GREENovation

Spring 2012

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Cover Photo:

Local students learning about macroinvertebrates at Occoquan Wildlife Refuge through the GMU Potomac Environmental Research & Education Center’s (PEREC) Meaningful Watershed Educational Experience Program

by Samantha Oester
March 2012
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We Need to TALK.......  

By Dr. Chris Parsons,  
GREENovation Editor  

Four words that every partner or spouse dreads and four words most scientists dread too. In a previous editorial (Greenovation Spring 2011) I mentioned how environmental practitioners are recognizing that communicating environmental science to various sectors of the public is becoming more and more important. You just have to look at how the human influence on climate change is portrayed in the media to realize what a poor job environmental scientists have done in communicating environmental science.

For example the media regularly portrays a balanced debate among scientists on whether or not climate change is being caused – or at least exacerbated – by humans or is due entirely to natural events (Boykoff & Boykoff 2004, Antilla 2005). However, 97-98% of practicing climate change scientists agree that present-day climate change is primarily anthropogenic (William et al 2010). The equality with which the media treats both sides of a very unequal debate translates into a US public where less than half believe that humans are influencing climate change. A Gallup poll found that 34% of the public believe climate change is human caused; 47% believe it is natural; 14% said it was both (Ray & Pugliese 2011). To translate the inequality of scientific opinion into something that perhaps may be more accessible to the public: Imagine seeing an article on a religious debate in the London Times – on one side would be the Christians, Jews, Hindus and Muslims all agreeing on a religious tenet, whilst on the other side, being given equal weight, would be “Jedi” dissenters. (In the 2001 UK census, approximately 1% of the general public who declared a religion said they were “Jedi”; in the New Zealand census that year, the percentage of declared “Jedi” was 2.5%; see http://en.wikipedia.org/wiki/Jedi_census_phenomenon.) Even on the GMU campus, the level of understanding of environmental issues can be low; for example, less than 5% of GMU students in one survey could correctly identify the most endangered whale species from a list they were given (Parsons et al 2010).

So how do we communicate better? Many scientists who publish a scientific paper believe their job is done. The information is in the public domain, and therefore it will be somehow disseminated to the public. I’m a co-author on a 2009 paper (Sutherland et al 2009) that apparently was the most cited in the top journal of the conservation field, but how many citations earned it that accolade? Just 82 in over four years. So how many citations do other papers get? With the ease of internet searches to find paper references, even a citation is not a guarantee that a paper has actually been read. I’ve certainly seen citations of my own papers where it was clear the author had not actually read the original paper. And as for theses… the average readership for a PhD thesis beside yourself is your committee plus two (and one of these is usually a long-suffering spouse). So unless you get your thesis published, all of your hard work really goes for naught.

Getting your work published in a peer-reviewed journal establishes it as a high-quality study, accepted by the academic community, and it is an essential step. But to have any influence, you need to go beyond that. At the very least, produce a press release and send it to GMU’s media relations staff -- our ESP contact is Tara Laskowski at tlaskows@gmu.edu. 

When doing a press release make sure that:

- It has a snappy title – journalists review hundreds of press releases every day and you need to grab their attention.
- Describe quickly what the issue is in a clear and concise way, avoiding jargon. Remember to keep it simple, but simple doesn’t mean “dumbed down.”
- Explain why the public should care – what does this issue mean to them? Are there any public benefits?
If it is an environmental problem you’re describing, what might the solutions be?
Include a couple of quotes from yourself about the work and try to make these snappy sound bites – perhaps personal anecdotes, or quotes using descriptive metaphors.
Provide your contact details and those of expert colleagues who know your work and who could comment.

Finally make sure you are available when it is released to speak to reporters. If they try to contact you and you’re not around, they will likely give up and move onto the next news item.

Social media such as Twitter and Facebook are increasingly being used to disseminate scientific information. Personally, I regularly post environmental articles I find interesting on Facebook. Blogs are also a useful medium through which to disseminate your research or ideas. The proportion of blogs based on science and conservation issues are ten times that of the proportion of such articles in newspapers. If you do want to try writing blogs, then here are some tips:

- Give it an original voice – make it “your own.”
- Think carefully about who your audience is – scientists, policy wonks or a more general audience.
- Update it regularly; then people will come back.
- Share the location with people; there’s no point writing a blog if no one can find it and no one reads it.

One of my favorite blogs is Southern Fried Science, which is written by a bunch of imaginative and passionate marine science graduates (http://www.southernfriedscience.com/). Try it... could you do that? Trust me, they have far more readers than most scientific journals.

In a bid to try to promote better and more diverse communication skills in ESP students, we ran a seminar this semester on “communicating environmental issues.” Students had a variety of in-class and homework projects, including writing tweets, press releases, op-eds on their environmental research and taking part in mock TV/press interviews. Within the first few weeks a couple of students actually got their class op-eds published, and other students were thinking about developing blogs.

So I asked the class what their take home messages would be regarding the need for environmental scientists to communicate with the wider public. “It’s fundamental,” said ESP PhD student Carlo Contesso, “not only do you have to be able to communicate, but you have to be able to ‘sell’ what you’re communicating as well.” Richard Friesner added, “It’s not just your job to do your science, but you have to publicize it as well.”

