HUXLEY
COLLEGE OF THE ENVIRONMENT

Internship Title

Student Name Max Wilbert

Internship Dates June - August 2010

Signature

Advisor Name Andrew Bunn

Student Signature **Date** 2-17-2011

INTERNSHIP REPORT

Huxley College of the Environment
Western Washington University
Bellingham, WA 98225

I. STUDENT INFORMATION

NAME: Max Wilbert	W#: 00747617
MAJOR: Environmental Advocacy and Communication	CONCENTRATION (WHERE APPLICABLE):
PERIOD OF INTERNSHIP: Summer-Fall 2010	
AVG. HRS. PER WEEK:	TOTAL HRS. WORKED: 250
LIST THE QUARTER, YEAR, AND NUMBER OF CREDITS THAT YOU HAVE REGISTERED FOR INTERNSHIP CREDIT: Fall 2010, 5 credits, ESCI 498b	

II. HOST INSTITUTION INFORMATION

INSTITUTION NAME: The Polaris Project	
INSTITUTION ADDRESS: www.ThePolarisProject.org	
INSTITUTION MISSION: The core of the Polaris Project is a field course / research experience studying arctic system science at the Northeast Science Station in Cherskiy, Siberia (north of the Arctic Circle on the Kolyma River). It is one of the most remote and beautiful places on the planet. During the Polaris Project field course, students and faculty work together to study the Arctic as a system. Instead of focusing on a single question in a single ecosystem type, we consider a range of questions across multiple components of the Arctic System including forests, tundra, lakes, rivers, estuaries, and the coastal Arctic Ocean. The unifying scientific theme is the transport and transformations of carbon and nutrients as they move with water from terrestrial uplands to the Arctic Ocean. We emphasize the linkages among the different ecosystems, and how processes occurring in one component influence the others.	
SUPERVISOR NAME: Chris Linder/Max Holmes	SUPERVISOR TITLE: Science Journalist/WHRC Senior Scientist
SUPERVISOR CONTACT INFORMATION: Chris@chrislinder.com / rmholmes@whrc.org	

III. DESCRIPTION OF DUTIES AND RESPONSIBILITIES

[Provide a detailed description of your duties and responsibilities, including any relevant background information like how you found the internship. Please give a brief background description about the agency/company: max. 1,500 words.]

The Polaris Project is an undergraduate research program that occurs in Cherskii, Siberia. More than a dozen undergraduate science students from universities around the US join a handful of professors, international students, Russian scientists, and various graduate students to conduct field work focusing around the issue of climate change in the Arctic. The program's goals include increasing the body of scientific knowledge, but also on developing the participants and sharing the story of field science (especially Arctic field research) with the general public.

I found this internship though Bill Dietrich, a professor of Journalism at WWU. Dietrich hosted Chris Linder when he spoke about science photojournalism and the Polaris Project last year, a presentation that I was present at. I then took Andy Bunn's climate change class at WWU, which is a prerequisite for the program. My application for the Polaris Project was accepted and I joined the team heading to northeastern Siberia, along with WWU Environmental Science student Kate Lewis.

My assignment was to assist Chris Linder, the expedition journalist, in his activities documenting the work being done on the Polaris Expedition, and the publicize and promote the Polaris Project and the ongoing climate science illustrating the threat of climate change. I worked primarily as a multimedia journalist, taking pictures and recording interviews in addition to writing blog updates and assisting the scientists with their work in communicating their science to the public. Chris and I would often be out photographing the surrounding area until 5am, working on capturing the settings of the research and the local phenomena. I worked closely with scientists in the lab and in the field. Photography in these conditions was challenging – in the lab, the cramped quarters, dim light, and sensitive instruments made working difficult. In the field, we battled swarms of mosquitoes, sucking quick-mud, freezing waters, ankle-breaking terrain, and ice to photograph science and climate change in progress across the landscape.

We traveled from the immediate area of the Northeast Science Station in Cherskii to the surrounding terrain, including Rodinka, a nearby mountain, and the bay where the Kolyma River meets the Arctic, to document the area and the work being conducted. On that journey, I had to deal with logistical problems after we were stranded for 24 hours by a storm. My memory cards were depleted and my batteries exhausted by the time we returned home, so I had to switch to shooting JPEGs and not reviewing my shots. This was just one of the challenges I faced on this trip. Others included lenses fogging up in temperature changes, certain people resisting being photographed, climbing in trees and across slippery ice wedges for certain photographs, and working with tired and cranky scientists late at night. I also had to work hard to balance my needs for along time, sleep,

and rest with my drive and need for more material. Science was being conducted at all hours of the day and night, and so by the end of the trip I was exhausted.

