Rivers are stories to me. Stories of how the planet came to look and act as it does, stories of how scientific ideas interact on a vast range of scales, and stories of humanity's past, present and future. Understanding these narratives requires diving into the scientific subjects, human lives, and geographical locations that are shaped by rivers. Learning these stories through experience and sharing them through visual storytelling is what I want to do with my Watson.

Knowledge shapes the way I see things. This perspective shift is central to the reasons I love to learn and teach, and visual storytelling is one of the ways I share that vision with others. The process of pairing photos and information allows me to anchor emotions, sensations, and knowledge in the tangible world. Visual storytelling is a way to share a glimpse of the x-ray vision that drives my own curiosity and wonder. With this project, I want to focus that process on rivers—a venue that is deeply personal to me, where conceptual understanding has enhanced my hands-on experiences all my life.

The ways rivers shape the world are numerous and complex, a story made up of myriad smaller stories. Exploring these smaller parts as vignettes—one cycle, process or idea at a time—will allow me to explore each with the focus and detail it deserves. Using this as an organizing principle, I plan to divide my exploration into four parts:

The Sediment Cycle (China)

The story of how rocks are transported and transformed by erosion, from solid mountains to fine sands, shows how rivers shape human lives by shaping the landscapes we live in. I will start following this story on the Tibetan Plateau, where the world's most rapid mountain building in the Himalayas causes dramatic erosion amidst the headwaters of several major rivers. Here, I will use my whitewater kayaking and raft guiding experience to volunteer with Last Descents River Expeditions, one of the only river rafting operations in China. Working among multilingual guides and a wide range of Chinese clientele will help me navigate the language barriers without compromising my chance to learn and connect with local people and places.

In China's first national park near the Three Headwaters Area, Last Descents is working on the first guidebook on the natural setting and oral histories of the Daqu River. I will contribute my research, photography and GIS skills to their project to learn about how rivers and sediments start their journey.

From the Himalayas, sediments travel down rivers across the Tibetan Plateau and into China. I plan to follow them with Last Descents along the Salween River, one of the longest undammed rivers in the world. I want to see how the river's water and nutrient-laden sediments are a lifeline to the agrarian communities on its banks, and I also want to examine the impact of rafting itself on people's relationship to rivers. River rafting is an almost unheard-of sport in China, and Last Descents uses river trips as a tool to convince policy-makers of the value of preserving natural river systems. As the inverse of my own mindset, I want to see how experiencing rivers can shape people's understanding.

Finally, I will follow the sediments to river deltas, where they are deposited before entering the sea. In Shanghai, the city is sinking because river sediments are no longer being deposited on the underlying delta. The world's biggest dam on the Yangtze River and levees near the city block the sediment flow, contributing to billions of dollars in damage. Here, I will work with Danning Li, Director of the freshwater program at The Nature Conservancy (TNC) China to learn about how TNC uses river science to inform policies on dams and urban watersheds.

The Carbonate Cycle (China, Australia)

Carbonate is an ion formed when carbon dioxide dissolves in rainwater, pulling carbon out of the atmosphere and creating an acid that erodes rocks and liberates minerals. The story of carbonates unifies concepts as disparate as mountain uplift, marine shellfish ecology, and global climate change. This story will take me to many of the same river locations as the sediment cycle, but will provide a different lens through which to view them. While in the Himalayas, I will tell the story of how mountain uplift exposes fresh rock to weathering, causing CO_2 absorption that has cooled earth's current climate. From there, I will follow the minerals dissolved from these rocks into the ocean, where I will experience calcium and carbonate ions in their new form as the skeletons of coral. In Brisbane, I will use my ecological reef survey experience to work with Richard Hamilton, chief scientist at TNC Melanesia, and learn how he and other TNC biologists use a "Ridges to Reefs" approach to consider river systems' impact on reef health.

Back in South China, I will explore how this mineral cycle has operated through time, and the story of how ancient reefs dissolve and recrystallize into limestone. Near the city of Guilin, I will use the landscape of the world's largest and most dramatic karst limestone towers as a backdrop to the story of limestone's relevance to industry, agriculture, and culture. Near Hong Kong, I will visit the Xingwen UNESCO Geopark, to see about how these karst landscapes are being used to bring visually stimulating science education to the general public.

How Rivers Live (Peru, Brazil)

From the migration of early life onto land, to the Fertile Crescent, to today's agriculture and drinking water, the story of our life on earth has been intertwined with rivers. I want to explore this story along the lengths of the world's largest river, home more than a third of all species on earth—the Amazon. Uniting my love of biology with my experience from farming in South America during my gap year, I want to explore how ecosystems in the Amazon Basin are tied to the river, and how human cities and agriculture disrupt them.

Starting near the Amazon's source in the Peruvian Andes, I will work with Quito-based rivers expert Marta Echavarria and her partners around Peru to learn about their strategies for balancing the health of urban watersheds with the water needs of the 10 million residents of Lima. Downstream of the Andes, I will volunteer my biological field experience with Elizabeth Anderson at the Tropical Rivers Lab to study Andes-to-Amazon connectedness, with a specific focus on how dams impact migratory fish ecology. Alongside Anderson and her colleagues, I want to explore the scientific stories of the Amazon—how the Amazon used to empty into the Pacific before the uplift of the Andes reversed its course, how the area's past as a shallow sea birthed its extreme biodiversity, how dust blowing from the Sahara provides the phosphorus that fertilizes the forest, or how transpiration from the forest canopy is responsible for the rainforest's self-perpetuating humid climate.

How Rivers Die (Mexico)

Every story up until now explores the vitality and interconnected systems of rivers, but highlighting the importance of these systems necessitates a warning about how human demands and alterations are imperiling rivers around the world.

Growing up in Denver, I drank Colorado River water from my tap every day, one of the 40 million people whose demand now sucks the Colorado River dry, dooming its once-vibrant delta to dust. Working with Jennifer Pitt at the Audubon Society, and the Mexican NGO Pro Natura, I want to finish my story by traveling to the Colorado River Delta on the Sea of Cortez, to come face to face with my own role in the death of a river and the destruction of an ecosystem.

Alongside exploring the causes and repercussions of the Colorado Delta's demise, I want to revisit the threat of human alteration in all of the stories I've explored thus far, from the dams going up in China, to the logging in the Amazon. Connecting this concept to How Rivers Live, I want to emphasize the fragile give and take by which humanity is sustained, but also often threatens to destroy itself.

Confluence

Together, these four chapters help tell the story of how rivers work, and how they shape our world. A Watson Fellowship will give me the freedom to learn and share these stories in their most visible or most interesting forms, traveling on or along the rivers themselves whenever possible. Each of these stories will augment my understanding of the interrelationship between natural systems and human experiences—a connection that is seldom taught, yet critical to the perspective that I want to cultivate in myself and others.

By the end of my Watson, I hope to pull the stories of my year-long exploration into a single piece of work. This final piece of visual storytelling will form a unified narrative that intertwines scientific processes with my tangible experiences, and uses photography to root them in reality—an exercise in science communication that lies at the confluence of my skills, my passions, and my future aspirations.