B. Your Aspirations

Question #2. What are your professional aspirations? Indicate in which area(s) of the environment, Native American health care, or tribal public policy you are considering making your career and specify how your academic program and your overall educational plans will assist you in achieving this goal.

Though industry has historically been responsible for much of the environmental degradation in the United States, I strongly believe that the private sector will be an important catalyst in the revitalization of our environment. Notwithstanding the short-term, profit-driven negligence of a few corporations, the majority of American companies are coming to realize that it is simply better business to conduct themselves in an environmentally sound manner rather than face costly litigation and inflated remediation costs. I hope to be part of the emerging generation of ecologically conscious men and women who will lead the development of a new business model that regards proper stewardship of the environment as standard practice. Whether I confront environmental problems as an engineer, businessman, or lawyer, the focus of my career will be to ameliorate past abuses while proactively managing future pollution sources. I feel that by working within industry to promote positive change, I can achieve tangible progress in improving the way our business community interacts with the environment.

My current studies in Environmental Engineering (EnvE) and my planned minor in Global Business Strategies (GBS) will be valuable two-fold preparation for such a role in the growing environmental profession. My EnvE degree will train me to address the changing environmental needs of modern industry by providing a unique engineering education that integrates traditional process design with a strong background in the environmental sciences. Through the completion of my coursework in contaminant hydrology, microbiology, fuel science, mineral processing, hydrogeology, and engineering design, I will be qualified both to help reclaim contaminated environments and minimize the impact of future air, soil, and water pollution. The GBS minor complements my technical education by providing the basic finance, management, and entrepreneurial skills necessary to succeed in the business world. This practical balance of my undergraduate education creates multiple options after my graduation. Though I plan to work for several years to achieve my Professional Engineer (PE) credential before returning to complete an advanced degree, I will be well-prepared to reenter higher education to pursue a master’s in environmental engineering, a company-financed MBA, or an environmental law degree. Any of these educational paths will help me accomplish my ultimate goal: to pursue a lifelong career protecting and restoring the natural environment through a pragmatic, market-oriented approach.
D. Your Programs and Activities

*Question* #3. Describe non-course-related research experience, if applicable. *Indicate which areas of the environment, tribal public policy or health care your research affects, and the ways in which the experience will assist you in achieving your goals as stated in section B, #2.*

This past semester I began independent research into the in-situ bioremediation of hexavalent chromium, a major industrial pollutant in the United States. On my own initiative and working outside of my academic department, I contacted a number of professors over the summer in search of interesting undergraduate research opportunities to supplement my coursework. After receiving several offers, I chose to work with Dr. Janet Teacher and Dr. John Teacher of the Department of Civil and Environmental Engineering, since their expertise in bioremediation complements my major’s emphasis on physical remediation techniques. I developed a simple 36-hour experiment examining the biological reduction of carcinogenic hexavalent chromium to innocuous trivalent chromium using *Shewanella putrefaciens* CN32 bacterium. This initial “learning experiment” will likely be the foundation of more original work for my senior honors thesis. I also enrolled in a graduate literature review course that discussed the biological reduction of metals, a topic that greatly aided my understanding of the underlying science supporting the burgeoning bioremediation field.

*Question* #4. Describe a leadership experience in which you made a difference on campus or in your community.

My two most recent leadership activities did not involve my campus community, but could make a difference in a number of developing communities. I am an active member of Engineers Working for a Sustainable World (EWSW). Though unable to participate directly in any of the organization’s development projects in El Salvador, Jamaica, or Nigeria because of coursework and time commitments, I have contributed to the organization in other ways, namely by completing two non-technical writing projects over the past year as fundraising and recruiting tools. Last spring, I worked closely with the club’s faculty advisor drafting a grant proposal for multiple service projects in the rural village of Nueva Esperanza, El Salvador. This document will be given to a number of development foundations to solicit the necessary financing for continued bridge construction and house retrofitting. More recently, I led a team of EWSW volunteers in creating a brochure for the organization. I arranged meetings, delegated responsibilities, and edited the final product. The brochure will be professionally published and used to promote EWSW throughout the university. By advertising the organization, I am helping to attract more dedicated people to EWSW. In the future, I hope to lead a technical project of my own, possibly the design and implementation of an arsenic removal system for the drinking water of an Argentine village.
Question #5. Describe a specific activity or experience that has been important in clarifying or strengthening your commitment to the environment, Native American health care, or tribal public policy.