During the course of this trip I had to previsualize what shots might be important for the scientists – for example, one aerial shot I took at the beginning of the trip of a drained lake bed turned out to be very important. It turns out that lakes in the area are draining as the underlying permafrost thaws away. There were many conceptual challenges around photographing the science being conducted. Sam Dunn, for example, was conducting research on nitrogen gas escaping from soils, which is, as far as I know, impossible to photograph directly. Instead, I had to focus on the process of the research itself – collecting soil samples, painstakingly transferring them to sealed jar, pumping out the air, leaving them to collect gas, and then inserting a needle to sample that gas.

One thing that I focused on was audio collection. I had a bit of experience prior to the trip, but I learned a ton about audio over my time in Russia and since. Often, the science stories could not be told with pictures alone, and the voices of the scientists and of the places we saw told the story with so much more depth than printed words or pictures alone. Among the skills I learned was how to find an interview location, prepare and conduct an interview on a topic I may not fully understand, draw out a layman's story from sceintists used to working in technical jargon, and how to edit that audio effectively.

IV. OUTCOMES

[Provide a detailed description of the results of your internship work, including all relevant data in tables and figures; max. 750 words.]

I photographed and recorded audio of all the science being conducted, and am working to disseminate the story of what is happening there far and wide. Over the 4 week trip, I took over 22,000 photographs and collected more than 18 hours of audio. I have spoken about my experience in public settings already, including meetings, political events, and on a podcast interview. I shared a collection of the 300 best photos for use by Polaris participants in their work, and updated the trip blog with pictures and stories continually from our location in Siberia. I also wrote an 1500-word journalism story that was recently published in The Planet magazine, and which I hope to pitch to other magazines around the country. Pending funding for Polaris II from the National Science Foundation, I will soon begin work on a multimedia slideshow documenting the experience of students on the Polaris project. Chris Linder may assist me with this project if the funding comes through – if not I will be doing it alone.

I learned a great deal about photography, journalism, documenting science, working with scientists, and being part of a field team in remote regions of the world. The diversity of backgrounds represented on the project made for some interesting conversations, as each of us had different perspectives on the world. Working with this crowd was both a blessing and, at times, a challenge. Living in cramped quarters and seeing the same people, all day, every day, for a month straight is a test of intrapersonal skills and our ability to adapt to changing circumstances.

The most important skills I learned revolve around translating complex science and abstract ideas into concrete, relatable stories that can be understood by the general public. This process is a learning experience that I have been taking part in for several years as a communicator, journalism, and someone who is concerned about climate change and other environmental problems. Finding metaphors, similes, and popular myths that people can more readily relate to in complex, but often the scientists themselves have a great, unexplored talent for putting their own work into that more simple language. Facilitating that process is sometimes like pulling teeth, but it is important if we are to have any hope for ethical progress in the sciences and public policy.

V. ASSESSMENT

[Provide an evaluation of (a) the success of the project(s) on which you worked and/or the effectiveness of your host institution; (b) your contributions to the project(s) and/or fulfillment of the host institution's mission; and (c) the skills and experience you gained through this internship; max. 750 words.]

The goals that I set for myself, with the help of Chris Linder and Max Holmes, were:
1. To increase my photographic and journalistic skill set, particularly with regard to science journalism.
2. To provide photographs for the use of the Polaris PI's and students.
3. To disseminate the story of our journey, the climate science we conducted, and climate change in general.
4. To produce a multimedia piece with the help of Chris, illustrating the experience of students on the Polaris Project.

I will respond to each goal:

1. This goal was definitely reached. I learned quite a lot working with Chris Linder day after day. His curiosity and creativity really inspired me, and his technical knowledge helped me understand how science journalism works as a business and an art. My technical skill in photography and audio collection increased significantly, along with my professionalism in data management and interacting with the people I was photographing and working for. The struggles of this experience helped me learn a great deal, and the length of the trip allowed a lot of experimentation with different techniques and styles of photography, interviewing, data collection, etc.
2. This goal was reached. I provided a file of 300+ photos to the Polaris team, and have been providing high-resolution versions on request. These photos were used for several posters at the 2010 AGU conference in San Fransisco, and are available at any time for Polaris participants to use in their work.
3. This is an ongoing project. I have referenced my experience already in several public venues, including interviews on internet radio. I have also just published an article in The Planet, WWU's environmental magazine (which I spoke more about above). That story was sent to an uncle who teaches high-school science in Conneticut, who shared the story with his students. This is an ongoing project that will continue for years, as I continue my long term project of educating the public about climate change.

