest of Oregon (ref?). In 1996-97 Oregon experienced more than 9,500 landslides (Hofmeister, 2000). Understanding the underlying components and their triggers can help enable us to better analyze what areas have a higher risk and enact mitigation measures.

Kolby Childers

AEG Poster Abstract

4/26/2016

Radon is a natural but hazardous gas that results from the decay of uranium and found in almost all soils. Geology is the most important fact in controlling the source and distribution of radon. Radon hazard mapping has been used to decrease the risk and map potentially more dangerous areas as radon is able to enter homes and buildings and may be contained in water. There is uncertainty about all the health risks when being exposed to radon, but it is the second leading cause of lung cancer and affects the health of humans if not properly handled and contained. Radon causes over 21,000 lung cancer deaths and is approximately 13% of all lung cancer deaths. Being able to map and control a safe level of radon is the only way to contain exposure.

Medical Geology and Public Health

By: Hannah Smith

Major: Biology

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Medical Geology is a developing field of study that requires collaboration of many scientific disciplines, including but not limited to geologists, chemists, biologists, and medical anthropologists. This project will explore the relationship between the environment and public health. Several case studies will be discussed to identify influencing factors that affect human health, including air, water, and soil quality. One of these studies is the Portland Moss and Air Quality Study. This emerging technique is being used by scientists to measure air pollutants in urban areas. Mosses act as sponges in the environment, absorbing airborne contaminants and pollutants. By collecting, examining, and testing the types of contaminants within samples of moss, we are able to understand the air quality within cities. We can then move forward in finding the cause of the pollutants to minimize its output, and decrease potential health risks. Recognizing the connection between humans and the environment will allow government and health officials to make educated decisions on how to approach environmental problems that pose risks to human health. It will also encourage us to maintain cleaner environments, with minimal toxin output from industrialization.

Kyle Warren
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Dr. Taylor
Seismic Hazards of the Willamette Valley

Subduction zone earthquakes are notorious for being the biggest and most violent, just to name off a few there was the 9.0 in japan in 2011, the 8.6 in Indonesia in 2005, and the 9.2 in Alaska back in 1964. Some of those areas that experienced the more recent earthquakes are still dealing with the consequences to this day. We live right on the edge of one of the biggest potential earthquake spots in the world not to mention we are a couple years overdue. The Cascadia subduction zone has a history of producing these massive earthquakes and we live right where all the damage is going to happen. We don't know when the next big one will hit, but we do have a record of the previous ones, and we know that this next subduction zone earthquake should be huge. The Willamette Valley needs to worry about the shaking and what that could do to our infrastructure. We also have to worry about tsunamis on the coast and then liquefaction in the valley. This earthquake could desecrate everything west of I-5, and that is why we as Oregonians should be worried. Unlike Japan the West Coast of the United States is not prepared for a big earthquake, it's about time we start to prepare.

Joey Rodgers

4/25/16

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Tsunami Hazards on the Oregon Coast

The topic I will be presenting today is all about the tsunami hazards along the Oregon Coastline. The Oregon coastline is filled with tsunami hazards from north to south which include low lying floodplains and buildings not being able to withstand powerful surges of water that come with a tsunami. Some important things we need to consider when talking about tsunami hazards along coastal Oregon include the following. First, we need to make sure we build our buildings on a solid platform and not on sand because sand can flood really easy. Second, tsunamis can cause major impacts to our coastal communities because it the tsunami hazards along the Oregon coast are so significant which results in catastrophic damage. This topic is important to society and environment. This is because it can do a lot of damage to our infrastructure and buildings. It can also cause all of the land around our coastal towns to subside and fall away at very rapid rates. In conclusion, I would like to mention that this is the best topic in the whole wide world. This is because it is very interesting to learn about and is something I enjoy learning about because e my family is going to be living on the coast full time starting this summer.

Paul Rostad

ES473: Environmental Geology

Doctor Taylor

April 24, 2016

Seismic Preparedness in Western Oregon

Earthquakes are a powerful force of nature capable of causing millions upon millions of dollars' worth of damage, displacing populations, and carry the risk of endangerment of human life. They are deceptive in that the damage caused by coseismic events can sometimes outweigh the damage caused by the earthquake itself, which is why preparation is key towards the mitigation of its affects. Coseismic hazards are potential hazards that occur as a result of an earthquake, and they include [but aren't restricted to]: ground shaking, liquefaction, tsunamis, falls, and slides. These hazards are responsible for shaking the foundations of poorly-supported buildings, weakening and toppling un-reinforced masonry structures, the destruction of public road systems vital to post-event aid, and are even capable of damage thousands of miles away. The damage caused by earthquakes and coseismic hazards can never be truly avoided, but it is within our scope of ability to reduce the amount of damage and risk associated with them. By evaluating structures based on their construction, surveying the land, and promoting a partnership between planners and the public to establish safe routes and havens, the costs of enduring an earthquake and coseismic hazards can be minimized.

Nitrate levels in the lower Umatilla Basin exceed 10 to 20 mg/L in many areas. This level of nitrates in the groundwater is dangerous for infants. Activities that contribute to the high concentration of nitrates in the groundwater are agriculture, food processing, livestock, domestic sewage, and military activities. The 550-square-mile investigation is located in northern Morrow and Umatilla Counties between Willow Creek, Cold Springs Reservoir and the Columbia River. Hydrology of the area is mainly Columbia River Flood-Basalts (CRBs) Miocene in age. Individual flows range in thickness from 5 to over 100 feet, and total thickness of the series of flows may be as great as 10,000 ft. When the hiatus between flows was significantly long, soil developed or sediments were deposited on the surface of a flow. If these sediments were preserved by an overlying basalt flow, a sedimentary interbed may be preserved between flows forming a layer of impermeable material. The upper part of the CRBs is a good unconfined aquifer that has a good hydraulic conductivity with the overlaying alluvium aquifers. The purpose of the paper was to find the leading cause of the high nitrate concentration in the ground water and to create a plan in order to fix the problem, however, due to the slow travel time of nitrates in the groundwater system there is no quick fix to the contaminated groundwater.