During my first semester at Mythic University, I was able to attend a field trip to a local Superfund site with my advisor and about a dozen of my peers through the Society of Environmental Engineers (SEE). The field trip was a valuable learning experience that reaffirmed my career goals by allowing me to see firsthand the interesting, worthwhile work that environmental engineers do involving site characterization and remediation.

The Mythic Organics facility that we visited was both a registered Superfund site and a working chemical processing plant. In the early 1960s, herbicide precursors had been dumped at the property in open, unlined pits. Testing in later years showed that the hazardous chemicals were migrating to nearby groundwater sources and damaging the aquatic ecosystems. With the enactment of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980, the company became legally responsible for the mitigation of its poor pre-regulatory disposal practices and was required to implement an appropriate reclamation strategy. Our SEE group was given a full tour of the facility and learned about the specific remediation techniques the company was utilizing to remove the chemicals from the environment. Recognizing that the herbicide precursors are volatile organic compounds (VOCs), the Mythic Organics engineers determined that a soil vapor extraction system was the best approach. By mechanically pumping ambient air into the contaminated soil, the VOCs are volatilized into gases and then extracted by pumps and passed through a series of special filters that remove the compounds from the air. With the proper regulatory nudge, Mythic Organics has assumed responsibility for its past actions and is actively addressing them.

I was impressed by the simple efficiency of the remediation strategy and how it represented the real-world integration of a broad spectrum of knowledge including basic organic chemistry and engineering design. Observing a successful reclamation plan for the first time, I realized that our Superfund process was working and that my undergraduate education was preparing me for a meaningful career. I was excited to be in my engineering program and look forward to completing my degree because of the engaging, constructive work I can do with the skills I acquire.

Question #6. Describe briefly any public service or community activities associated with your interests in the environment, Native American health care, or tribal public policy in which you regularly participate. Explain the duration, degree, and significance of your involvement.

My interest in the environment has always been practical rather than romantic, focused on improving the way people interact with their world over championing natural aesthetics. This guiding emphasis has especially influenced how I view the complex environmental dilemmas of the developing world and its constant struggle in an increasingly competitive global society. I sympathize with the desire to achieve a more comfortable modern lifestyle by exploiting one’s abundant natural resources, but
recognize that the Western-inspired path many underdeveloped countries are currently following could be self-destructive. The uncontrolled, haphazard industrialization of 19th century Europe and North America cannot be repeated in Asia, South America, and Africa or the environmental consequences and resulting human suffering will be grave. The international community must assist the developing world in establishing balanced, equitable growth that does not sacrifice environmental quality and social welfare in the name of economic expediency. Sustainable development programs that promote self-reliance, respect local customs, utilize appropriate technology, and re-establish traditional cultural stewardship are the only way that these countries can improve the daily lives of their average citizens without misusing their resources.

This firm commitment to sustainable development led me to join Engineers Working for a Sustainable World. Over the past three years, I have attended monthly meetings, contributed my time to several fundraising activities, and have worked closely with our faculty advisor on two writing projects. In the future, I hope to lead a technical project that will allow me to travel to and directly assist a developing community.

Question# 7. What additional information (not already addressed in the application) do you wish to share with the Udall Scholarship review committee?

Environmental advocacy demands the extensive knowledge and communication of complex, interrelated subject matter. It is not enough to just argue that our remaining redwood forests should be preserved for the sake of their aesthetics; an activist must be able to explain in convincing detail to sometimes hostile audiences just how ecologically damaging their loss would be. It is not enough to allege that pollution disproportionately affects the poor; hard evidence must be presented that integrates human geography, medical studies, and environmental sampling. To advance the evolving environmental agenda, the next generation of activists must overcome the stridency of vocal critics and reach out to the public with clarity and well-reasoned arguments. My environmental engineering education will provide the essential framework for a productive career of environmental advocacy from within the business community, a significant component of American culture traditionally resistant to regulation. By understanding the technical side of environmental issues, I will be well-prepared to play my part in promoting the transformation of industry into a responsible, accountable steward of the environment.
E. Essay

In 800 words or less, discuss a significant public speech, legislative act, or public policy statement by Congressman Udall and its impact on your field of study, interests, and career goals.