4. This portion is still in the works. I am waiting to see if Chris will be working beside me, or if I will be working alone. Either way I will be beginning this project in the next several months.

VII. APPENDICES

[Attach copies of relevant supporting documents. These might include a list of key contact, projects completed, reports written, your resume, etc. Please provide a letter, on letterhead, from your supervisor stating that you have completed the internship according to the organization's expectations and that you completed the required number of hours (30 hours x # of credits you took).]

THE PLANET

FALL 2010

SIBERIAN SUMMER

STORY **MAX WILBERT** | PHOTOS **MAX WILBERT**

The long Arctic twilight paints pink hues on the barge that houses the researchers of The Polaris Project, as one researcher finally arrives home after a long night in the lab.

SIBERIA— IT CONJURES IMAGES OF THE DEEPEST WINTERS, of Soviet gulags and featureless tundra that stretches to the horizon. It is a land frozen in time. If Siberia were its own country, it would be the second largest in the world. Cold is what defines this place. Soil that remains below freezing for many years, known as permafrost, underlies the vast majority of Siberia. This permafrost contains the remains of an ancient grassland - billions of tons of carbon, safely locked up in a freezer thousands of miles across. It's been called a "climate bomb" that is poised to go off. And as the climate warms, it is beginning to thaw.

That is why I am here, peering out the window of a small propeller plane, looking down on a strange landscape. Small lakes streak by beneath us, then a deep blue expanse - the Kolyma River. The airport, if it can be called that, sits on the far side of the river; we seem to be plunging into its depths. We touch down, and the plane shakes violently. The wheels screech and shoot tongues of dirt into the air.

I get ready for my first breaths of crisp, cool Arctic air. The flight attendant's voice chimes through the speaker, first Russian, then English. "On behalf of Air Yakutia, I want to welcome you to Cherskii." She opens the hatch, and hot, stagnant air creeps under my collar, along with the first of the mosquitoes.

The heat is sadly ironic. I'm here with a dozen climate scientists as part of The Polaris Project, a $1.6 million, three-year project funded by the National Science Foundation. Professor Andy Bunn, who teaches climate change at Huxley College, is a lead researcher and permits two students from Western Washington University to apply each year.

We are in the lower reaches of the Kolyma River, in far northeast Russia. I'm serving as the expedition journalist, working with Chris Linder, a professional science journalist, and serving as a representative of the Huxley College Environmental Journalism program.

SIBERA HAS BEEN CALLED A CLIMATE BOMB POISED TO GO OFF.

For the next three weeks of the Siberian summer, we will be studying the ecosystems and their relationship to climate change. The main lab sits beneath an enormous Soviet-era satellite dish. Our quarters are narrow bunks on a barge floating on the river - three to a room. We have porridge for breakfast, moose for lunch and fish soup for dinner. For the first week, the temperature hovers around 90 degrees.

The scientists are split into teams, each studying a different part of the landscape. Research is being conducted on everything from nitrogen in soils to insect populations in local lakes and streams. Travis Drake, a recent graduate


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(1) Trees slump as part of what locals call a "drunken forest." The trees lean as the permafrost underneath their roots thaws and the soil shifts. **(2)** Chris Linder peers over the edge of an eroding escarpment at Duvanni-Yar, on the Kolyma River. **(3)** Melissa Robbins, from the University of Reno, Nevada, caps bottles for an experiment on bacterial activity. **(4)** Polaris research includes measurements of permafrost depth, temperature, and composition. Here a researcher gathers a sample of the frozen, carbon-rich soil that underlies the region. **(5)** Valentin Spektor, a researcher at the Melnikov Permafrost Institute of the Russian Academy of Sciences in Yakutsk, Siberia, displays a piece of ice hacked out of an "ice wedge" in the soil. **(6)** Small lakes and tributaries crisscross the floodplain of the Kolyma River near the town of Cherskii. Some lakes are draining as the permafrost beneath them thaws, leaving empty lakebeds behind, as seen here. **(7)** "Orbita" is the Russian name for the main lab, where equipment runs analysis on samples gathered in the field underneath a Soviet-era satellite dish. **(8)** Sergei Zimov, the head scientist at the Northwest Science Station, and Polaris participant Lydia Russell-Roy use this 8-wheeled amphibious all-terrain vehicle to reach the more remote sites in the region. **(9)** A methane bubble silently bursts on the surface of Shuchi Lake, near the Northeast Science Station. During the short Arctic summer, the sun does not set at all, but traverses the horizon for hours on end. This photo was taken one minute before midnight.

from Carleton College, is looking at how gases dissolved in small streams are escaping directly to the atmosphere. Drake has spent two summers on the Polaris Project, and said his experience has been challenging.