Some students offered advice for their fellow students:
“You need to be flexible in the types of communication you use, such as Twitter or blogs, and to be willing to change – many scientists are frightened of change.” (Treda Grayson)
“Just communicate the most important thing, don’t try to give everything all at once, keep your message simple.” (Meredith McCone)
“If you’re not comfortable to go in front of a crowd, get someone to do it for you.” (Christine Gleason)

But what if you don’t think that your project would be of interest to the public? Richard Friesner adds this final thought: “If you can’t work out why someone should care about your issue, perhaps you should be doing something else!”

- Dr. Chris Parsons is an associate professor and the undergraduate coordinator in the Department of Environmental Science and Policy. He is the marine section president and a governor of the Society for Conservation Biology, the program co-chair for the 2011 International Marine Conservation Congress and a national delegate to the Scientific and Conservation Committees of the International Whaling Commission.
Events in Photos:

Chesapeake Bay Bowl @ GMU

ESP Department Chair Dr. Robert Jonas speaks at opening ceremonies

Current and former GMU graduate students and faculty volunteering at the event

Graduate student Kate Blackwell keeping time in a competition room

Graduate student Karen Kohanowich consults with a fellow judge in a competition room

ESP Associate Professor Dr. Chris Parsons at the judge’s table
Student Power:
Two Ways College Students Can Fight Climate Change

By Neil Ransom,
GMU Graduate Student

Global climate change! If you’re reading this article in GREENovation, most likely you’re already convinced climate change is real and you’re already concerned about it. There are many examples that can explain the science behind climate change and the role humans play in it, for example Richard Alley’s PBS series Earth: The Operator’s Manuel. All I will say is 2000-2010 was the warmest decade in recorded history (Border 2010), and this winter (as you’ve probably noticed!) is the fourth warmest winter since records have been kept (Dolce 2012). And, the Chesapeake, less than an hour away, has been experiencing rising sea levels and more severe storms over the last few decades that are reducing some islands by as much as 24 acres of precious land a year (Kobell 2012). Convinced? Worried? Good!

As college students concerned about the impacts of global and local (don’t forget the Chesapeake) climate change, what can we do to reduce its effects? The two most important actions a college student can take to combat climate change are: first, get politically involved with the issue and second, convince your parents climate change is real.

Why those two? A quick search on the Internet reveals dozens of consumer-based activities one can do to reduce their personal carbon output. However, most of them have little relevance to university students living on campus or in student apartments. For examples, some of the most common suggestions are to buy a hybrid car, install solar panels on your roof, insulate your home, replace your incandescent lights with compact fluorescent and turn down the temperature of your water heater (Attari et al 2011). Great! But most college students don’t have the money to buy a car, you would likely be arrested if you tried to add insulation or install solar panels to your dorm building’s roof and unless you work on the maintenance crew, it’s unlikely you have access to the water heaters. The majority of significant consumer-based actions to reduce carbon emissions are out of reach for most college students.

This does not mean we can’t play a meaningful role in the fight to stop climate change. Au contraire, university students are in a unique position to become politically engaged in the issue by pushing for local and national legislation, undoubtedly the most viable solution to climate change, like a tax or cap-and-trade bill that regulates carbon emissions. University students can legally vote and, as seen by the election of President Obama (Washington Times 2008), have the numbers and political power to make things happen in Washington. As students, it is the perfect time to take up this political cause because our schedules are externally flexible, we
Green Happenings @ Mason

• GMU’s Arlington Campus will celebrate the second annual "Earth Week Community Fair" on Sunday, April 22 from 12:00 to 3:00 pm. The fair will highlight a diversity of businesses, non-profit organizations, research centers, and student groups that promote environmentally friendly practices and policies. In addition to the exhibitions, the fair will offer delicious food, music and sustainability-focused educational programs in our new state of the art auditorium.

• The Office of Sustainability and Community Relations have provided 20 plain rain barrels to participating schools in Project Rain Barrel. Students are artistically painting the barrels and will deliver them back to the Arlington Campus for display at Founders Hall art gallery. The painted barrels will be judged by three community members. Water Management Inc. is providing a $100 prize for each of the top three entries, with the prize money going to the schools that produced the winners. The barrels will then be sold in a silent auction, with the proceeds benefitting the Arlington County Council of PTAs Scholarship Fund and Mason’s Early Identification Program.

• April 24 is Bike to Mason Day on the Fairfax Campus. Students, faculty, and staff are encouraged to bike to Mason, and enjoy refreshments, food and good company when they arrive. A group bike ride around campus will take place at noon.

ESP Graduate Student Association

By Christine Gleason, GMU Graduate Student

The Environmental Sciences and Policy Graduate Student Association (ESP-GSA) has come back with a bang! In Fall 2011, we co-sponsored a mixer at Rock Bottom Brewery with the Society for Conservation Biology, DC Marine Community and the Women’s Aquatic Network, worked on student concerns and held a faculty and graduate student holiday party at Auld Shebeen. Up and coming dealings for Spring 2012 are: organizing and presenting teaching assistant concerns to the College of Science, co-sponsoring two academic speakers, various social events such as Thirsty Third Thursday Happy Hours and a spring faculty and graduate student mixer. Watch your email for the dates for these exciting events!! Our next happy hour will be held April 19th at The Well at Mason Inn.