Congressman Udall and the Foundations of Modern Environmentalism

The 1970s represent a historic period of evolution in the American environmental movement, a critical time of transition that fundamentally changed the way concerned citizens and policymakers understand and confront pervasive environmental problems. It was a decade that celebrated the rich heritage of Muir and Thoreau while recognizing that traditional preservation alone could not adequately address the complex, interrelated social, economic, and environmental dilemmas of a growing nation and a globalizing world. It was a defining era of maturation when the environmental movement progressed beyond romantic idealism to practical action. Among the leaders of this dramatic refashioning was Congressman Morris K. Udall, a remarkable civil servant whose pragmatic vision embodies the philosophical foundation of modern environmentalism.

While reading a number of Congressman Udall’s public speeches, I was immediately captivated by the basic agreement of his ideas and principles with my developing views on the same issues. Though nearly three decades have passed, I was particularly impressed by a speech he made to the Izaak Walton League of America in July of 1975 entitled “Environment vs. Economy: Exploding a Phony Issue.” His arguments are well-reasoned, well-written, and well-defended, and most significantly, they portend the emerging sentiments of an entire generation of likeminded environmental advocates, myself included. Focusing on his three Es—energy, environment, and economics—Congressman Udall succinctly defined the central themes of my educational program and eloquently articulated many of my personal beliefs about the essential interconnectedness of our national responsibilities to the environment and each other.

One of the most admirable qualities of Congressman Udall’s speech is his progressive, yet balanced position on a number of contentious issues. It would have been very easy for him to slip into hyperbole and rail across-the-board against the evils of industrialization as certain “barefoot elitist” environmentalists of his time did. But he resisted the rhetorical temptation and instead concentrated on presenting useful criticisms in accordance with the pressing realities of the day. Nowhere is this measured commentary more effective than in his careful critique of our country’s flawed energy policy. Congressman Udall’s reservations about nuclear power and the expansion of domestic oil and gas drilling, his criticism of inefficient automobiles and our unfortunate tradition of profligate resource consumption, his belief that dramatic improvements could and should be made to the mining industry, and his insistence on judicious conservation are all concepts that I learn about daily in my coursework in the Department of Environmental
Engineering at Mythic University. It is a testament to Congressman Udall’s foresight and understanding of the issues that these same ideas are integral to my curriculum today.

A second component of Congressman Udall’s speech that highlights his contribution to the philosophical evolution of the environmental movement is the historic connection he makes between environmental quality and social welfare. While previous generations of naturalists had disregarded the human costs of haphazard industrialization, Congressman Udall was one of the first politicians to recognize the underlying link between poverty and environmental degradation. Reasoning that overcrowded, dilapidated urban slums are as much a failure of environmental management as denuded landscapes, Congressman Udall was an early voice for the environmental concerns of minorities and other underrepresented groups. With sensitivity and poise, he helped bring this worthy cause into the mainstream movement of the 1970s. The fact that the concept of environmental justice is a guiding tenet of progressive politics today is further tribute to his enduring legacy.

The pronounced economic focus of Congressman Udall’s speech is indicative of another innovation in environmentalism: While regressive-minded businessmen and reactionary politicians had attacked the environmental movement as inherently detrimental to the economy, Congressman Udall was one of the first to counter this overly simplistic assertion. Arguing that proper stewardship over the long term would strengthen the economy rather than detract from it by precluding future reclamation costs and health-related damages, he showed that environmental regulation is not some radical erosion of free enterprise that will take jobs away from people. It is a catalyst for better business practices that will ultimately improve the American economy. This perspective that Congressman Udall helped develop has been critical in shaping the way environmentalists combat the scare tactics of antagonistic elements in industry and government.

