

# Across the Watershed to the Bay

A Field Trip to Harrisburg, Havre de Grace, & Annapolis

April 22–23, 2005



## A Final Report to Our Sponsors/Contributors:

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## By Michael Svoboda

**Abstract:** The Across the Watershed to the Bay fieldtrip aptly summarized the environmental component of the “Writing, Critically and Bioregionally, about the Environment” honors first-year-composition course for which it had been planned. Participating students were able to present the findings of their final research projects in appropriate settings, and the journey—from the farmlands of central Pennsylvania to the junction of the Juniata and Susquehanna, then down the Susquehanna and, finally, out onto the bay—mimicked the action of the watershed. The flow of excess nutrients, the essential problem of the bay and its watershed, was also traced in a series of presentations that reinforced this key environmental lesson of the course. Participating faculty were able to use this occasion to imagine and plan other projects together, projects that would include new ways for students to “publish” the results of their cultural, ecological, or historical research on the watershed. Among these planned projects are future trips Across the Watershed.

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## **Introduction**

Water is not a prominent element of the Pennsylvania State University or State College landscapes. The standing bodies of water are small and man-made, and the one steady runner is a small stream that skirts the edges of campus and town, mostly out of sight. Yet the flow of water across these landscapes provides one way of identifying our place in the natural world: the Chesapeake Bay Watershed. For this reason, the Chesapeake Bay Watershed was one of the foci for a spring 2005 honors first-year-composition course: “Writing Critically, and Bioregionally, about the Environment” (English 30).

This honors first-year-composition course examined environmental issues in two different contexts. The first was the very public and often caustic debate that greeted *The Skeptical Environmentalist*, the 2001 work of Danish statistician Bjorn Lomborg. The second was the subject of our field trip: the ecology and cultural history of the Chesapeake Bay Watershed, the bioregion in which Penn State is situated. The two contexts came together, however, when we discovered—through reading John Wennersten’s *The Chesapeake: An Environmental Biography*—that the Chesapeake Bay Watershed offered multiple stories of resource, ruin, and recovery, regional stories similar to the global tales that Lomborg tells about air, energy, forests, pollution, population, and water.

### **Purpose of the Field Trip**

Prompted by an invitation from Pennsylvania Lieutenant Governor Catherine Baker Knoll to tour the capitol building in Harrisburg, this field trip was proposed as an opportunity for students to see the links between global environmental issues and regional concerns, between actions on the watershed and their consequences in the bay, and between policies and politics.

To accomplish these objectives, the trip was planned so that students could observe the largest river of the watershed, the Susquehanna, at several key points on its journey to the bay; so that the students could hear different, interested parties review the interrelationships of the land, the river, and the bay; and so that students could share, in appropriate settings en route, their own research on the watershed and its history. Finally, we wanted the students to have a direct, personal experience of the bay itself. The resulting itinerary featured extended tours or presentations in Harrisburg, Havre de Grace, and Annapolis, and in between, a sequence of quick stops along the Susquehanna.

### **The Participants**

A total of nine students, roughly two-thirds of my English 30 class, participated in some portion of the field trip: George Bragdon, Lea Cobaugh, Grace Clauss, Nick Giner, Blake Goll, Mike Lizerbram, Jennifer Martin, John McCormack, and Ryan Svoboda (no relation). Accompanying us, and driving the two PSU maxi-vans we rented for the trip, were Chris Duffy (professor), Kevin Dressler (post-doctorate), and Peter Beeson (grad student) of Penn State’s Land & Water Research Institute. For their own work with environmentally-themed English courses and their related field trips to the Appalachian Trail and North Carolina’s beaches, associate professor Robert Burkholder and his wife Valerie were also invited to join us. As was Keith Diehl, the PSU master gardener who, when not recording our activities with Public Scholarship’s digital camcorder, would comment on the passing flora. Two other faculty, Kathy Hood, associate professor of Human Development and Women’s Studies at Penn State, and John White, professor and chair of Art Education at Kutztown’s State University, would link up with us in Annapolis for Saturday’s skipjack excursion on the bay.

## **Sponsors & Contributors**

Financial support for the Across the Watershed to the Bay field trip came from three academic units at Penn State: the Laboratory for Public Scholarship and Democracy (hereafter the Public Scholarship Program) funded by the office of Associate Vice-Provost for Undergraduate Education Jeremy Cohen, the Land & Water Research Institute, and Schreyer Honors College.

Financial and logistical support also came from Diane and Doug Bragdon, the parents of George Bragdon, one of the students in the class. The Bragdons generously agreed to host the students for our Friday night layover in Annapolis. To this early commitment, which persuaded me to go forward with the planning, they then added the packaged lunches for Saturday's excursion on the bay.

Other groups participated in the Across the Watershed to the Bay field trip through the presentations or tour talks they delivered to our mixed group of students and faculty. The Office of the Lieutenant Governor of Pennsylvania provided the initial impetus for the trip by issuing the invitation to tour the capitol building. Donna Dupstadt facilitated our planning for that phase of our journey and, in the lieutenant governor's unexpected absence, she and Amy Collins guided us through their offices to the balconies overlooking the House and Senate chambers. The lieutenant governor's office also helped us schedule the presentation we received in the Rachel Carson Building from Kenn Pattison of the Department of Environmental Protection's Office of Water Management. Finally, Lynda Tison and Sherilee Ruhl in the Chesapeake Bay Foundation's Phillip Merrill Environmental Research Center in Annapolis assisted us in selecting the most appropriate program for our purposes: the skipjack excursion managed by Paul Bayne, with Dave Gelenter and Claire Winchester. The Chesapeake Bay Foundation also provided several different publications—brochures, pamphlets, and research reports—that summarized the state of the bay and explained, in text and graphics, the basic principles and problems of the bay's ecology. Some of these were used in class; others were included with the packets we assembled for the trip.

## **The Field Trip**

**Overview** — The Across the Watershed to the Bay field trip neatly divided into two parts: Friday's trip down the Susquehanna to the bay and Saturday's excursion out onto the bay in the Chesapeake Bay Foundation's skipjack.

The Susquehanna portion of the field trip naturally focused on the upper watershed, on how the scapes and uses of Pennsylvania's lands affected the flow of water over and through them, and on what that water carried with it to creeks, streams, rivers, and, finally, the bay. While in Harrisburg, we also wanted to tour the capitol building and to hear a problem/policy presentation from the Pennsylvania Department of Environmental Protection. To best accomplish these objectives we chose a route that hugged the eastern shore of the river, one that allowed us to stop beside or look over the Susquehanna at several critical junctures.

For the Chesapeake Bay portion of the trip, the Chesapeake Bay Foundation offered several different options. We selected the skipjack cruise because getting out on the water in a single vessel, far from shore, would allow us to function more effectively as a group, to get a better sense of the bay's scale, and to connect more directly with several threads from Wennersten's narrative history of *The Chesapeake*, the surprisingly dramatic story of the oyster in particular.

The itineraries of these two very different days are detailed in the pages that follow.

## **The Itinerary – Friday April 22, 2005**

**Central campus, Pennsylvania State University (PA)** – At 8:00 AM that Friday morning, in the parking lot behind the Osmond and Davey Labs opposite the Hetzel Union Building, students and faculty assembled for our departure. By 8:15, Kevin Dressler had arrived with the first maxi-van; Peter Beeson arrived with the second a short time later. By 8:30 we were underway. Within 45 minutes, just south of Lewisburg, we were driving alongside the Juniata, which we then followed for the next 45 minutes, until it joined the Susquehanna just north of Harrisburg. After crossing the Susquehanna, we left 22/322 and followed a winding road to our first ridge-top stop.