"This place is truly scary to me," Drake said. "Seeing slumping trees and thawing permafrost is exciting scientifically, but nerve-wracking as a human."

Drake and the rest of the scientists agree – this landscape will play a vital role in the next hundred years of climate change.

"Warming in the Arctic is two to three times greater than the global average," says Dr. R. Max Holmes, senior scientist at Woods Hole Research Center in Massachusetts and leader of The Polaris Project.

The effects of this rapid warming are immediately visible in the landscape. Permafrost in the area is thawing more than ever before. Erosion is accelerating. Some lakes are disappearing, draining into the soil as the underlying permafrost thaws. Others are migrating, as the shorelines thaw and the prevailing winds cause one side of the lake to slump and erode. Some roads have dropped more than 10 feet as the land beneath them subsides. "Drunken forests" are visible everywhere, as trees lose their grip on the thawing, shifting soil and keel over.

The vegetation and soils that erode into the lakes are decomposed by bacteria that release methane, a potent greenhouse gas. Shuchi Lake, near the station, is where much of the research on this phenomenon has been conducted. As I trudge through the mud, wearing tall boots and struggling to hold my balance, owls swoop overhead and bubbles of methane erupt around my feet.

WARMING IN THE ARCTIC IS TWO TO THREE TIMES GREATER THAN THE GLOBAL AVERAGE.

Something even more frightening is happening on the coast. Jorien Vonk, a Polaris participant from the University of Stockholm, said rapidly thawing soil along the Arctic coast is losing its strength. As the coastal erosion increases, methane trapped under the seabed is venting into the atmosphere and carbon locked in the soil begins to reach the atmosphere. The National Science Foundation has warned that even if a small fraction of the methane trapped under the sea is released, we risk "abrupt climate warming."

This is an example of what scientists call a positive feedback loop: as greenhouse gases accumulate, the planet warms and accelerates permafrost thaw. This triggers the release of more greenhouse gases, which amplify warming and strengthens the loop.

Another feedback loop is affecting the oceans. As carbon dioxide builds up in the atmosphere, it dissolves into the oceans, acidifying them and contributing to a 40 percent decline in phytoplankton since 1950, according to recent research published in the journal Nature. These tiny creatures are the basis of ocean ecosystems and take carbon dioxide out of the atmosphere. With less phytoplankton more carbon stays in the atmosphere and oceans.

Climate is driven by heat, so as the planet warms, weather patterns are shifting. These shifting patterns result in what meteorologists refer to as climate destabilization: stronger and more frequent storms, droughts, floods, and forest fires. This contributes to glaciers melting around the world and rising sea levels.

These stresses are taking their toll on ecosystems around the world that are already affected by mining, logging, overfishing, agriculture, industry and overpopulation.

Even remote Siberia is not immune to these problems. Flying over the endless landscape, vast clear-cuts of the boreal forest assailed my eyes. Railways and pipelines cut across long empty stretches of land, and bulldozers scraped and burrowed in vast open-pit mines. All over the world, ecosystems are bearing the brunt of industry, or simply collapsing.

Greenhouse gas emissions are tracking near the high end of the scenarios used by climate modelers. James Hansen, the NASA scientist who helped create the first climate models, and who first brought climate change to the attention of Congress in the 1980s, has said he believes that we need drastic cuts in emissions to protect out planet and all of its inhabitants.

"This is analogous to the issue of slavery faced by Abraham Lincoln or the issue of Nazism faced by Winston Churchill," Hansen wrote in his recent book, *Storms of My Grandchildren*.

"On those kind of issues you cannot compromise. You can't say let's reduce slavery, let's find a compromise and reduce it 50 percent or reduce it 40 percent," he wrote.

Hansen has joined many who are frustrated with the lack of government leadership in calling for direct action to halt the flow of fossil fuels. He was arrested in 2009 for attempting to shut down a mountaintop-removal coal mine in West Virginia.

His words ring in my ears as we begin the long journey home. We spot dozens of wildfires from the plane. In Moscow, thick smoke clogs our lungs and makes us light-headed; simply breathing outside for one hour is the equivalent of smoking two packs of cigarettes, according to the city health department.

A few days later, Moscow surpasses 100°F for the first time in recorded history; then again... and again, as part of a global trend of rising temperatures. Obviously, this is not just weather fluctuations anymore.

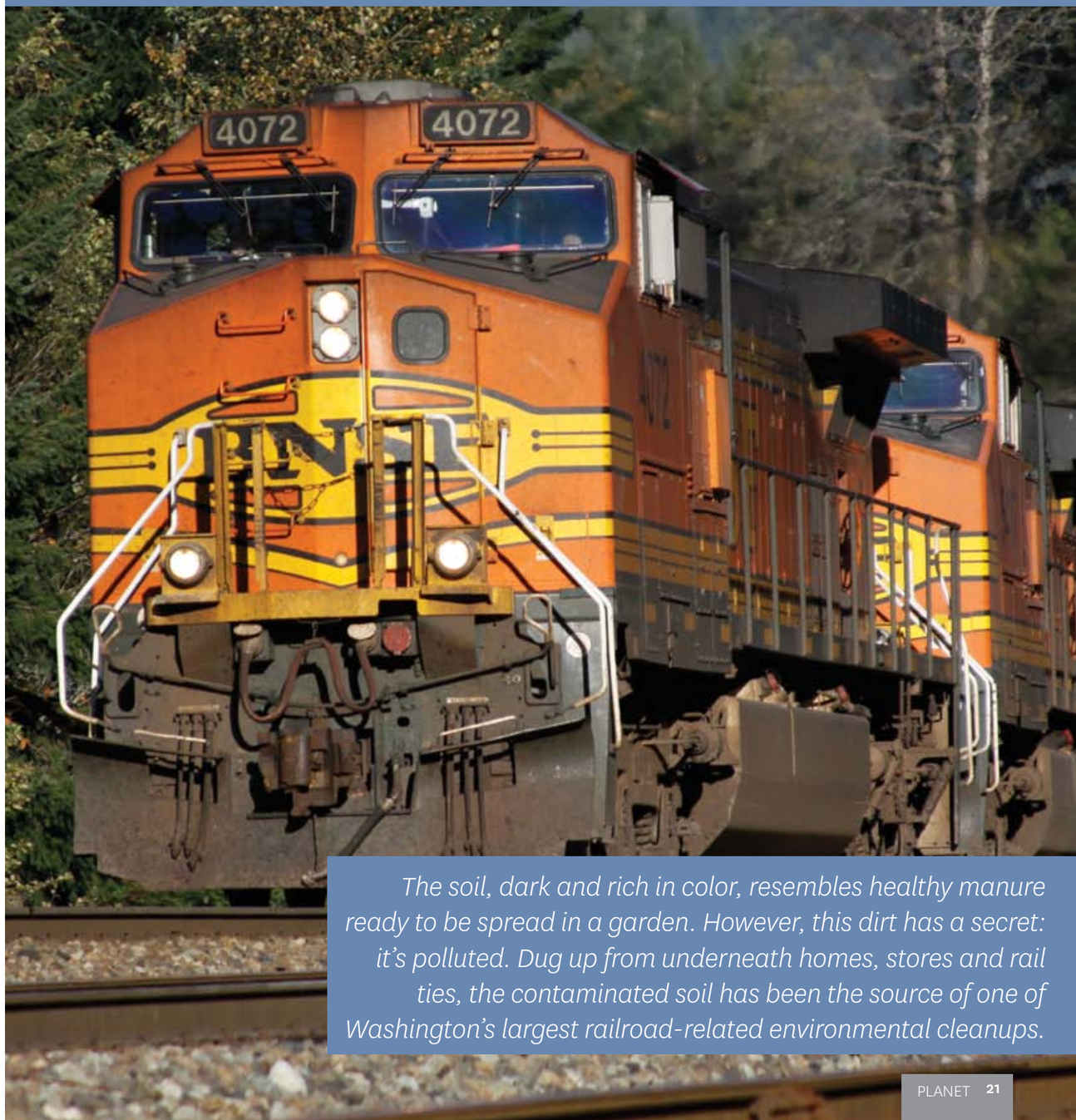
Russia was one of 18 countries to set all-time high temperatures in 2010.

MAX WILBERT is a senior majoring in Environmental Advocacy and Communication. He works with the local environmental organization Fertile Ground, and spends his free time cooking and enjoying the natural world.

STORY **JESSICA PETERSON**
PHOTOS **REIKO ENDO**

RAILROAD REMEDIES

A westbound BNSF train comes into town in Skykomish, Wash.



The soil, dark and rich in color, resembles healthy manure ready to be spread in a garden. However, this dirt has a secret: it's polluted. Dug up from underneath homes, stores and rail ties, the contaminated soil has been the source of one of Washington's largest railroad-related environmental cleanups.

Here we face a critical branch point in history. What we do with our world right now will propagate down through the centuries and powerfully affect the destiny of our descendents.

-Carl Sagan