“Don’t let anyone tell you that being for the environment means you have to be against progress,” Congressman Udall boldly declared midway through his public address. This single, poignant statement captures the underlying theme of my education and the foundation of my pragmatic ideals—i.e., the careful advancement of an environmental agenda will bolster, not impede, our country’s development. Congressman Udall’s support of sensible resource conservation, his concern with environmental justice, his defense of active government regulation, and his demand for industry accountability are all central components of modern environmentalism. The current generation of environmentalists owes the philosophical basis of our education, our beliefs, and our career goals to the trailblazing work of people like Congressman Udall. I truly believe that his lifetime of civic service is a model for all of us to follow.
B. Your Aspirations

Question# 2. What are your professional aspirations? Indicate in which area(s) of the environment, Native American health care, or tribal public policy you are considering making your career and specify how your academic program and your overall educational plans will assist you in achieving this goal.

When working toward the management of invasive species, the protection of natural resources, the conservation of endangered species, and the improvement of environmental health, important decisions must be made, often with limited knowledge. As T.J. Case (2000) commented in An Illustrated Guide to Theoretical Ecology, “…an understanding of these problems and how precisely to achieve our goals is inevitably a quantitative and inferential subject.” Finding solutions to these problems in a purely experimental fashion is often financially or physically impossible. However, applying mathematical modeling to problems of biological concern can provide managers with solutions to real problems, especially in conjunction with experimental work.

In my current research at Mythic University, I am using a mathematical model to consider optimal management and monitoring strategies for a particular invasive species, the North American gypsy moth (Lymantria dispar), and I am learning firsthand how to create and use mathematical models to answer ecological questions. Ultimately I plan to expand upon the gypsy moth system and apply the model to other invasive species. Species-specific modifications will have to be made, but a general model will help to develop a framework for applied problems of invasive species management.

As an undergraduate in the Mythic University Honors College, I have the unique opportunity to stay at Mythic University for an additional year in order to complete a graduate program of study through the Integrated Undergraduate/Graduate Program. Continuing at Mythic University for an M.S. in Ecology, in addition to receiving my B.S. in Mathematics, will enable me to bring my ecological and biological understanding up to the level of my mathematical understanding, giving me an equally strong background in both mathematics and ecology. After the completion of my work at Mythic University, I plan to pursue a Ph.D. in Ecology and conduct research in the area of invasion biology and natural resource conservation, using both mathematical models and field experimentation. Beyond my educational goals I plan to teach and conduct research in the area of quantitative ecology at the university level. I will continue to use my mathematical and ecological knowledge to look at applied problems. My work as a quantitative ecologist will be important in finding solutions, especially when large-scale experimental work is too costly or difficult to conduct.
D. Your Programs and Activities

Question# 3. Describe non-course-related research experience, if applicable. Indicate which areas of the environment, tribal public policy or health care your research affects, and the ways in which the experience will assist you in achieving your goals as stated in section B, #2.

Conducting independent graduate-level research on the use of mathematical modeling to answer questions of the management of a particular invasive species, the gypsy moth, has strengthened both my ecological and mathematical backgrounds. The gypsy moth is a widespread forest pest of great economic concern to the United States. In order to better understand the invasion of this pest and obtain life history data, I am working with Dr. Andrew Liebhold of the United States Department of Agriculture (USDA) Northeast Forest Research Station. Working with Dr. Liebhold allows me to have a direct application of research to policy and management decisions, while my work at Mythic University with Dr. Janet Teacher allows me to gain experience in ecological research and modeling applications. The research I am doing, therefore, not only involves pure mathematical modeling and biological experimentation in a laboratory setting, but also incorporates the practical aspects of applying research to management decisions.

Question# 4. Describe a leadership experience in which you made a difference on campus or in your community.

In March of 20xx, Mythic University will host the Northeast Ecology and Evolution Conference (NEEC), an annual event for post-docs, graduate students, and advanced undergraduate students. The 20xx conference will include two days of talks, a poster session, and evening receptions and lectures. I am not only presenting a poster for NEEC, but also, since the conference is entirely student-run, I have taken on membership in multiple committees and assisted in the overall development of the upcoming conference as a part of the Ecology Graduate Student Organization. Working on the events for the first night of the conference through the Registration and Opening Events Committee, I secured guest speakers and panelists to speak about the future of ecology and evolution and the different career opportunities for up-and-coming ecologists and biologists. Additionally, I am working with the Facilities and Logistics Committee to reserve room space for speaker sessions and recruit volunteers to monitor and run the six different sessions throughout the weekend. Finally, I have helped in the promotion of the event by sharing information with other undergraduate students across the university who are involved in the sciences.