**Peters Mountain Road Overlook (PA)** – On a clear day, from this overlook one can see the confluence of the Juniata and the Susquehanna and an expanse of the valleys from which these two rivers draw their waters. But Friday, April 22, 2005 was not a clear day. So, after gathering in a circle for brief introductions, the group climbed backed into the maxi-vans to journey further down the river for a better view of the points we had wanted to make there.

**Fort Hunter Mansion – Rockville Bridge (PA)** – On a short loop off Route 22, which becomes Front Street in Harrisburg, the Fort Hunter Mansion Park provides a good view of the stone columns and archways of the Rockville Bridge. It also provided a slightly warmer venue in which to introduce some of the themes we would be talking about over the course of the day: (1) the different periods of history and stages of development visible on the landscape, (2) the impact of those periods and stages on the Susquehanna and the bay, (3) the continuities and discontinuities between these pasts and the present in the watershed, and (4) the constant action of the watershed—water flowing off the land, into the streams and rivers, and then into the bay. Following this overture, and a class photo, we followed Front Street into Harrisburg and into the Capitol district.

### **Capitol Building (PA) – Office of Lieutenant Governor Catherine Baker Knoll**

Although an invitation from Lieutenant Governor Catherine Baker Knoll had provided the initial impetus for this trip, we had learned the day before that a funeral in Pittsburgh had called the Lieutenant Governor away on the day we were to visit. Her staff, Donna Duppsstadt and Amy Collins, welcomed us nonetheless, offering us a quick tour of their office, the Supreme Court Chamber, and the House and Senate galleries. Whatever one's politics or aesthetics, the Capitol Building is stunning, almost over-whelming, and in itself provides evidence of the way people had once chosen to live on this landscape. Its dark, rich colors set a mood that, while never explicitly discussed, certainly affected our subsequent perceptions of and along our journey.

In one of the many foyers of the Capitol Building, however, one theme was explicitly laid out. In the first of the several presentations that would be made that day, Lea Cobaugh provided a brief biography of Rachel Carson that highlighted the different ways her life and work intersected with the geography and history of the Chesapeake Bay Watershed. Rachel Carson grew up in Pittsburgh, just outside the watershed. For a time, she lived and worked in Baltimore, on the shores of the bay about which she wrote some of her first articles. And her final work, *Silent Spring*, called our attention to the chemical degradation of bird habitats, including the Chesapeake Bay and its watershed. With Lea's presentation as our introduction, we made our move to the Rachel Carson Building. (Lea Cobaugh had to part company with the group before our appointment, in the main auditorium of the Rachel Carson Building, with Kenn Pattison from the Office of Water Management of the PA Department of Environmental Protection (DEP).)

**Rachel Carson Building (PA)** – Our arrangements with the PA DEP were not specific: someone, we did not know who, would speak to our group when we arrived at noon for a presentation on the PA perspective on the Chesapeake Bay Watershed and its problems. Kenn Pattison was the Office of Water Management representative who met us for that presentation; he did a superb job.

The students in my English 30 class had already had the opportunity to review the Chesapeake Bay Foundation's *State of the Bay: 2004* and John R. Wennersten's *The Chesapeake: An Environmental Biography*. Thus, they were already familiar with the basic problem that faced the bay: excess nitrogen and phosphorus flowing into the bay from agricultural runoff, inadequately treated sewage, and depositions from automotive exhaust. Pattison's presentation built on this foundation, clarifying and extending our understanding of these elements and their interactions in ways we had not anticipated.

For the faculty, however, Kenn Pattison's presentation sharply focused our perception of the political problems that underlie the bay's ecological problems. The Chesapeake Bay Program—a joint undertaking by Pennsylvania, Maryland, Virginia, and the U.S. Environmental Protection Agency—had set a series of goals that were to be achieved by 2010. As we are now less than five years away from that target date but nowhere near the targeted measures, it is clear that these goals will not be met. Failure to meet these goals will open the way for inter-state litigation on the state of the bay, but in the present political climate the outcome of such litigation is very much in doubt. The fear, then, is that the promise of the Chesapeake Bay Program will ultimately prove empty.

**Taking Route 441 out of Harrisburg, PA** – Route 441, Cameron Street after it exits central Harrisburg, offered a tour of the rise and fall of heavy industry in central Pennsylvania. We passed the shells of several large factory buildings and countless empty rail sidings as we followed the Susquehanna from the Capitol District to the rich agricultural lands that lie south of Harrisburg. Several students commented on these industrial skeletons. Others wondered what had flowed into the river behind them when these buildings were young and active, digesting the raw materials brought to them by an endless stream of freight cars.

**York Haven Dam – Conewago Falls (PA)** – Roughly 15 miles south of Harrisburg, Route 441 offers access to the Susquehanna at the PA Fish & Boat Commission Boat Launch just below Conewago Falls. We stopped there, right on schedule, to talk about what we'd seen in route (a list of sights that included Three-Mile Island) and to hear a couple of presentations. Chris Duffy asked the students to consider the ways the landscape here was different from what we had seen that morning above Harrisburg. His point? We had left the ridge country and were now in the Piedmont. Then, because he had to leave our group and head back north for a choral concert that evening, we asked Ryan Svoboda to deliver his presentation on the Mason-Dixon Line.

In a detailed but impromptu presentation that covered nearly 350 years of American history, Ryan argued that the initial differences between the settlements of Maryland and Pennsylvania, later reified in the boundary line drawn by Charles Mason and Jeremiah Dixon, set in motion key events of American history and foreshadowed the political obstacles that stand in the way of solving the ecological problems of the bay and its watershed. The different objectives of the Chesapeake and Pennsylvania colonies created different cultures in response to the different landscapes they encountered. The political disputes that arose out of these cultural differences—foremost among them the Civil War—created new cultural differences that still create tensions today. Effective action to restore the bay requires cooperation across the watershed, but the watershed remains divided politically, by state lines that include the line of Mason and Dixon.

**Chickie Hill Overlook (PA)** – Another 15 miles south of Conewago Falls, where one can drive down to the river's edge, one reaches Chickie Hill Overlook, a pull-off where one can look out over the river from a tall bluff. Chickie Hill Overlook offers two vistas. The intended view, indicated by the wooden railings and the signage, looks north at a bend in the south-flowing river. The other view, reached by following a dirt path through the woods that crown the ridge, looks south, over two bridges that connect Columbia, on the eastern bank of the Susquehanna, with Wrightsville, on the western bank. During our time at Chickie Hill we took in both views.

The view north offered an opportunity to review the essential action of the watershed: water flowing off the land, picking up the traces of our different uses of that land, and carrying those traces into the rivers and down to the bay. In the picture before us were indications of many different human activities: residential life, power generation, manufacturing, and farming. Aware that after leaving Chickie Hill we would be taking leave of the river as we traveled through Lancaster's farm country, I asked Mike Lizerbram to deliver his presentation on Edmund Ruffin and the history of agricultural reform in the watershed.

Now best known for his staunch commitment to the Confederacy—when Lee surrendered, Ruffin shot himself so as to avoid life under Union domination—Edmund Ruffin had, before the war, achieved a considerable reputation as an agricultural reformer. By mixing crushed oyster shells into the soil of his farm, Ruffin was able to rejuvenate land that had been exhausted by over a century of single-crop farming. But marling—from marl, the word used to describe the mixture of mud and shell that makes up an oyster shellbank—was a labor-intensive practice. For Ruffin, this meant slave-labor; thus, his commitment to revitalizing agriculture in the lower Chesapeake reinforced his cultural commitment to the Confederacy.

After the war, farmers north and south found other ways to solve the problem of exhausted soils. But the widespread use of fertilizers, especially on the large, heavily-mechanized farms that characterize modern agriculture, contributes roughly one-third of the excess phosphorus and nitrates that are slowly killing bay. Residents of the watershed are faced with another choice of values: Are we willing to pay more for our food in order to practice a more modest agriculture that does not endanger the health of the bay. An example of a more modest agriculture can already be found in the upper watershed, in the Lancaster countryside we were about to tour: the Amish farmer. But Mike Lizerbram cautioned, even Amish farming practices will require reform if the bay is to recover its former health. The Amish, too, have been cited for the runoff from their farms.

Having absorbed this sober message while taking in the view north, we then hiked up the short trail to the ridge overlooking the town of Columbia, just to our south. Here, I pointed out, it was possible to see several stages of economic and technological development at once. The two bridges spanning the river below us were clearly built in different eras. And before the bridges, the town had been the site of a ferry, a major crossing point for the way west. People had been living on this land by the river for centuries, but their ways of life had changed several times in that long span. Some ways survived to this day, many did not.

Though it dealt with a town much farther north, in her watershed paper Grace Clauss had told a similar story about ways of life developing and disappearing. Near her hometown, near Scranton, were the remains of an amusement park that had been built in a time of prosperity when affordable rails connected hot summer cities with the cooler countryside. When roads replaced rails, or perhaps when cities could themselves be cooled, or when some other, more attractive

destination came within reach, the amusement park was abandoned—except by its ghosts. This was the story Grace told us on the ridge overlooking the very old town of Columbia.

Before we left the ridge and the two very different views from Chickie Hill, I posed a challenge. We were about to leave the river's edge. But this was not by choice. After Columbia, there was simply no road on which one could follow the river's course. Not until a new road rejoined the river at Conowingo Dam. Why? Why was there no river road from Columbia to Conowingo?

**Conowingo Dam (MD)** – The long and circuitous route from Columbia to Conowingo, 441 to 999 to 741 to 272 to 222, took us to outer edge of Lancaster and then down through miles of farm country, including, as had been suggested by the earlier presentation, Amish country. At several points along the way we could see young men turning the soil with horse-drawn plows. Shortly after we picked up 222, we turned back toward the river. Route 222 joined Route 1 about a mile east of the river, and soon we were crossing the dam.

On the west bank of the river, on a hill above the highway, there is parking lot for a shelter that overlooks the dam. But a small gate bars entry and a sign warns against trespassing. Parking beside the gate, we decided to risk a quick look down from the shelter. The angle does not permit a view of the dam per se, but one can look out over the reservoir on one side and then, on the other side, down at the rocky river run some 100 feet below. Beyond the rocks, one could see the bare limbs of bushes and scruffy trees. All were covered in mud. Nothing green could be seen in the river's broad bed. Just bare rock and, at the edges, brown branches. Only behind the embankments were the trees leafed out and green. Clearly, there had been a recent, heavy flow of mud.

Once back outside the gate, Chris Duffy delivered a short presentation on the life-cycle of a dam. The dirty secret was that dams filled up with silt. At which point they can no longer regulate the flow of water. Whatever comes in must pass through. The Conowingo Dam was nearly full. Unless dredged, or unless thousands of tons of silt were flushed through, the dam could no longer play a role in flood control. But flushing out the accumulated silt, some of it toxic, would add to the bay's already heavy burden. According to research done by other hydrologists in the region, a similar problem was posed by the thousands of mill ponds in the region, many of which dated back to the days of the first colonies. As these mill dams break down, thousands of tons of trapped sediment are released. The banks above and below these dams, subjected now to new forces, also collapse, adding still more sediment to the stream and, finally, to the bay. Collectively, Chris Duffy warned, these mill ponds pose a much greater risk than the much larger and more imposing Conowingo Dam that we could see just below us.

**Port Deposit, MD** – After leaving the gated overlook, we re-crossed the dam and then headed south on Route 222, which took us down to the river's level—and at times, it seemed, beneath it. Here levees had been erected to keep the river in its place. Without the levees, the several houses we passed along this route would routinely be flooded. The same could be said of Port Deposit, a small town pressed tightly between the road and the river on the one side, and on the other between the road and ridge that rose up behind it. As with many towns we had passed along the way, Port Deposit had clearly assumed many different identities over the course of its long life. When we stopped at the Post Office near its center, we could see that the town was being reinvented yet again—as a resort community. Or maybe a wealthy retirement community. Along the river's edge, a complex of condominiums was nearing completion, each unit on land paired with a berth in the

water. Wennersten, author of *The Chesapeake: An Environment Biography*, our main text for the watershed emphasis of the course, had concluded his book with a summary of the new pressures facing the Chesapeake Bay. New levels of consumption—larger houses, on more land, farther away from schools and work and shopping and thus requiring more miles driven in our bigger, less fuel-efficient vehicles—meant that the rising population numbers for the region told only part of the story. The residents of Port Deposit's new condominiums were likely to consume more resources than the residents of its older buildings, even with the added efficiencies of their up-to-the-minute technologies. But can the bay carry this capacious new lifestyle?

When we left Port Deposit, we were once again led away from the river by our road. Here this may have been due to the steep bluffs that ran right up to the river's edge: there was simply no place to put a road. At Conowingo Dam, however, Chris Duffy had speculated that the original river road was now under water, beneath the surface of the reservoir that had formed behind the Conowingo and the two other dams, Lake Aldred and Safe Harbor, just above it. That was one possible answer to question we had posed at Chickie Hill. Now, however, we were on our way to Havre de Grace and the mouth of the Susquehanna River.

**Havre De Grace, MD** – We crossed into Havre de Grace, on the west bank of the Susquehanna, from Perryville, on the east bank, on Route 40. We then drove through the town, with its chaotic mix of old and new, until we reached Memorial Park on the Chesapeake side of the city. The hour was approaching 6:00, the sun was beginning to set, and a strong wind was blowing in from the bay. This spot was many degrees cooler than the riverfront at Port Deposit. Not just cooler—cold. Nevertheless, here under a boardwalk shelter in this old town where the Susquehanna River meets the Chesapeake Bay, we paused for three more presentations, presented in historical order.

Blake Goll, who delivered the first of these presentations, analyzed the story of Pocahantas. For her age group, the ur-story of Pocahantas is the Disney animated movie, an environmental romance in which a (slightly) red/brown woman tries to save her green land while saving and falling in love with a white man. The real story, Blake reported, was much more complex. The near-execution of Captain John Smith may have been a mock-ceremony. The Powhatans, the tribe of Pochantas, may have had a strategic use for the English; this was their way of making an alliance. The long-term strategy of the English, however, did not include the Indians, no matter what temporary tactical advantages they offered. The native Americans, while they certainly shaped the land, lived much more lightly on it than did the new settlers. Even apart from their direct conflicts and the diseases they brought, the settlers also quickly made it impossible for the natives to live as they had before. As for Pocahantas herself, she did marry an Englishman, though not Captain Smith, and for a time she was able to keep the peace between her two peoples. But after a successful visit to England, she died of tuberculosis on the return voyage home, in 1617. Shortly thereafter open warfare broke out between settlers and natives, and by 1645 the Powhatans had effectively been vanquished from their native lands. Similar stories could be told about Pennsylvania, I added. Indeed, in route to Harrisburg, we had passed a site where, roughly a century later, the murder of a settler precipitated a war that drove the remaining Indians out of eastern Pennsylvania.

From Pocahantas and John Smith, we then jumped forward to George Washington and the Dismal Swamp Company. Though it dealt with a wetland many miles to our south, on the southern-most edge of the Chesapeake Bay Watershed, Nick Giner's tale of the Dismal Swamp was a fitting conclusion (or at least part of a fitting conclusion) to our long trek through a part of

Pennsylvania's portion of the watershed. Though it began as a story about creating fertile farmland by draining wetlands, in the end the Dismal Swamp story was a story about lumber. And much of the Pennsylvania story of the watershed, as recounted by John Wennersten, is also a story of lumber. The rush to harvest the huge crop of timber that covered much of the watershed when the Europeans first arrived in the New World was at the root of the first major injury the colonists inflicted on the bay. Deforestation destabilized thousands of acres of hillsides and hundreds of miles of stream and river banks within the watershed. The result was a torrent of sediment flowing into the bay. This happened in the Dismal Swamp and in central Pennsylvania. It happened in the 18<sup>th</sup> century, and it is happening still today.

The final presentation at Havre de Grace was delivered by John McCormack. Again we jumped forward roughly a hundred years, this time to the Civil War. Almost immediately John's presentation provided a vivid example of how we compartmentalize our knowledge. Because we don't usually think about watersheds when we think about the Civil War, or about the Civil War when we think about the watershed, we can be surprised by the fact that so much of the Civil War was played out within the Chesapeake Bay watershed. The two capitols, Washington and Richmond, were both located within the watershed, and many of the key battles—Bull Run, Antietam, Gettysburg—were fought on its hills and fields. In his paper and in his presentation, John tried to show how the landscape of the watershed shaped the war and its battles and how, in turn, these battles, and the war as a whole, affected the watershed. Picking up on some of the broad themes that Ryan had articulated earlier in the day, John described the environmental, political-economic, and social differences that divided the North and South. Then, narrowing his focus, he analyzed the landscapes of three important battlefields. John's final note was the observation that efforts to preserve Civil War battlefields now often dovetail with the interests of conservation.

By the end of the last presentation, the wind had chilled us all. Still, before piling back into the vans, we paused to look out over the bay. The waves lapping the shore immediately beneath the shelter were black and frothy, as if filled with coffee grounds and oils; the ducks wading in the water were soiled by it. Farther from shore, the water was the color of coffee and cream, a warm, light brown. Only after looking out some hundreds of yards from the shore could one see a color that fell within the spectrum one usually associates with water. The mud that had recently coated the brush below Conowingo Dam had clearly reached the bay.

**Key Bridge – Baltimore, MD** – Before heading south, the group broke up to find refreshments and to see the sights, reassembling by the vans at 7:00. After a few wrong turns, we found our way out of Havre de Grace and onto US 95 South. Roughly 40 minutes later we were crossing the Patapsco River on Key Bridge, on the southern edge of Baltimore. Though we did not stop here, this brightly lit industrial face of a major shore city provide another example of the complex factors affecting the health of the bay.

**Annapolis, MD** – Shortly before 9 PM we arrived in Annapolis and then delivered the students to the home of George Bragdon, whose parents, Doug and Diane, had graciously agreed to host the class for the night. Faculty and staff stayed at a nearby hotel, but gathered first for dinner and conversation (see “Outcomes – For the Faculty” below) at The Ramshead Tavern in Annapolis.

## **The Itinerary – Saturday April 23, 2005 – A CBF Skipjack Excursion on the Chesapeake Bay**

Forecasts for the weekend had warned that Saturday would be a day of wind, rain, and thunder. And hail. And farther north—snow. The weather on the drive down Friday had seemed to confirm this. It had rained several times, and during our brief stop at Havre de Grace we had been chilled by the dark skies and the brisk bay winds. On Friday we could retreat from weather into the vans. On Saturday, we would be exposed on board our boat on the bay. That thought had given all of us pause.

**Boarding & Heading Out** – Annapolis was overcast when we awoke the next morning, but the sky held until we arrived at the Bragdens. Then the clouds broke. The students gathered their belongings slowly; they were in no hurry to abandon the warm, dry house of their hosts. In route to the city dock, we stopped at a tackle shop to look for rain gear. An “emergency rain poncho,” essentially a clear plastic bag with a hood, was purchased for each student. And then the rain stopped. By the time we arrived at the city dock, the air had warmed several degrees and the sky had lightened considerably. It was turning into a good day!

The Chesapeake Bay Foundation’s tour vessel is moored at the first dock in the Annapolis city harbor, just off Market Space at the bottom of Main Street. A handsome if somewhat unusual vessel, the *Stanley Norman* carries a crew of three—Paul Bayne, program director, Dave Gelenter, captain, and Claire Winchester, first mate—all of whom were on hand to greet us. In short order, all of our supplies—lunches, sweaters, and jackets—were stowed, and students and faculty, including two new guests, Kathy Hood and John White, were seated around the edges of the boat. The crew issued life-jackets all around, secured the remaining gear, and then cast off from the dock. We were underway.

A skipjack is working sail vessel with an off-board motor. Suspended from a frame that projects off the back of the skipjack, a small, sealed boat, not much larger than a row boat, encloses a gasoline-powered engine. When not under sail, the skipjack is powered by this smaller boat pushing from behind. By adjusting its position within the frame, the captain can use this off-board motor to execute fairly complex maneuvers. With a series of these maneuvers, Dave Gelenter guided the *Stanley Norman* out of the harbor and into the bay. Once out of the harbor, on the more open waters of the bay, Dave reviewed the procedures we would follow in hoisting the sails. With appropriate “ho”s and heaves, this work was quickly accomplished. The *Stanley Norman* was now being pushed by the wind, and the small boat with the off-board motor was raised out of the water and safely stowed within its frame.

**Chesapeake Bay 101** – The much more quiet power of the wind made it much easier to be heard. The deck of the *Stanley Norman* could now become the classroom for Chesapeake Bay 101, Paul Bayne’s introduction to the bay’s troubled ecology and history.

The lesson began with maps—of the watershed, of the bay, and of the Rockwell River portion of the bay in which we were now sailing. The students were already familiar with the bigger picture as a result of our work and readings in class. But the closer, more detailed pictures were new, and we gathered around Paul’s maps to get a better view.

Water flowed into the bay from rivers that traversed six different “states”: New York, Pennsylvania, Maryland, the District of Columbia, Virginia, and a small portion of West Virginia. With these waters came the two interrelated problems that now beset the bay: suspended silts and excess nutrients.

As we had seen earlier, in Havre de Grace, and as we could see now by simply looking over the sides of the *Stanley Norman*, the waters of the Chesapeake Bay were far from clear. Where they lapped the shore in Havre de Grace, the waves had been nearly black. Farther out, coffee and cream. And out farther still, the water looked as it did alongside our vessel: a cloudy green. Like the clouds on an overcast day, the cloudy water blocked sunlight. Without sunlight, the bay grasses that had once covered many miles of the bay's shallows could not grow. And without the bay grasses, a vital habitat, the Chesapeake's famed blue crab could not thrive. Simple suspended silts, in and of themselves, severed an important link in the bay's ecology.

But most of the silts suspended in the bay were not simple; they did more than simply cloud the water and block the sunlight. Much of the soil flowing into the bay contained excess nutrients, especially nitrogen and phosphorus, that clouded the waters in another way: by promoting algae blooms. Water, soluble nutrients, and sunlight create the ideal medium for the growth of algae. In smaller concentrations, algae are an important part of the aquatic food chain, but during times of explosive growth—blooms—algae break that chain. As the single-celled plants rapidly multiply, they consume oxygen, often to the point that other creatures cannot “breathe” in the depleted water. And when the blooms die, the process of decomposition continues to tie up the dissolved oxygen. In extreme cases, the result is a “dead zone,” anoxic (oxygen-deprived) water in which nothing can live. But algae cells, whether living or dead, also cloud the water, cutting off sunlight as well as absorbing oxygen. Thus, nutrient-bearing silts compound the bay's problems.

As a result of deforestation, intensive agriculture, insufficiently treated waste water, and depositions from automobile exhaust, thousands of tons of nutrient-rich sediments enter the bay each year. This would overwhelm even an otherwise healthy bay. But overfishing, especially of oysters, has further handicapped the bay. The much-reduced oyster beds, 2% or less of the huge banks found by the first European settlers, can filter only a fraction of these turbid waters each year. The bay's self-cleaning mechanism has been shut down even as the flows of soiled waters have increased.

David illustrated this last point by pulling out an aerial photograph of the Chesapeake Bay watershed after hurricane Isabel brushed the Northeast in 2003. On the laminated color photograph he traced several bright brown lines that burst into broad patches when they reached the open water of the Chesapeake. These were rivers, most notably the Susquehanna and the Potomac, carrying the sediment-laden runoff from the storm to the bay. On the photo, he then traced the route of another river, its blue channel hard to see against the dark-green edges of its forested banks. Here the water was running clear because the healthy watershed, with its established forests and wetlands, could absorb and slow the excess flow and thus hang on to its soil. The bay would only recover when the other rivers ran as clear as the York.

His own lesson concluded, David opened the deck for questions, and then announced that we would break for lunch while the ship made its way to the oyster reef.

**Dredging for Oysters** — Having finished our lunch, generously provided by the Bragdon, and still having some way to go before we reached the oyster reef, we gathered back around the center of the vessel to hear another student presentation.

George Bragdon had researched the tragic history of the Chesapeake Bay oyster. We'd already heard part of that story in Paul Bayne's “Chesapeake Bay 101” lecture, and soon we would be getting our own hands-on experience of oysters in the bay. George's role was to provide some

additional context and color. Always and still vital to the bay's ecology, for much of the bay's history the oyster was also vital to its economy, the wealth humans drew from the bay. When the first Europeans arrived in the New World, the bay was striated by long, ship-wrecking oyster reefs. Oysters almost immediately became a part of the New World's trade with the old. Even the oyster's empty shells were valuable, as we learned from Mike Lizerbram's presentation, in revitalizing the exhausted soils of the first settlements. As the region's population grew, so did the trade in oysters. By the mid 1800s, the "oyster industry" was a mainstay of the region's economy, especially in Baltimore. By the late 1800s, however, it was becoming clear that the oyster banks were not limitless. Ever more boats were trying to dredge in the same finite space. The first attempts at regulation were limited and, because two different states were involved, inconsistent. The Oyster Wars of the 1860s, 70s, and 80s—the skirmishes between competing groups of oysterman and the gun battles between oyster pirates and oyster sheriffs—called the public's attention to the Chesapeake's version of the tragedy of the commons, the degradation of a common resource because no one will limit his personal take in order to preserve the total stock. Still no effective action was taken, and by the middle of the 1880s the numbers for the annual harvest started to decline. Pollution and disease soon added to the pressures on the bay oysters, and by the 1920s the oyster industry was shrinking year by year. With the decline of the oyster, and the loss of its filtration, the bay itself declined. Restoring the health of the bay requires the healthy return of the oyster. Hopes are now pinned on an Asian oyster resistant to the parasite that afflicts native bay oysters; scientists are now closely monitoring an experimentally-seeded reef.

After hearing this second profile of the Chesapeake Bay oyster, we were now ready to meet the creatures themselves. As we floated over the marked and protected oyster reef that rose up to within 10 feet of the bay's surface, Paul Bayne explained the process of "dredging." The dredge is a large, squared, cast-iron maw, with teeth extending from its bottom jaw and two heavy ropes tied to rings hanging from its upper. To begin a run, the crew carefully coils the two ropes onto the deck and then drops the dredge over the side. When sufficient lengths have been fed out, the two ropes are tied to cleats on the deck. Then, under sail, driven only by the wind, the ship drags the dredge over the oyster reef. When the captain believes the dredge has been filled, he instructs the crew to untie the ropes and, by hand, to haul the load up on board. To complete this last phase of the process, Paul Bayne set up two lines of volunteers and then handed each line a rope; in short order we had lifted the dredge up out of the water and, guided by Paul, onto the deck. Paul and Claire then emptied the dredge onto a worn piece of marine plywood.

Now it was Claire's turn to instruct the group. Crouching behind our small catch and holding up a gnarly clump of shell and rock, Claire explained how oyster reefs are formed. As oysters filter the water, they extract particles which they then gather into viscous tubes of slime. When excreted, these coils function like a cement, binding shell to shell to rock, creating the kind of clump she held up for our inspection. Amid this porous mass of rock and shell lived a variety of creatures.

First and foremost, of course, there was the oyster. Past dining experiences, as well as the present catch, would suggest that the oyster was a small creature, no bigger than 4–5 inches in length, but in their letters and dairies, the first settlers recorded lengths of 10–12 inches. All had the same shell shape and body parts, however, which Claire now reviewed by prying open one oyster and then carefully parting and sorting the softer tissues inside. Having sacrificed the one, Claire then took care to gather up the remaining oysters, which she placed in a small tank of bay water.

Left on the plywood sheet were the clumps of broken shells and rock. On these Claire invited us to search for other creatures: worms, crabs, other bivalves. In short order, examples of each were found. Of particular interest to the students were the five or six mud-crabs that, once exposed, scuttled between back and forth between them.

By this point in the day, the skies were beginning to confirm the grim forecasts we had received for that afternoon's weather: thunderstorms. Paul and Dave wanted to start back in to insure that we could dock before the storm hit. Wind and waters permitting, we would still attempt to perform the last two activities, water testing and trawling, in route.

But once underway we first gathered midship to hear the final student presentation: Jennifer Martin's account of the bald eagle's history with the Chesapeake Bay and its watershed. When the first European settlers arrived in the region, the bald eagle was nearly ubiquitous on the bay, with as many as 4,000 nesting pairs. As the human population grew, the eagle's numbers naturally declined, as much through habitat loss as through hunting. With the introduction of DDT in the aftermath of WWII, however, its prospects changed dramatically. A remarkably effective pesticide, DDT is also a remarkably durable compound. And fat-soluble. When consumed by animals, whether directly or indirectly, it is absorbed by the fatty tissues where, because of its durability, it builds up over the life of the animal. The dynamics of the food chain further compound this problem. A predator absorbs much of the DDT its prey has accumulated in its tissues. And the predator of a predator—an eagle that feeds on fish that feed on arthropods that feed on plankton that have filtered the DDT in the water—further concentrates the fat-soluble compounds already concentrated in the predator/prey. As one of the top-level predators in the Chesapeake Bay's food chain, the bald eagles were accumulating very high levels of DDT. The effect of these high doses was unexpectedly indirect, however, and thus was not immediately observed. The DDT did not impair the health of the adults, but it severely weakened the shells of their eggs, which were often crushed in the nest as a result. After several years of DDT spraying in the region, the bald eagle population began to plummet because the pairs successfully hatched fewer and fewer eggs each year. In 1967, it was estimated that fewer than 80–90 pairs still nested in the region. Only after DDT was banned and the bald eagle was declared an endangered species did the situation begin to turn around. Although habitat destruction bars the return to its pre-Columbian population, the bald eagle is no longer endangered. Nesting pairs are common in the parks around the region, including one near Jennifer Martin's hometown in Waldorf, Maryland. But the eagle's future is by no means secure, in part because there are new calls to lift the ban on DDT!

Still concerned about the weather, we were now close enough to the harbor for a quick run to safety. To do that, or to conduct our last two exercises, however, we had to drop sail and shift power and navigation to the outboard motor. Captain Dave led us through this procedure, lining all of us up on the deck to handle the ropes for the sails and the boom. The sail stowed, Dave returned to the stern, started the outboard motor, checked our bearings, and then turned control of the ship over to Paul.

**Testing the Waters** — After setting our course and positioning Paul behind the wheel, Dave then guided us through our next encounter with the bay: taking the measures of its waters. Our previous lessons had told us that the related problems of excess sediments and excess nutrients, the causes behind the baygrass-killing and oxygen-depleting algae blooms, are the principal impediments to the bay's good health. The relative impact of these problems, we also learned, is affected by several other factors, such as temperature and the mix of fresh and salt water in the bay. All of these vectors could be measured. We were about to give the bay a physical.

Before assigning us our separate tasks, Dave briefly described the different pieces of equipment we would be using to make our measurements. Then, sending us to separate stations on the deck, Dave distributed the equipment and handed each team a laminated set of instructions. On top of the hold, Dave then placed a white eraseboard on which we were to write our results.

In roughly twenty minutes our five teams had completed our measurements. John McCormick and Mike Lizerbram measured the temperature and the salinity at different depths in the water. Kevin Dressler and Nick Giner measured the turbidity. Jennifer Martin and George Bragdon measured the oxygen, again at different depths in the water. Grace Clauss and Blake Goll measured the pH. And John White and I measured the phosphorus. The results were as follows: turbidity = 2.25 ft; pH = 7.5; temperature = 55degrees Fahrenheit; phosphorus = less than 1 part per million (ppm); salinity = 4.2 @ 5', 5 @ 10', 5.3 @ 15', and 4.4 @ 20'; and the dissolved oxygen was 9.5 ppm at the surface, 8.3 ppm at 10', and 4 ppm at the bottom.

As he reviewed the results, Dave explained their significance. All but one measurement met the target levels spelled out by the Chesapeake Bay Program. We were looking at healthy waters. The reason for this, Dave suggested, was that we were floating just beyond the mouth of a river, the Rockwell, that was pouring fresh, oxygen-rich water into the bay. The water was likely light in nitrogen and phosphorus because the comparatively short river ran through a well-settled landscape that had not recently experienced a major storm. The one shortfall, turbidity, indicated that the bay as a whole was too rich in sediments—and too poor in the oysters that filter such sediments out. Dave reinforced this last point by calling our attention to the water tank that held the oysters we had saved from our dredging run: the water was getting clearer.

**Trawling** — We were now ready to sample the life in these waters. To begin the trawl, Paul and Claire unrolled the net down the length of the boat and then asked us to line up behind it. On their command, we picked up the net and stepped to the rail. Then, coordinating our actions with Dave's handling of the boat, Paul asked George to toss the “duck-ass” buoy into the water and, a moment later, told the rest of us to drop the net. In short order, the net stretched out at an angle to the skipjack and sank into the water. Now Paul arranged us in two lines at the center of the boat, facing the gate in the railing. After roughly ten more minutes of trawling, Paul handed us the ropes and instructed us to haul in the catch.

There was, in fact, a catch to haul in: 8–10 white perch ranging in size from 4 to 12 inches. These Paul poured into a second tank of water, inviting us to step in for a closer look and even to handle the fish—carefully. A few of us took him up on his offer and, while at the tank, asked him what else they had caught in their nets in recent years. He spoke of rockfish, shad, and, on one memorable occasion, squid. When we ran out of follow-up questions, we returned the fish to the bay. In his final comments, Paul again called our attention to the tank of oysters. The water was unquestionably clearer than when we had first poured it into the tank; the oysters were doing their job, filtering the water.

**Returning to the Dock . . . and State College** — A strange thing happened on our way back to the city harbor of Annapolis: the threatening clouds cleared and the sun came out. By the time Captain Dave maneuvered the *Stanley Norman* into its berth, the temperature had climbed at least 10 degrees. It was a bright and beautiful day. We spent the next 20 minutes unloading the ship and loading the vans and then bade the crew farewell. Before taking our leave of Annapolis, we agreed that faculty and students would split for 45 minutes of free-time in the downtown square.

Students and faculty met at the vans at 4PM for the return trip home, which we completed by 10 PM.

## Outcomes

### 1. For the Students

As they explained in the journals they submitted afterwards, on their trip Across the Watershed to the Bay the students discovered a new sense of connection: to nature and the environment, to their home communities, to the places with which their home communities are environmentally linked, to the news, to the materials we read in class, to their own research papers, and, perhaps most importantly, to each other.

By happenstance, roughly two-thirds of the students who had registered for the course had grown up within the Chesapeake Bay Watershed. And of these students, roughly two-thirds lived in the upper watershed, in Pennsylvania, while the remaining third lived in bayside communities in the lower watershed, in Maryland or Virginia. These ratios held true for the roughly two-thirds of the class that actually went on the field trip. One outcome of the trip, then, was that watershed residents got a much better sense of their watershed neighbors. The two who had lived on the bay paid very close attention to our trip down the Susquehanna; those who had lived in Pennsylvania now understood, in very concrete terms, the bay to which their communities were connected by the Susquehanna and its tributaries.

Because the field trip came at the very end of the semester, the students had already completed both of the major texts for the course: Bjorn Lomborg's *The Skeptical Environmentalist* and John Wennersten's *The Chesapeake*. The first book had provided a global picture; the second focused exclusively on the watershed and its history. Again as noted in their journals, through the field trip the students were able to connect these readings, especially Wennersten's book, to concrete points of reference. Further, the three different overviews—Kenn Pattison's DEP presentation in Harrisburg, the connected vignettes of the journey, and the CBF's "Bay 101"—all reinforced and re-contextualized Wennersten's environmental biography of the bay. Several students specifically noted that they now read or hear environmental news differently.

Delivering summaries of their final papers over the course of the field trip, sometimes in settings directly related to the topics of their research, also provided the students with the opportunity to re-think their own work. Not in the sense of recanting a position but of revisiting one's thoughts. In many cases, their work now made more sense for them. And they could now see ways they might act on that sense: groups they could join, lifestyle choices they could make, votes they could cast.

Finally, the field trip was a real opportunity for this set of students to bond with one another. Some lasting friendships may have been formed on this trip, friendships that might significantly affect the Penn State experience for these freshmen. Many expressed regret that the field trip had not been scheduled earlier in the semester, or that they had not taken this course in the fall. They wanted to capitalize on the relationships they had formed and worried that they might not find each other again when they returned next fall for their sophomore year.

## 2. For the Faculty

With my English class for those two days were four other groups engaged in researching, teaching, and writing about the watershed. The Across the Watershed to the Bay field trip provided an excellent opportunity to compare notes and to consider future plans of action.

Chris Duffy, Kevin Dressler, and Peter Beeson had been working together, under the auspices of Penn State's Land and Water Research Institute, on a variety of projects related to the Susquehanna, most notably the project to set up a Susquehanna River Basin Hydrologic Observation System with support from the National Science Foundation.

Robert (Bob) and Valerie Burkholder were the veterans of several major field trips he had organized—week-long hikes of the Appalachian Trail and long kayaking excursions along North Carolina's ocean beaches—as complements to the in-class content of his courses on nature writing.

John White, professor of Art Education at Kutztown University, and Kathy Hood, associate professor of Human Development and Women's Studies at Penn State, had both joined us for the skipjack excursion, an invitation I had issued to repay the opportunity to participate in a cultural and historical exploration of the Schuylkill River watershed that John had led the previous summer.

Finally, our digital cameraman and Penn State Master Gardener, Keith Diehl, was also there representing the eyes and ears of Rosa Eberly, the recently announced director of the Laboratory for Public Scholarship and Democracy at Penn State.

In short, all of us there had experimented with ways we might help students more meaningfully engage their natural environments. Two times during the field trip—first during our late Friday-evening dinner and then during our post-skipjack break, both times in collegial Annapolis venues—we had an opportunity to talk about what we had done and to think about what we might do together. Gathered here are our reflections on the general questions/problems that must be addressed in order to make the most of the costly, both in terms of energy and funds, undertakings that student field trips represent. Below, under “For the Work on the Watershed,” are also listed the future projects we are actively considering.

Most of what we discussed could be gathered under three questions/problems: (1) How can we help students engage and record the experience(s) of a field trip? (2) How can we help students process the experience(s) of a field trip? and (3) How can we “publish” student and/or student / faculty work so that it could effectively contribute to the decision-making discussions of the concerns/issues for which the field trip was undertaken? Our answers to these questions varied with the kinds of field trips we had organized; still, some generalizations were possible.

Students need ways to record both what they see and how they react to what they are seeing, but they should not withdraw behind those techniques or technologies. Bob Burkholder has provided pencils and pocket-sized memo books for his students; something in which they could jot down a quick note and then put away, keeping their hands free for the hands-on experiences of the field trip. John White encourages his students to carry sketchpads and, in a small portable pack, a basic set of art supplies; his model was the artist in the field. Donna Meyer, of the Schreyer Honors College, recommends that each student be issued a small disposable camera. Finally, as Keith Diehl had daily demonstrated, there is now a very broad range of digital equipment available for recording still images, moving images, and sound. Clearly, we do not lack for options. Getting the students to actually use these options, however, is another matter. Almost none of the students had used the memo pads I provided. Perhaps we need to consult their preferences?

Whatever they return with in the way of notes and mementos, the students must then make their own sense of the material. Bob asks his students to submit a 2–3 page journal entry within a week of their return from a fieldtrip. John had his students, art teachers who were taking summer courses for advanced degrees or certifications, prepare group presentations. For some of Chris Duffy’s more strictly disciplined outings, a research report has been the logical output. While I did require a one-page journal, this field trip came too late in the course for the students to respond with a major paper. On the other hand, the faculty had enjoyed the summaries the students had presented of the major papers they had submitted just before the field trip; the students’ work had contributed to the success of the trip. In planning future trips, it was agreed, we should consider how the field work could profit from and then benefit the students’ work on campus.

The final question is both the most interesting and the most difficult. All of us feel that the writing done both for and in response to these trips should have an audience beyond the students and their instructors. We were engaging problems and issues of real concern to the public; the public should be able to read our responses, results, and proposed solutions. Because John had worked with teachers, their students constituted a broader audience, a public, for their work on the Schuylkill River watershed. In together considering ways to share our work on the Chesapeake Bay Watershed, we agreed, in general terms, that we should use a variety of media (print, radio, internet) and genres (research reports, editorials, essays, pamphlets, maps, public service announcements etc.). Special attention, however, should be paid to the ever expanding possibilities of the internet. And in response to that challenge, we have begun work on the specific projects listed below.

### **3. For the Work on the Watershed**

When Chris Duffy and I first began talking about the Chesapeake Bay Watershed, in the summer of 2002, I already had plans for a radio program and he had already been working on his plans for the Susquehanna River Basin Hydrologic Observation System for more than seven years. Our work together, including the Across the Watershed to the Bay fieldtrip, has advanced both of these plans, discussed under “Current Projects,” but it has also prompted us to consider several new projects, discussed under “Future Projects.”

#### **— Current Projects**

**The *Chesapeake Chronicle*: A Radio Watershed Report** — Our Across the Watershed to the Bay fieldtrip repeatedly highlighted the political lines dividing the parties that must work together to solve the problems of the bay. A similar point could have been made regarding the media: the watershed is subsumed by many national media markets and subdivided by many local and regional media markets, but no media now present a regionally-defined message across the watershed. For this reason, it’s difficult to communicate to watershed residents about the watershed.

Radio offers one potential solution to this problem. Radio programs can be economically produced and, if properly recorded and packaged, economically transferred from one station to another. Recognizing this logic, in 2002 I began pitching a proposal for a weekly radio program on the Chesapeake Bay Watershed that could be syndicated to all the NPR affiliates broadcasting

within the watershed. Initially I envisioned a one-hour program, but conversations with NPR affiliates in Baltimore, Harrisburg, and State College convinced me that it would be better to start with a much shorter program, something that could easily be inserted into local broadcasts of *Morning Edition* and *All Things Considered*. *Star Date*, the two-minute astronomy program broadcast daily on NPR stations across the country, provides a successful example of this approach. And with that model in mind, WPSU has agreed to produce a pilot series to gauge the level of interest a focused environmental program might hold for other NPR stations in the Chesapeake Bay watershed. We hope to have the pilot series, of 5–10 two-minute episodes, ready for distribution by the end of the summer.

This pilot will probably be marketed as a weekly insert, that is, only one episode would be aired each week, although that episode might be aired several different times in that week's schedule. But after reviewing my students' watershed essays, and hearing their presentations during the field trip, I am convinced that we could soon be producing a daily program. The region's diverse history, which can be correlated with the calendar, and the region's rich ecology, which can be correlated with the seasons, together provide more than enough material to fill 365 episodes each year. Student research and writing will continue to contribute to this story-gathering process.

These programs would tie environmental news to the environmental region in which its listeners live and, as citizens, act. The region's cultural and natural histories would be linked to the core narrative about the region's principal environmental problem: excess sediments and nutrients running off the lands of the watershed into the waters of the bay. Rachel Carson's birthday (May 27, 1907), for example, could be observed by noting that some of her first pieces, published in the *Baltimore Sun*, were about the Chesapeake Bay, and her final book, *Silent Spring*, is a still relevant reminder of the damage humans can do, such as nearly killing the bay with excess nutrients, when they live heedless of their impact on the land. Each day, listeners will be encouraged to celebrate the history and natural beauty of the Chesapeake Bay watershed—and to be more mindful of its needs.

Shepherding this program through production will be one of the first ways I will follow up on the success of our Across the Watershed to the Bay field trip.

(See the *Chesapeake Chronicle* proposal that accompanies this report.)

**The Susquehanna River Basin Hydrologic Observation System (SRBHOS)** — As noted above, the SRBHOS (<http://www.srbhos.psu.edu/default.asp>) has been on Chris Duffy's agenda since the mid 1990s. After participating in the Across the Watershed to the Bay field trip, Chris added a new research experiences for undergraduates (REU) site proposal to the ensemble of funding requests he has been drafting and revising in pursuit of this multi-year, multi-site study. Public outreach—and research on the difficulties of and opportunities for conducting public outreach on regional environmental issues in the new age of digital communications—now occupies a more prominent place in those plans, and the Across the Watershed to the Bay field trip enabled us both to test and to formulate new ideas about public outreach, three of which are being considered for future projects.

## — Future Projects

**The Natural/Historical Map of the Chesapeake Bay Watershed** — Our separate projects with two different but similar website maps have convinced us that a more sophisticated website could combine natural and historical features and could serve as an effective way to publish student research on a variety of regional topics.

Chris Duffy’s SRBHOS website includes a subdirectory of maps and documents for SRBHOS testbeds, stream- and creek-sheds within the Susquehanna River Basin where preliminary data collection is already underway. The descriptions of these stream- and creek-sheds follow a standard protocol and layout, which includes a map. What Chris Duffy has begun to do for the Susquehanna River Basin, we propose to do for the entire Chesapeake Bay Watershed.

But to these basic descriptions of stream- and creek-sheds we propose to add a variety of cultural and natural/historical narratives. The model we would follow here is the Literary Map of Pennsylvania (<http://www.pabook.libraries.psu.edu/litmap.html>), a project of the Pennsylvania Center for the Book, directed by Steve Herb. Moving over the interactive map, county by county, one can call up brief biographies of cultural figures that have some connection with the commonwealth’s towns and cities. These biographies, which all follow a very strict set of style guidelines formulated by the Center, have been written by the students in a succession of Editorial Process (English 417) classes, including the eight sections that I taught from 2003–2005. In this way, students who have researched, written, and edited work for their courses have also created a resource that is now available to the general public through the internet: The Literary Map of Pennsylvania. We believe this model can be used for “publishing” student work on the Chesapeake Bay Watershed.

Like Chris Duffy’s SRBHOS maps, our Natural/Historical Map of the Chesapeake Bay Watershed would be subdivided into river-, stream-, and creek-sheds. After calling up an enlargement, you would then see a variety of icons scattered over the individual “shed” you selected. By highlighting one of these icons with your cursor, you could then call up the biography of a historical figure; the natural history of a particular plant or animal; the narrative of a significant event, whether natural (a flood), historical (a battle), or technological (completion of a dam); the explanation for a particular feature of the landscape, perhaps, a geological formation; or a recent set of environmental, or hydrologic, measures. All of these texts could be written by students, working in a variety of different courses but following the same set of guidelines. Like the Literary Map of Pennsylvania, we would want this Natural/Historical Map of the Chesapeake Bay Watershed to be available to the general public on the internet, and we would hope to establish links with as many other Chesapeake Bay sites as possible.

**The Grand Tour** — Our Across the Watershed to the Bay field trip traversed only a quarter of the Chesapeake Bay Watershed’s full length, which stretches from the headwaters of the Susquehanna at Cooperstown, New York, on the south end of Otsego Lake, to the mouth of the Chesapeake Bay, where Virginia Beach, Virginia, rests on its southern lip. Having thoroughly enjoyed our journey from State College to Harrisburg to Havre de Grace to Annapolis, both Chris Duffy and I were both tantalized by the prospect of a Grand Tour.

Clearly a journey of several days and some expense, we concluded it might best be reserved for teachers seeking additional certification or innovations for their classrooms. While a variety of itineraries are possible, one trip might begin with an overnight stay in Cooperstown, NY, then follow the Susquehanna down to Lewisburg, PA, then continue, on the third day, down to Harrisburg and then to Havre de Grace. The fourth day we would travel from Havre de Grace to Woodbridge, south of Washington, DC; and on the fifth we would make our way to Virginia Beach, Virginia. The sixth day we would start back north by crossing over to the eastern shore on the Chesapeake Bay Bridge/Tunnel, then hitting Cambridge and Saint Michaels before re-crossing the bay, on the upper Bay Bridge, to enter Annapolis. On the seventh day, we would rest briefly before making our separate journeys home.

Several objectives would be pursued over the course of this long journey. Each day we would walk through a forest and assay the different species of trees, bushes, wildflowers, birds, insects, and any other fauna we might see. We would also spend some time on or near the water, to make a similar assessment of water quality and life. And we would use our time on the road to consider, by means we would devise in route, the kinds and degrees of land use. The teacher-students would be asked to record their experience in a variety of media. And each night we would discuss how the “lessons” of the day might be applied in their classrooms.

Through this experience we would hope to educate and inspire teachers to incorporate the watershed into their lessons—lessons about the environment, about basic science, and about regional history and culture. We would also hope to recruit teachers, and through them their students, for work on our different “publishing” projects: the chronologically-driven radio program, the geographically-driven natural/historical map, and the topically-driven Chesapeadia.

**The Chesapeadia** — Modeled on the Wikipedia, the Chesapeadia would use the same wiki programming to create an open site for the publication of all things Chesapeake. Wikis are ever-evolving sites of endlessly edited documents. Anyone can make or edit an entry. The architecture of any given site may permit outright deletion, or it may retain a full record of the text in all its permutations, thus allowing the “restoration” of deleted passages by simply returning them to the current level. The natural method of organization here would be alphabetical, but we might be able to impose and to enforce a basic topical structure.

While the Chesapeadia would also be open to contributions from the public at large, we envision it first and foremost as another site for the publication of student research and writing. The genre, encyclopedia, naturally favors some forms of writing over others: histories/biographies of proper nouns and definitions/explanations of common nouns and verbs. Other forms could be derived from these, however, and we would want to encourage as much experimentation as possible. In particular, I would hope that the Chesapeadia could be a place where students can publish oral histories of family members—parents and grandparents, aunts and uncles—who have had first-hand experiences of the changing water- and landscapes of the Chesapeake Bay Watershed.

## Conclusion

Everyone who participated in Across the Watershed to the Bay, but especially the students, has since described the field trip as a positive and meaningful experience. And some of those expressions directly confirm the fact that the field trip achieved the purposes for which it had been planned.

- The students were able to link the global environmental issues discussed in Bjorn Lomborg's *The Skeptical Environmentalist* with the natural features and human actions we observed on the Chesapeake Bay Watershed.
- As we traveled down the Susquehanna and out onto the bay, the students could and did connect actions on the watershed with their consequences for the bay. Several specifically commented on what they saw at Conowingo Dam on Friday and what then they observed from the *Stanley Norman* on Saturday.
- On several occasions, students were presented with evidence of the difficulties that both intra- and inter-state politics posed for the formulation of effective policies, the kind of economic, environmental, and planning policies that the restoration of the bay requires.
- Some of these presentations were made by the students themselves, a confirmation that the students were able to share their own research with their companions, both students and faculty, in a way that contributed to what all of us learned on the trip.
- And, finally, the students most definitely had a personal, memorable, experience of the bay itself. Even those two students who had grown up on its shores noted that the trip down the Susquehanna altered their perspective of the bay.

Beyond these purposes, however, the field trip also achieved several other ends.

Across the Watershed to the Bay provided an opportunity for several faculty members to have an extended conversation about two interests they all shared: the environment and teaching. From this conversation emerged a renewed commitment to our craft and to our cause, as well as some specific ideas about how these commitments might be met. Among these ideas were some critical reflections about the planning and conduct of environmental field trips.

The field trip also facilitated the joint planning of several new projects about the Chesapeake Bay Watershed and its separate river basins, notably the Susquehanna River Basin. The working relationships formed or enhanced by our trip Across the Watershed to the Bay will result in new research experiences, new sites to publish the results of those research experiences, and, quite probably, new field trips.

Finally, the working relationships formed between our group and the institutions and organizations with which we engaged over the course of planning and making our journey will likely result in new ways to communicate with the citizens of New York, Pennsylvania, Maryland, Virginia, West Virginia, and the District of Columbia about the environment they share in common: the Chesapeake Bay Watershed.

For all of these reasons, we thank our sponsors, contributors, and participants for making the Across the Watershed to the Bay field trip such a success.