Additionally, the ESP-GSA is working with the ESP department to create an orientation program for incoming students. With the absence of an orientation, many have felt confused or frustrated when trying to get their bearings at a new school. Through the creation of an orientation, the GSA and ESP Department hope to better acclimate new students to the programs, policies and resources here at George Mason. Recently a new student orientation committee has been formed and they are gathering relevant topics and documents that should be discussed with new students. If you have any ideas you would like to share about how to make the best orientation, please contact Katie Layman at klayman2@gmu.edu.

The ESP-GSA is also happy to announce the reinstatement of its student travel fund. To be eligible, you must be a dues paying member of the ESP-GSA and attend at least one ESP-GSA event/meeting in the semester you are applying. Not a member or want more information? Look on our Facebook page or contact Marieke Kester at mkester2@gmu.edu. If you have an ideas or concerns you would like brought to the attention of the faculty or student body, please contact us at espgsa@gmu.edu or talk to one of the Interim Board members: Christine Gleason (cgleaso2@gmu.edu), Marieke Kester (mkester2@gmu.edu) or Katie Busch (kmandel@gmu.edu). You can also follow us on Facebook!
Approximately 250 high school students from across the nation will arrive at Mason in June for the 2012 Washington Youth Summit on the Environment (WYSE) (http://wyse.gmu.edu). WYSE, which runs June 24-29, will be an action-packed week. Many of Mason’s facilities and faculty are lined up to participate, including a number of high level DC area practitioners in government, corporate and non-profit sectors.

George Mason University, along with distinguished partners the National Geographic Society and the Smithsonian National Zoo, hosts WYSE each summer. Highlights for the 2012 program include visits to the Smithsonian National Zoo, Smithsonian Conservation Biology Institute, National Aquarium, US Environmental Protection Agency’s Headquarters, the National Geographic Society’s Headquarters and meetings with congressional representatives on Capitol Hill.

Two keynote addresses from Washington government and non-government speakers are scheduled and include:
- Nancy Sutley, Chair of the White House Council on Environmental Quality and a senior advisor to the President on environmental matters
- Dr. Henry Kelly, Acting Assistant Secretary of Energy for Energy Efficiency and Renewable Energy at the Department of Energy
- Miranda A.A. Ballentine, Director of Sustainability at Walmart

In addition to these speakers, a select number of Mason faculty, alumni, staff and graduate students are set to present on their research topics. The week will conclude with the 2012 WYSE Gala held at the Mason Inn, the first USGBC LEED Gold hotel in Virginia.

For more information of the Washington Youth Summit on the Environment and how you can participate in 2012, please contact Program Director Richard Friesner at rfriesne@gmu.edu or (703) 993-5417.
The first national park in the world, Yellowstone, was created in 1872 largely for its scenic and geothermal features. Today, the protection of local biota is a well-known goal of protected areas but other benefits are more intangible like recreational, educational, spiritual, cultural, and therapeutic values (Harmon and Putney 2003). However, one value that is now extremely important to human communities surrounding U.S. national parks is very tangible indeed: the economics of tourism.

Social scientists can now roughly estimate the economic benefits of units of the National Park System to local communities. To get such estimates, the National Park Service (NPS) relies on models developed by Daniel Stynes, Department of Community, Agricultural, Recreation and Resource Studies, Michigan State University, East Lansing. According to Stynes’ calculations, the 281 million visitors to the U.S. National Park System in 2010 spent $12.13 billion in local gateway communities (i.e., within about 60 miles of a park boundary) supporting 258,400 jobs in the hotel, restaurant, retail and amusement industries.

Remember when the federal government shut down twice between November 14, 1995 and January 6, 1996. Many national parks had to close due to lack of staff. Arizona businesses that cater to park tourists became threatened. In response, the Governor of Arizona led his National Guard troops to Grand Canyon National Park and made an agreement with the federal government to open the park during the holidays, according to the National Parks and Conservation Association.

National parks are cash-cows for local businesses. How much would you guess that the 37 mile long, 48,700 acre land and water area of Assateague Island National Seashore spanning both Virginia and Maryland, is worth to local businesses? NPS data report there were 2,041,090 recreational visits to the National Seashore during 2010. Using the Stynes model, the estimated answer is that non-local visitors spent $135,543 million in 2010 supporting 2,041 jobs. The most recent data indicate 1.4 million annual visits to the Town of Chincoteague.

The 8,400 acre Chincoteague National Wildlife Refuge was created in 1943 which is almost totally confined to Virginia. Most people think of only the northern portion of Assateague Island as Assateague Island National Seashore, established in 1965, all within Maryland. Technically, the entire island (except for the 800 acre state park inholding) is part of the National Seashore. The US Fish and Wildlife Service (USFWS) and the National Park Service (NPS) share management of Assateague Island. The USFWS allows NPS to manage the beach in the Refuge and Tom’s Cove Hook. The Refuge and the Seashore have been in the midst of long-range resource planning. One option being considered at the Refuge is reducing the size of a key non-asphalt 8.5 acre parking lot (which once held 951 vehicles) located near the southern end of Assateague Island and require overflow traffic to park in the Town.

Many in the Town of Chincoteague are opposed to reduced beach parking. They fear that a shuttle system from the Town will ultimately be the only way to get to the beach. In fact, in public survey conducted by the Town, 82% of respondents said they would not return to Chincoteague if a trolley/bus transportation system to be beach were adopted. Both the Refuge’s early draft “Comprehensive Conservation Plan” (CCP) (see http://www.fws.gov/northeast/planning/Chincoteague/CCP_Newsletter_August2011_web.pdf ), which demands an Environmental Impact Statement, and the Seashore’s draft “General Management Plan” (GMP) (see http://www.nps.gov/asis/parkmgmt/general-management-plan.htm ) were released in August 2011 for public comment. Comments were accepted, newsletters posted and public meetings held. According to the USFWS, there were nine public meetings, four workshops and refuge staff gave additional public presentations. But according to some
members of the Town, ongoing refuge planning has not been an open public process. Some in the Town perceive they have been excluded and believe the Refuge decided on their preferred alternative before the public was invited to participate. Concerned local people who are against limiting beach access have organized and posted documents on their website called “Help Preserve Access to Assateague Island, VA” site (see http://www.chincoteague.com/preserve-access/). The official Town website is located elsewhere (see http://www.chincoteague-va.gov/). A more conservative forum about these planning issues also exists (see http://www.chincoteaguereports.com/my-weblog/2010/04/chincoteague-national-wildlife-refuge-forum-on-beach-parking-plans.htm). The fact that the Refuge recently received a $1.5 million grant to purchase a campground in the Town to serve as a vehicle staging area has some local people thinking that such plans are already final. Total cost of the campground would be $7.5 million. Some members of the Town contacted Representative Scott Rigell (VA-02) who wrote a January 17, 2012 letter of protest to the Director, USFWS.

Rigell asserted “this grant [for the purchase of a vehicle staging area] lends credibility to the town’s fears that the Refuge managers have already decided on their plan and the public process is nothing more than a pro forma exercise with a foregone conclusion.” He perceives a NEPA violation may have occurred since parking lot negotiations preceded the preparation of an Environmental Impact Statement. Rigell also confirmed what the Town already knows: “the local economy is inextricably linked to the public beach.” However, the need for overflow parking space on Chincoteague Island was identified as early as 1992 in a USFWS Master Plan for the Refuge.

A hearing before the House Committee on Natural Resources, Subcommittee on Fisheries, Wildlife, Oceans and Insular Affairs, was announced on February 9 to be held Friday, February 17, 2012. The hearing was entitled “Fish and Wildlife Service’s Proposed Comprehensive Conservation Plan and its Potentially Devastating Impact on the Economy of the Town of Chincoteague, Virginia.” Witnesses were by invitation only. Only three witnesses generally supported the USFWS parking lot/shuttle bus proposal: Ms. Wendi Weber, the USFWS Northeast Regional Director; Congresswoman Colleen Hanabuga from Hawaii; and Ms. Nancy Payne, representing one sector of the Chincoteague business community.

However, long-range plans for the Refuge go beyond just parking space. The most preservation oriented options (Alternative D, later called Alternative C, of the early draft CCC and parts of the GMP) being considered include reducing the size of the exotic pony herd (now limited to 150 for the Virginia portion of Assateague Island); phasing out over time off-road vehicle (ORV) beach access to the southern end of the Island; stopping horse-back riding on the beach; creating an undetermined “marine sanctuary” somewhere in Chincoteague Bay; creating a proposed 1,300 acre wilderness area; eliminating the exotic Sitka deer (Odocoileus hemionus sitkensis) population; limiting or banning commercial fishing and aquaculture in parts of the Refuge like Tom’s Cove; and shutting down NPS’s Tom’s Cove Visitor Center as waves overtake its land base. In the early 1990s, according to USFWS, their formal plan stated “this area [the land base directly behind the dunes] will eventually be lost due to natural movement of the barrier island.”

Into such considerations enters the Endangered Species Act (ESA) mandate that demands protecting the habitat of the threatened Atlantic Coast population of piping plover (Charadrius melodus) which nests on the beach in the springtime, along with an occasional threatened Atlantic loggerhead turtle (Caretta caretta). Note: other rare species in the refuge include the endangered Delmarva fox squirrel (Sciurus niger cinereus) and the threatened seabeach amaranth (Amaranthus pumilus). Thus far, the NPS is managing ORVs and visitors that like to beach-hike by closing public access to the most southerly portion of Assateague Island during the plover’s and turtle’s nesting seasons (i.e., typically closed from March 15-August 31). ORVs are usually allowed access to the “hook” (i.e., the recurved spit at the southern end of the island) during the rest of the year where rope barriers channel trucks away from any remaining fragile coastal dunes. Surf fishermen’s vehicles typically only use that part of the shoreline which experiences tidal wash. If the causeway across Tom’s Cove is demolished as one option recommends, access to the beach and the hook by vehicles would be precluded. An annual Virginia-only ORV permit costs $70, for example, which both USFWS and NPS sell.

Even the Chincoteague Volunteer Fire Department has an economic stake in this controversy. This involves horses (Equus caballus). The Department owns the approximately 150 Chincoteague ponies (or Assateague horses) on the Virginia portion of Assateague Island. Each summer the ponies are rounded-up and the foals are sold at auction, a practice that has been going on since the 1920s. During the 2011 summer round-up, for example, 67 foals were sold for an average price of $1,442 (highest bid $6,700) which provided the Fire Department $99,500 to support their critical community service.

After reading the above mentioned “Help Preserve Access to Assateague Island, VA” website and other protests, I can offer at least some clarification. First, the enabling legislation did state that the primary purpose of the National Seashore was “for public outdoor recreation and enjoyment.” The Refuge later adhered to this priority, for example, by allowing a road to be constructed through the

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**The parking lot during the “off-season” on October 8, 2011. On this date, the lot could have accommodated 350 vehicles, down from its earlier capacity of 951** (Photo courtesy of Patrick J. Henderson, HighCamera.com).
Graduate Op-Ed (continued from page 7)

have access to networks of other students and activists through on-campus clubs, classes and events that can be easily mobilized behind the issue and, especially at GMU, we can engage with and be mentored by professors who are already involved in the climate change fight.

Our time as students is short, and so we must seize this opportunity to engage ourselves as citizens and put pressure on our elected officials to address climate change. We can become engaged by calling, emailing or writing our representatives (all their information is listed online) to let them know we support climate legislation and politicians who vote for it. We can also let our voice be heard at town hall meetings by participating in political actions or rallies or by sharing our views in public forums, including on the internet. Unfortunately, concerns about the economy have overshadowed climate change in recent years and the continued pressure from big oil-funded climate disinformation campaigns (Lehmann 2011) have made it unlikely a comprehensive climate bill will be passed any time soon. This does not mean we should give up hope. Instead we need to be strategic and use our political pressure to pass smaller legislation with more bipartisan support, like ending subsidies to oil companies (Clark 2012), increasing funding for alternative energy, encouraging subsidies for home efficiency improvements and passing stricter laws to regulate pollution from coal power plants for public health reasons.

Al Gore, at a TED Talk given in 2008, said, “In order to become optimistic about [climate change] we have to become incredibly active as citizens in our democracy.” I agree, and I think we, as college students, have a special opportunity to become engaged citizens and use the democratic process for good. President Obama told university-aged climate activists during a meeting in the spring of last year that the role of young activists was to pressure him on the climate and other environmental issues — and we did. Later that year, over 10,000 climate activists, including thousands of young students, made a human chain circling the White House to protest the proposed 1,700 mile Keystone tar-sands pipeline from Canada to Texas (Kollipara 2011). Shortly thereafter, President Obama rejected the Keystone pipeline proposal. We will make our biggest impact toward addressing climate change as citizens and activists engaged in the democratic process.

We can also encourage our parents to take political and consumer action by convincing them that climate change is real. I personally know how hard it can be to engage parents in something as complicated and political as climate change. Mine happen to live close to a river in the Midwest and have experienced one 50-year record and two 100-year record flood events, as well as the warmest winter in recorded history in the 8 years they have lived there. Yet, they still have doubts about climate change. Despite the difficulty in persuading them, there is no one with more influence on your parents’ perceptions of climate change than you. Through constant lobbying and some good old facts (like 97% of climate scientists agree climate change is real), they eventually will see it your way. This is important, because they also have much needed political influence that can be galvanized into political action. Additionally, they can make important consumer decisions to reduce their energy consumption and CO₂ emissions like those listed above.

By becoming politically engaged in the issue, and by working to convince our parents that climate change is real, we can do our part to lessen the impacts of climate change. I personally believe taking civic action to stop climate change is the most important undertaking an individual can do. Obviously, we should all be looking for ways to reduce our own carbon footprint, but calling your senator is one of the most important.

- Neil Ransom is a second year PhD student in the Environmental Science and Policy program. He is interested in studying the role small-scale technologies, Do-It-Yourself organizations and tinkering traditions can play in increasing adaptive capacity to climate change. He plans to do his research in Kenya, where he grew up as a child.
refuge to get to the beach (Mackintosh 1982). However, subsequent amendments to the 1916 NPS Organic Act in 1970 and 1978 made preservation dominant over public use in NPS national seashores or national recreation areas. Preservation is now the foremost consideration in all units of the National Park System. Second, just because a particular use has been long standing does not mean it must always occur. For example, ORV use in parts of Assateague Island is really more privilege than right. Third, the NPS and USFWS can seek to prohibit commercial fishing in some of its waters to enhance a diminishing natural resource.

The waters of Tom’s Cove represent a jurisdictional mixture between NPS, USFWS and the State of Virginia. Fourth, creating marine sanctuaries has been shown to ultimately enhance adjacent commercial fishing around the world (Gell and Roberts 2003). Fifth, some of these initiatives are not new. For example, a wilderness designation for Assateague Island has been discussed since 1973. Sixth, some expressed policies are not new either; for example, the policy of eliminating exotic species like Sitka deer in units of the National Park System was around in the 1930s. Finally, the primary landowner of barrier islands south of Chincoteague is not USFWS but The Nature Conservancy.

There is yet another consideration in this conflict, but this one is not so conducive to the democratic process. One 2009 hurricane dumped so much sand on the Refuge’s beach parking lot that is took six months to remove it. Three feet of sand, deposited by Hurricane Ida during November 2009, was barely cleared by the following Memorial Day to accommodate the annual public beach onslaught. This hurricane flattened Assateague Island’s picturesque coastal dunes from top to bottom. According to USFWS, the parking lot was overwashed eight times during 2009 alone. Almost two years later, Hurricane Irene dumped more sand on the same parking lot during August 2011. This time only some of the lot area was unearthed by Labor Day, leaving it with a reduced vehicle parking capacity of 350. Such sand removal is very expensive and is counter to the NPS policy of allowing natural processes to prevail (NPS 2006). That policy for seashores has been in effect since 1973. According to USFWS, based on NPS data, $2.4 million was spent to repair the parking lot over the last 4 years. One option allows the USFWS to move the parking lot northward where it will be more protected from erosion but this will demand eliminating some valuable refuge habitat.

According to USFWS, artificial barriers like groins would be extremely expensive to build and maintain and only represent a short-term fix. Witness what happened to the northern end of Assateague Island after the jetties at Ocean City were constructed from 1933-1935. The northern six miles of Assateague Island receded westward. This is one of the dilemmas of making barrier islands into protected areas. Assateague Island is a highly dynamic ecosystem and much of its beach is eroding inland. Just look at the beach today and one can see former marsh vegetation protruding above the sand surface. Consider the climate change projections in the NPS GMP. According to USFWS, the parking lot that served beach visitors during 1990 is now underwater. In 1833, when the Assateague Lighthouse (or Chincoteague Lighthouse) (see Figure 1) was being constructed, that lighthouse was near the ocean’s edge. Today it is more than one mile inland from the main beachfront in the midst of a loblolly pine forest. From 1859-1981, the end of Assateague Island extended south and west for an additional 5 miles. This means Tom’s Cove Hook and the water body known as Tom’s Cove was created since the lighthouse was constructed (Goettle 1981). The problems we see at the parking lot are a result of rising sea levels and more frequent storms.

The Government Accounting Office recognizes that federal land management agencies face a real challenge “adapting to climate change” including “economic and social effects, such as adverse impacts on tourism.” However, as this account reveals, such agency counsel about adapting to future adverse effects on tourism is much easier said than done. How will all this civic debate end? Federal land managers are trying hard to do their jobs according to agency organic acts, park and refuge enabling legislation and mandates like the ESA and NEPA. Local people are seeking more influence into the refuge/seashore planning process, input guaranteed by NEPA, to make sure their favorite pastimes or livelihoods are not gored. A battle between the ocean and a parking lot is taking place but the end result is predictable.

The above illustrates that the Town of Chincoteague, Virginia, senses how much Assateague Island National Seashore is worth to them economically. It also demonstrates what a hard job it is to be a federal land manager. They are not to blame for rising sea levels and seashore erosion. Furthermore, Congress is responsible for legislation passed to protect the environment which land managers must honor. It is easy to understand why some of the options being studied and presented by USFWS and NPS are locally unpopular. However, the NPS has lost when fighting the ocean at other national seashores (Dolan 1972, Godfrey and Godfrey 1976).

The Town of Chincoteague’s economic reliance on oyster harvesting collapsed decades ago. The Town’s very existence now depends on Assateague Island’s natural resources that are owned by all of the people of this country. Like it or not, today our public land stewards are increasingly in the business of “social value management” (Kennedy and Thomas 1995) but the priority values they are guided by are enshrined in public land law.

- Craig L. Shafer is an ESP PhD student. He is a regular Assateague Island surf fisherman.
Meet New ESP Faculty!

**Dr. Chris Kennedy**  
*Assistant Professor of Environmental Economics*

Hi All! I am originally from Rochester, NY, but have spent the last six years in Wyoming, where I completed a PhD in economics. My research has focused primarily on the management of coastal and marine fisheries. (No, we don’t have those in Wyoming, but it was a good way to get out of the snow.) I am also interested in behavioral economics and energy policy. Currently, I am teaching a graduate course in environmental and resource economics (offered every fall), and next semester I will be teaching the undergraduate version. In my spare time, I like to mountain bike and ski and spend time with my dog. I am excited to be part of the Mason community and the ESP program, so please stop by and say hello any time, or ring me up if you have the scoop on any good trails!

**Dr. Kim de Mutsert**  
*Assistant Professor of Ecology*

I joined the ESP faculty in August 2011. I received an MS in Biology at the University of Amsterdam in the Netherlands and a PhD in Oceanography at Louisiana State University. My research interests lie in the fields of fish ecology, estuarine ecology, marine biology and aquatic ecology. In recent research projects, I have studied the effects of freshwater input through a water control structure on estuarine fish communities and effects of the *Deepwater Horizon* oil spill on Gulf shrimp in Louisiana estuaries. My research typically includes a lot of field sampling, with the addition of tools like hydro-acoustics, stable isotope microchemistry and ecosystem modeling. Current research projects include modeling effects of hypoxia on living marine resources in the Gulf of Mexico, surveying the spawning behavior of clupeids in creeks in the Potomac watershed and long-term monitoring of the fish community in Gunston Cove after wastewater treatment improvements in the 1980s. I teach freshwater ecosystems for undergraduate students in the fall, as well as estuarine and coastal ecology and the seminar class controversy in fisheries sciences for graduate students in spring. Outside of the classroom, I can be found in waders almost every week from March to September sampling fish in the Potomac watershed. In the summer, I will be organizing an estuarine and coastal ecology field course to give students some hands-on field experience.
GMU Students & Faculty Should Join the VAS

By Richard Groover,
GMU Graduate Student

The Virginia Academy of Science (VAS) is one of the oldest and largest “academies” in the United States, as it is America’s Fifth Largest State or City science academy and was founded 1923. The VAS holds an annual statewide conference every May. College students and faculty may present at this conference and then have publication of their abstract in the Virginia Journal of Science Proceedings. Publication of full articles is available in the Journal, if accepted. At the May Meeting, cash awards are presented for the best student papers in some sections.

Two other money opportunities exist for students. Each Fall an Undergraduate Student Research Forum is held in Richmond. Students present a poster about current or proposed research. Cash awards are given to many entrants and may be as high as $500. One of the best other funding opportunities is the Small Project Grant, which can be as high as $1250. By the way, FACULTY are also eligible for the Small Project Grants.

One should also consider the close proximity of events and networking advantages for members. Graduating soon? Looking for a job or the next university for graduate work? Almost every college and university in Virginia has members in this organization, which may be useful for your contacts. The May 2012 Conference will be held at Norfolk State University, and then at JMU in 2013.

Student membership is $10 and the faculty membership is $35. Currently, 34 GMU students are members. VCU has 50, so GMU can be better! For more information, query Virginia Academy of Science online.

- Richard Groover is an ESP PhD student and a recipient of a Virginia Academy of Science Small Project Grant. He is also serves as the treasurer for VAS.

50 Animals That Changed the Course of History

By Lorelei Crerar,
GREENovation Book Reviewer

Chaline selected fifty animals that he feels made the greatest impact on human history. The most interesting thing about this book is the manner in which he always brings the reader back to how important the animal was, even if it is as humble as a fruit fly (Drosophila melanogaster). Chaline begins each chapter by stating the scientific name the animal, its range, its phylogenetic class and the size. Then there is a list of four features, which are common throughout the book, which state whether the animal is edible, used in medicine, whether it is of commercial value and whether it is practical.

One of the most interesting choices Chaline makes is the cow. He goes through how the cow has been used by humans for a very long time, how the cow is revered in India, how the Spanish fight bulls in the arena and how important the cow was in the creation of the American west. The ending of the chapter is brilliant, discussing the excessive amount of methane produced by cattle, especially those grown in factory farms.

Chaline also talks about the impact of schistosome (Schistosome mansoni) (p. 194). This small worm is responsible for a debilitating disease in humans and is difficult to deal with since it spends different parts of its life cycle in several hosts. Chaline also describes the enormous impact the Oriental rat flea (Xenopsylla cheopis) (p. 204) had on history. This is the organism that killed millions of humans during the plague.

The final animal Chaline deals with is the human (Homo sapiens) (p. 210). The chapter goes through how new humans are as a species and examines some of the ancient human ancestors (p.211). There is also a lot of good information on human pre-history, which examines things like the ancient Egyptian society and also touches on ancient peoples from several other continents. Once again, Chaline always brings things back to the present, discussing topics like the role of humans in climate change.

- Fifty Animals that Changed the Course of History.

Herbaria are essential for plant biodiversity research, and Mason contributes to this important endeavor through its own herbarium located in Krug Hall. In herbaria, new plant species are described, better identification manuals are authored, and long-term evolutionary and ecological histories of plants are reconstructed. But, what is a herbarium you may ask?

A herbarium is a facility that contains a collection of dried, pressed plant specimens that are used for research purposes. Herbarium specimens are prepared by researchers using archival-quality materials and are intended to last for centuries. Each specimen is labeled with detailed information about its identification, as well as, where, when and by whom it was collected. There are over 3,400 herbaria in the world that maintain over 350,000,000 specimens that document the earth’s vegetation for the past 400 years. Mason’s herbarium is the fourth largest herbarium in the Commonwealth with 60,000 herbarium specimens, 97% of which are found in no other herbarium. Two-thirds of the herbarium specimens are Virginian and the remaining third are from out-of-state or out-of-country. The herbarium holds over 1930 specimens of plants that are rare, threatened or endangered at the Federal or State level, as well as specimens of species newly described to science.

Mason’s herbarium was established by ESP Professor Ted Bradley in 1967. During his 36 years as curator, Dr. Bradley created over 35,000 specimens and brought in ca. 25,000 additional specimens from Mason faculty and students as well as through external gifts. When Dr. Bradley retired in 2003, the university renamed the herbarium the Ted R. Bradley Herbarium in his honor. ESP Professor Andrea Weeks has been curator of the collection since 2005.

The herbarium’s record of activity since its reopening in 2005 is testament to its intellectual significance for both research and education. Over 27 peer-reviewed research publications have been based on Mason herbarium specimens, including 15 publications produced by George Mason University faculty and students. The herbarium has served as an integral resource for 11 graduate student theses and dissertations, including five that are currently in progress. Its specimens have most recently been used to create species descriptions for the upcoming Flora of Virginia (www.floraofvirginia.org), which will be published in Fall 2012. In addition to supporting original research, the herbarium has been active in educating the next generation of biodiversity scientists through the contribution of teaching specimens to seven Mason courses and sponsoring 12 undergraduate independent research projects (Figure 4). The herbarium has hosted 200 visitors and sponsored 16 public outreach lectures, tours, and workshops. The outreach audiences have included elementary and middle school-aged children, members of local native plant societies, gardening clubs, and plant rescue groups.

Access to the physical collection is by appointment only, although the curator frequently fulfills requests for information via email and approved Mason researchers have permission to access the collection when the curator is not present. The herbarium’s website (http://esp.gmu.edu/research/facilities/herbarium.html) posts general information about the collection, copies of its Annual Reports, and the full copy of the Collections’ Policies and Procedures. Volunteer opportunities are available.

Dr. Andrea Weeks is an assistant professor of plant systemics and director of the Ted R. Bradley Herbarium on the Fairfax Campus. She is also the associate editor of Systemic Botany.
A climate tax on meat and milk may help abate climate change by lessening greenhouse gas emissions. According to Kristina Mohlin, a researcher with the University of Gothenburg in Sweden, “Adding a tax to meat products can reduce greenhouse gas emissions in Europe by about seven percent.” Mohlin was a co-author of the article “Greenhouse Gas Taxes on Animal Food Products: Rationale, Tax Scheme and Climate Mitigation Effects,” published in the September 2011 issue of Climate Change. Stefan Wirsenius and Fredrik Hedenus also contributed to the article. “Agriculture is responsible for much anthropogenic greenhouse gas emissions,” Mohlin asserted in an email interview. “If there was a resulting decrease in agricultural land area from the climate tax, and this land was devoted to bioenergy production, emissions could be decreased by about 42 percent in the [European Union of 27 Member States].” The bioenergy production mentioned would be in the form of lignocellulosic crops, substituting for coal production.

According to the U.N. Food and Agriculture Organization (UN FAO), livestock farming made up more than 18 percent of the world’s greenhouse gas emissions in 2006, five percent more than cars, trains, planes and boats combined. Deforestation for agriculture and animal waste were the leading causes of greenhouse gas emissions from livestock farming. In 2008, Rajendra Pachauri, head of the Intergovernmental Panel on Climate Change, urged people to go meatless one day per week to help curb climate change. “Adding a climate tax would help lessen meat consumption, and more importantly, reduce the wasting of meat and dairy products,” Mohlin stated. “It could encourage consumers to only buy what they are really going to use and what they really need.”

Mohlin and colleagues found that a climate tax on beef of €60 per ton of equivalent carbon dioxide produced could be enough to generate their predicted reduction in emissions. “A tax on the emissions from food production is preferable, but this may be impossible,” claimed Wirsenius, of the Department of Energy and Environment in Chalmers. “It may be much more effective to apply the tax to meat and milk consumption, leading to product switching.” The highest emissions per kilogram of meat comes from beef, which would be taxed the highest under the researchers’ tax scheme. If beef were then replaced with beans by consumers, for example, emissions from that particular stock would be reduced by 99 percent. Emissions could also be decreased significantly by simply switching to a different meat source, the article explained.

The €60 per ton of equivalent carbon dioxide tax corresponds to approximately $80 USD. This would be enough to reduce beef consumption by approximately 15 percent, according to the study’s authors. Total U.S. beef consumption was 26.4 billion pounds in 2010, the USDA Economic Research Service estimated. That equals over 85 pounds of beef alone consumed by each man, woman and child in the U.S. in one year. According to the UN FAO, U.S. meat consumption per capita is about 57 percent more than the U.K. and 64 percent more than Sweden. About one-third of food produced globally for human consumption goes to waste, a study by the UN FAO found. Furthermore, rich countries, like the U.S., waste almost as much food as the entire net food production of sub-Saharan Africa. According to a study from the Laboratory of Biological Modeling at the National Institute of Diabetes and Digestive Diseases, published in 2009, Americans waste approximately 40 percent of their food.

Samantha Oester is a former journalist, editor and policy analyst, now a an ESP graduate student at GMU.
## Recent Publications and Presentations from Environmental Science and Policy Graduate Students & Faculty

### 2012

### 2011
- **Crerar, L.** 2011. What is this bone? New mitochondrial DNA sequence for Steller’s sea cow (*Hydradomas gigas*). Presented at the 5th International Sirenian Symposium, 27 November 2011, Tampa, Florida. [Poster].