Not only participating in, but working toward the overall development of NEEC has given me leadership and teamwork experience while also affording me the opportunity to meet with graduate students and professionals in my field, helping to build a network for my future work as an ecologist.

Question #5. Describe a specific activity or experience that has been important in clarifying or strengthening your commitment to the environment, Native American health care, or tribal public policy.
Environmental Justice in South Africa, Mythic University, Jan. 20xx-July 20xx
This spring and summer I am taking a course entitled “Environmental Justice in South Africa.” The course culminates in a three-week trip to South Africa devoted to researching and implementing projects in South Africa that seek to improve environmental and living conditions in a post-apartheid nation. Through coursework and communications with students and professors in Cape Town, South Africa, I am learning about the environmental outcomes of war and land division, while considering the societal and economic repercussions. The course allows me to not only conduct scientific research but also to make recommendations and assist with the implementation of environmental management decisions. Even thus far, my limited understanding of environmental justice in South Africa has given me a more global perspective on environmental issues and has strengthened my commitment to the environment.

Florida Keys Sailing, Hurricane Island Outward Bound School, March 20xx
Sailing on an open sprit-rigged ketch through the pristine environment of the Florida Keys solidified my desire to commit to and preserve the environment. In an ordinary week, five days and four nights seem trivial, but when spent living, learning, and playing on an open sailing ship in the Gulf of Mexico, five days turned into 120 life-changing hours. The passion and fascination that I developed from working in outdoor environmental education and summer camping turned into a desire to create change and commit to working for the environment. While I lived in rather close quarters with my 11 other fellow students and instructors on the boat, we were able to discuss important issues of environmental concern while witnessing firsthand the problems that we were discussing, including water pollution from commercial and recreational traffic and coral reef damage. Even the back country of the Florida Keys is touched by human influences and it was made evident to me that the environment needs to be a higher priority in the United States and internationally. Living simply, without setting foot on land or access to any of the typical comforts—that suddenly seemed like luxuries—gave me a deeper appreciation and respect for the environment along with a desire to create change.

Question# 6. Describe briefly any public service or community activities associated with your interests in the environment, Native American health care, or tribal public policy in which you regularly participate. Explain the duration, degree, and significance of your involvement.
Science and Mathematics Tutoring at Mythic University: Through the mathematics department I tutored a group of first- and second-year undergraduate students in the bottom 10% of their calculus classes. Through an NCAA grant I also tutored student athletes in introductory mathematics courses. The students that I taught were all students studying science—mainly biology majors—who needed extra assistance to get through their mathematics requirements. Tutoring these students helped me play a part in reducing attrition from the sciences by these students.

Educational Programming at the National Aviary in Pittsburgh: I spent 5-10 hours a week during high school volunteering my time as an intern and educational programmer. Throughout the internship I handled birds, gave tours of the Aviary, and facilitated educational outreach programs for local schools in addition to the visitors at the Aviary.

Environmental Education in the Classroom: Throughout my senior year of high school, I wrote lesson plans and was invited to be a guest teacher for first grade classrooms in one of the local elementary schools. One of the lessons I designed taught the first graders about the different layers of the rainforest, and using the Dr. Seuss book, *The Lorax*, conveyed the importance of preserving natural resources. At the conclusion of the school year, I trained ten high school freshmen to teach a group lesson on birds, and they ran several small workshops with the first graders.

Environmental Education in the Out-of-Doors: Summer camping—although a paid job—is certainly all-consuming. I spent six weeks leading young children as a cabin counselor and sailing director for a camp in the Adirondack Mountains. Being able to share my knowledge of ecology and impart a “Leave No Trace” style of life on young children in such a pristine wilderness setting is a small but important step in the fight for the preservation of and commitment to the environment.

Question# 7. What additional information (not already addressed in the application) do you wish to share with the Udall Scholarship review committee?

