Astronauts called Earth “the blue planet.” Maybe it should be called Water, not Earth, because it is water that makes Earth habitable. Water is essential to all life. Most living things live in water, including a good share of what we eat. In fact, most living things mostly are water.

People are nearly half water, and we can go only a few days without drinking. It is our most essential commodity and probably our most multifaceted resource. Water irrigates our crops, floats our ships and barges, carries away our sewage. It turns the turbines in hydropower, oil-fired, coal-fired, and nuclear power plants. It is the universal solvent we use for washing, bathing, and many industrial applications. And unlike other solvents, water isn’t flammable (it smothers fires), so municipal water supply systems do dual duty as firefighting systems.

Water also has many less-tangible uses. It is beautiful, it reflects images, scatters light, and makes soothing sounds, so water features are a popular aspect of landscaping and scenery. It is fun, so recreation spots almost invariably include it: we vacation beside it, ski or boat on it, fish in it, swim in it, and soak in it in springs and spas. Water also carries great symbolic value: we use it in religious ceremonies, we build fountains and reflecting pools at our most special places.

Because water is important to people, plants, and animals in so many diverse and competing ways, its management as a resource calls upon an array of skills and talents. A geographic education is arguably good preparation for a career in water resource management. Geographers learn to imagine places as they once were, to think about how and why places have changed. We learn to look at both natural and human processes when we seek explanations, and to examine places and patterns at a variety of scales, from local to global. Geographers also learn to examine issues and phenomena
from varied cultural, social, and disciplinary perspectives. We even talk of such humanistic abstractions as beauty, health, justice, and naturalness.

Today, I’ll share some observations and findings about geographers and water resource management. I’ll focus on a survey of geographers recently employed in the field that I conducted in the course of academic program review. As geography professors, we strive to offer excellent training for future resource managers. But in this era of Student Learning Outcomes Assessment, we are called upon to evaluate what we are in fact teaching our students. Are they learning what they need to know to find jobs and to work effectively in their chosen careers?

I sent out an e-mail survey to all current San Francisco State geography students and recent graduates who are employed in water resource management. I asked four open-ended questions:

1. How did geography prepare you for work in water resource management?
2. Compared to your colleagues in other disciplines, what special skills or abilities do you bring to your job?
3. Do you have a different perspective than your colleagues? Did geography train you to see things differently, or not?
4. What particular classes were important in preparing you for your work? What other classes do you wish you had taken, in preparation for your present job?

I discovered a pattern. Most of these students were broadly trained geographers who used a specialized skill (often a technical specialty such as cartography or GIS) to secure a position. Once on the job, they set out to gain a substantial amount of additional specialized background and training, as well as to familiarize themselves with bureaucratic standards and institutional procedures essential to their job performance. Still, they have continued to value the breadth of their geography background, and they are valued by their employers and colleagues for this breadth of understanding as well.

While we usually discuss aggregate data from survey results, I would prefer to examine several students’ responses in order to see how education, training, and job skills have facilitated individual career pathways. Let’s look at five examples.
First, there’s Paul, who earned his B.A. in geography and will complete his master’s thesis this year. After an internship with a Regional Water Quality Control Board, he was denied the option to test for a full-time environmental specialist position; in this way, his lack of specialization hurt him. He was employed by the Board as a contractor, then took a position as staff scientist with a nonprofit institute’s Watershed Science Program, where he works with a team collecting land-use, historical, and geomorphic data for Bay Area watersheds. Local, state, and federal governments and watershed groups use this information to plan restoration efforts, to assess impairment to fisheries and other aquatic species habitat, to measure channel changes, and to predict flood control implications due to increased sediment input.

Paul believes that the most notable difference between his perspective and that of many of his colleagues is “the ability to view the Big Picture while still having an understanding of the specific issues. So many people from different fields are unable to share this view because of their highly specific scope,” he finds. “Specialists are critical, but their disadvantage is often an inability to assemble all of the critical components that drive water resource issues… My broad scope as a geographer is an asset to me and to the people I work with.”

Paul credits geography with his appreciation for the spatial relationships that are often a crucial aspect of water resources, and for his ability to discuss the many issues that water resource managers face. The geography classes that most benefited him include physical geography, geomorphology, water resources, geographic techniques, regional environmental issues, GIS, and field methods.

He has also found that it helps to understand different communities and their perspectives on environmental issues. “You need to be personable and real while talking to the rancher that has dumped tires in a creek because he thought it was the best way to stop a head cut, as well as straight and stern while you tell a water district that they need to change their plans for a multimillion dollar flood control project. There is definitely a trick to successfully communicating in water resources, especially as it becomes more and more community driven.”
Valuable courses for Paul outside geography included ecology, geology, statistics, and biology. Paul wishes he had taken more science—chemistry, geochemistry, physics, hydrology, hydrogeology, fisheries biology—as well as more classes in physical geography, land-use planning, and environmental policy. He recommends that anyone interested in water resources "find a good internship and a mentor early on, and be prepared to volunteer [their] time in the beginning." He thinks geographers should be encouraged to find a specialty.

Another respondent, Cristina, has a bachelor’s in mathematics and a master’s in geography. She works as a systems analyst for an environmental nonprofit, where her primary duties include administering and maintaining databases and data sets for monitoring and research concerning biological invasions, wetlands, watersheds, historical ecology, and contaminant concentrations in water, sediments, fish, and shellfish tissue in the San Francisco Bay Delta.

Like Paul, Cristina values geographers’ Big Picture perspective. "We’re trained to incorporate the many different components involved in water resource management. This is a tremendous advantage, since all of the stakeholders must be involved in order for a resource management plan to be effective and successful," she explains. "By being aware of many issues that must be addressed in resource management, I think geographers are better prepared to communicate and to work with the various groups." She concedes, though, that "a potential disadvantage of the focus on a broad background in geographic training is that in-depth knowledge on scientific topics must be actively pursued from other disciplines."

Cristina values courses in cartography and GIS that taught her to work with and create maps and to display information in a clear and effective way, and an environmental management course that introduced concepts for environmentally conscious planning and management. Since she completed her master’s, she has taken several technical classes in data management. She wishes she had more advanced training in GIS, hydrology, and chemistry, as well as a policy course highlighting how government, private, and public organizations operate and how they differ in their decision-making.
President’s Plenary Session: Geography’s Contribution

Jeff, a third respondent, has a wide-ranging background: a BS in geology, an MFA in printmaking, and soon an MA in geography. He works at a federal agency managing the remote sensing and GIS aspects of the Lower Colorado River accounting system. Jeff generates crop and riparian acreage summaries used in allocating water resources. He is helping to design a land-cover and land-use information system for the Central Valley, and gives numerous presentations to facilitate this cooperative effort. He is also involved in a cooperative state and federal effort to provide Central Valley crop data for water planning purposes.

Jeff values the technical expertise he gained in GIS and remote sensing courses—expertise that got him his job. He appreciates geography’s spatial perspective, observing that “many people I work with don’t really relate to information in a spatial context, or quantitatively within that context.” He also appreciates being a well-rounded geographer, noting that he learned a lot from writing a seminar paper about historical water issues on the Lower Colorado River. “Though much of my present work is from a technical perspective, water resource management is very political and I don’t believe my present work would be as good without this perspective.”

Jeff wishes he had taken a course about resource and planning documents and environmental impact statements, since “the ‘required by law’ aspect of much of water resource management is really important.”

Another respondent, Lisa, has a BA in technical and professional writing and a minor in biology, and is about to finish her master’s in geography. She has held a series of internships, both paid and unpaid, one of which involved researching and writing a book on California water issues. She now works as outreach coordinator for a statewide nonprofit involved with urban stream restoration. Besides performing field surveys, helping design restoration projects, writing grant proposals, and performing hands-on work to implement restoration projects, Lisa also works with community creek groups and private owners, helping them deal with erosion problems in an environmentally friendly way, and conducts historical and geographic research on Bay Area watersheds. She is helping an
elementary school develop a creek stewardship program to enhance both the school’s grounds and nearby creek, and its science curriculum.

Like the other respondents, Lisa believes the geographer’s perspective is an advantage. “I think for me the idea that anyone would study the landscape the way geographers do—from physical and environmental perception perspectives, which can influence each other, was eye-opening.” Although she hasn’t formally studied cartography, she has found that her geographer’s perspective has given her a critical eye for maps—or the frequent lack thereof—in the grant proposals and project descriptions she comes across in her work, and that her understanding of the importance of a good map has given her an edge in this work. Lisa has taken several field classes in stream restoration to enhance her job skills. She wishes she had had the time to take a cartography course, more biology courses, and advanced hydrology, but is happy with the path her career has taken.

Finally, Brendan approaches water resource management from the perspective of habitat conservation. He has a double major in political science and modern European history, and has completed his master’s coursework in geography. He worked as an intern in a nonprofit and as coordinator for a creek coalition, and now works as an associate planner with a consulting firm that specializes in the acquisition and management of property for ecological preserves. Brendan facilitates consensus development with multiple stakeholders on environmental issues.

Assessing his qualifications for such work, Brendan says, “Clearly my advantages outweigh my disadvantages. It was difficult to break into water resource management when so many employers were clamoring for specialists. Once I was situated, however, the skills of interdisciplinary ecology, historical perspective, and human land relations have served me much better than many of my peers.”

A specific example is a project that he is currently involved in, assessing the impacts of a hydropower assets transfer upon fishery resources of two streams where threatened spring-run Chinook salmon and steelhead trout are found. “Working with fishery biologists, I found that they were focused on statistical significance thresholds, and were unable to work around situations when this
methodology did not work for their particular reach or reservoir. My background in geography helped me see a larger picture and synthesize the information and explain the fishery impact in a more understandable fashion.”

Brendan believes that colleagues and stakeholders appreciate his perspective. “On many occasions, individuals will come to me to get my perspective on a situation and the ramifications a water resource question would have on local politics or land uses. I believe this is a direct reflection of my training in geography.” Still, he wishes he’d had courses in plant identification, fish ecology, and fluvial geomorphology, which he’s had to learn on the job. He suggests that students might wish to specialize more, focussing their coursework on issues they intend to pursue in the future. “Every semester there will be papers to prepare, and you can craft those research opportunities into a crash course on topics that may benefit you in your professional career.”

So here is the central paradox: Our students and graduates appreciate their Big Picture perspective. They find that it enhances their job performance. But getting their job often required either specialized technical skills in GIS, cartography, or remote sensing, or else beginning as a low-level intern and rising within an organization. Once on the job, our successful Big Picture people have quickly sought more specific grounding in water resource sciences.

As a colleague mused when we were discussing the startling number of our alumni who have risen to high-level positions in resource management organizations and agencies, “Geography is a covert operation. We infiltrate.”

So, on to the questions I want to pose to this panel and the assembled audience concerning the assessment of geography’s student learning outcomes in the field of resource management: given the great range and variety of specialized knowledge required for success in different resource management jobs, is studying geography, infiltrating an organization, and then catching up on specifics an appropriate strategy? Is a “covert operation” going on in other departments and other communities? Should we be advising our students to specialize more, or is this “covert operation” a good strategy for securing geographers’ role in resource management?