I was raised by two strong women—my mother and my grandmother. Three generations of women living under one roof provided me with a unique experience while growing up. My mother was the first woman in my family to pursue higher education and continued her pursuit even after having a child. As I was growing up I watched her finish her nursing degree at Oakland University and begin a career in Neonatal Nursing. My interest in the sciences and the environment most definitely stemmed initially from my mother’s interest and passion for the subject. While my mother was attending classes and studying, my grandmother was my primary caregiver and she too encouraged my exploration and growth. Throughout my life, my mother and grandmother have continued to be my source of inspiration and encouragement.
Sample Udall Scholarship Essay—Student #2

E. Essay
In 800 words or less, discuss a significant public speech, legislative act, or public policy statement by Congressman Udall and its impact on your field of study, interests, and career goals.

Benjamin Franklin aptly stated, “When the well is dry, we know the worth of water.” Morris K. Udall spent a significant part of his early career fighting for the passage of The Central Arizona Project (CAP) legislation, aimed at diverting water from the Colorado River Basin to the deserts of Arizona. The CAP included an aqueduct from the Colorado River to Phoenix and elsewhere in Arizona, in addition to plans to augment the river to prevent predicted water shortages. Although Udall steadfastly defended the CAP, he later regretted the project and the environmental and societal damage it caused.

Since 1910, Arizona had recognized its need for more water, yet at the time of the CAP it was nearly 1968, and Udall picked up his state’s long struggle. He knew that Arizona needed water, and in the interest of his constituents, he saw the CAP as the solution. In his 1967 speech, “Countdown on the Colorado,” given at the Town Hall in Los Angeles, CA, Udall spoke to many California residents who were against the CAP because it diverted water from their state. He likened the fight for water to a Judgment Day not only for Arizona, but for the other states of the Colorado River Basin, including California.

Given the history of Arizona and its struggle to gain access to new water sources, Udall put all of his energy behind the CAP and the construction of dams in the Colorado River Basin. Udall and other members of Congress noticed that the legislation, as it progressed through Congress, contributed to the unification of environmentalists, resulting in one of the largest letter writing campaigns in history (Carson and Johnson 2001). However, once the CAP legislation made it through Congress and was passed, it was delayed multiple times due to funding and environmental controversies. Amidst these difficulties, Udall persisted and the project was completed in 1993. However, water users were left to pay off federal loans in the amount of $4.4 billion. Udall soon realized that water from the CAP was serving urban centers instead of the outlying farming areas where it was needed most. Doubting the worth of the project, Udall said:

By the time we finally got it passed, the environmental movement had arrived. Now what I thought would be the centerpiece of my career looks very dubious—to me and a lot of other people (Carson and Johnson 2001).

Looking back on his dedication to the CAP, Udall did what he thought was best for his constituents, but was also able to reflect intelligently on the final outcome of the project.
Like Udall, policy makers and managers are faced with situations in which decisions must be made in the face of uncertainty. My work in mathematical modeling is aimed at helping to improve our ability to make decisions when limited by uncertainty, time, and money. Specifically, I will be working this summer to examine the Lesotho Highlands Water Project (LHWP) and the issue of water distribution in South Africa, posing questions fundamentally similar to those faced by Udall in Arizona. The LHWP began in 1986 with the signing of the Lesotho Highlands Water Project Treaty and was meant to divert rainwater to urban areas of South Africa through a series of dams. So far, the LHWP has cost $8 billion, and is described as a “costly, corrupt, poorly designed, badly implemented, economically damaging, ecologically disastrous, and distributionally regressive mega-project” (Bond 2002).

With the understanding that there will nearly always be some level of uncertainty in decision making, I plan to examine management options using mathematical modeling and field work during my trip to South Africa to weigh viable options to the problem of water distribution. Considerations must be made not only from an environmental standpoint, but also from a societal point-of-view, as Udall very-well knew. As was the case for Arizona farming areas, water is still widely unavailable to the poor, urban households of South Africa because of increasing costs and excessive ‘luxury’ consumption by much of the middle- and upper-class households (Bond 2002).

The problem of water limitation in Arizona needed to be solved, and Udall worked for the most viable option available—the CAP. Eventually, Udall recognized that the CAP was not effective and worked toward repairing environmental and societal damages caused by the project. In South Africa, the problem is again water distribution and the implemented solution has proven, to an extent, unsuccessful. My goal, as an ecologist and mathematician, is to investigate solutions to the question of water distribution in South Africa and to apply what I learn to other questions of environmental management.

References: