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GRASPING WATER

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The cover image is of Delta of the Yellow River, China (top) and Delta of the Zambezi River, Mozambique (bottom). Landsat imagery courtesy of NASA Goddard Space Flight Center and U.S. Geological Survey.

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Editors

Contact Us

Open Rivers
Institute for Advanced Study
University of Minnesota
Northrop
84 Church Street SE
Minneapolis, MN 55455

Telephone: (612) 626-5054
Fax: (612) 625-8583
E-mail: openrvrs@umn.edu
Web Site: http://openrivers.umn.edu

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HYDROLOGY AND WORLD HISTORY: RIVERS AND WATERSHEDS FOR STUDENTS

By Patrick Manning

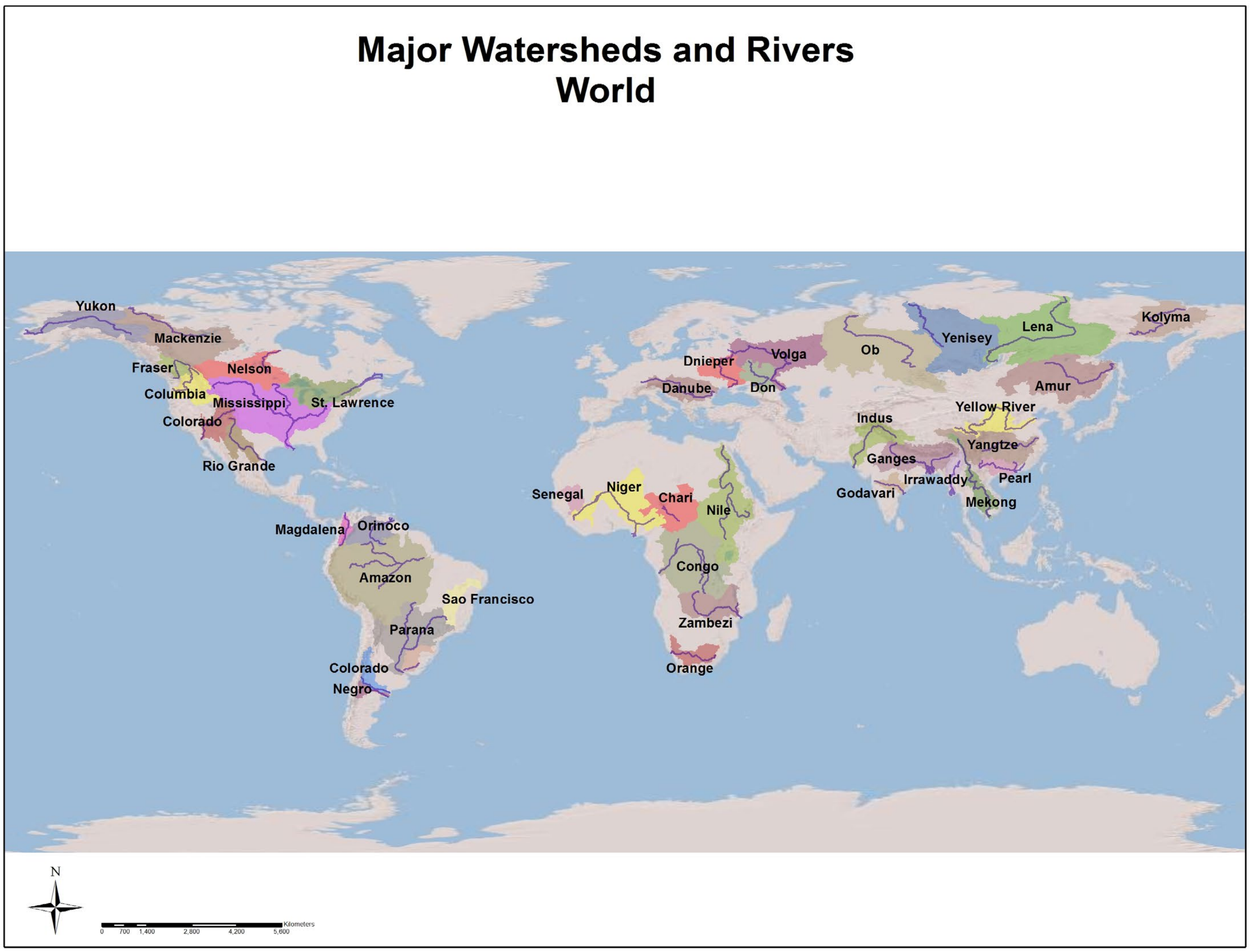
How can one convey, to students of history, humanity's intimate connections to streams, rivers, lakes, and seas? The vision of humans as landlocked inhabitants has been reaffirmed in exaggerated terms by historical texts and maps. When students in my World History courses tried to conceptualize the planet, they opened their texts to find political maps of the twenty-first century—emphasizing bounded terrestrial units, recent polities rather than historical spaces, and an implicit focus on divisions rather than connections among people.

How can one convey, to students of history, humanity's intimate connections to streams, rivers, lakes, and seas? Castle ruins of Aggstein, Wachau, Lower Austria. Photographer Uoaei1 (CC BY-SA 3.0 AT).

In response, I have been seeking to design a set of maps of the world to represent hydrology in the history of the past 10,000 years. The idea is that students would learn the main rivers and watersheds of the world, and through them become familiar with the places humans have inhabited and travelled for much of history. The maps displayed here reflect my first effort, with assistance from skilled cartographers.

I chose to link the display of hydrography to the issue of scale in history—alerting students to the various scales of human society, from local to global. I selected four scales that I hope students will become familiar with, using maps that fit on 8 ½-by-11-inch pages. They are a worldwide map of major watersheds, at a scale of 1:150 million; continental maps at 1:40 million; and sub-continental maps (basically 3 per continent) at 1:12 million. A full set of maps would include 1 world map, 5 continental maps, and 16 sub-continental maps—adding perhaps 10 maps with samples of localized hydrological phenomena at a scale of 1:2 million.

A worldwide map of major river basins provides a good start. Map 1 shows that 40 of the world's largest river basins can be visually displayed at once—in tropical, temperate, and Arctic regions.



Map of the major watersheds and rivers of the world.
Courtesy of the University of Pittsburgh Library System map collection.

The map shows well-watered inland areas, where much of the world's population has lived. These are all the places one can go by small watercraft, especially canoes—a main method of travel and shipping until very recently—including the linkages across great inland areas, such as the lands of Siberia, where immense river valleys connect wide territories. The watersheds are narrow at the coast, wide in inland areas, and allow movement along each principal river and major tributaries. The map displays migration routes, strategic points at links of watersheds, and the mouths of great rivers—and the great arid region from the Gobi to the Atlantic.

While maps of major watersheds reveal a great deal, they do not tell the whole story of hydrology. They show where people have occupied inland areas, but they do not portray the large part of human population that lives near the seaside in small watersheds, as in the Mediterranean, the Caribbean, and Japan. In addition, Map 1 does not include the *endorheic* or landlocked basins that exist on every continent—they are sparsely populated except for the Caspian Sea and Dead Sea basins. Especially for mapping coastal regions, greater magnification and different mapping techniques would be required. The map is not set up to show dynamic shifts in the course of rivers, though shifts in rivers cause little change to boundaries of watersheds.

If, however, we zoom in from the world map to the continental level, we see that Map 2, on Africa, shows 11 river basins, in place of the 7 watersheds shown on the world map—it also shows greater detail in principal river and major tributaries. Maps of the same scale would show equivalent detail for North and South America, Europe, and Asia.

Zooming in further to the sub-continental level, Map 3 displays southern and eastern Asia (one third of the area of the African continent and one fourth of Asia). Map 3 shows 10 river basins, in contrast to the 8 shown on the world map. All but three of the rivers flow out of the Himalaya Mountains. There would be 4 such maps for Asia, 2 for Europe, and 3 each for Africa, North America, and South America—plus one for Australia and New Guinea.

To provide a more localized view of hydrology, Map 4 (at a scale of 1:1 million) displays the historically significant Grand Portage route from the St. Lawrence watershed to Lake Winnipeg and the Canadian Prairie. This route, created by the Ojibwe Algonkians of Lake Superior, was adopted by Amerindian and French fur trappers and later by the British. When the border between the U.S. and British Canada was specified in 1803, the post of Grand Portage ended up on the U.S. side, so Britain moved its post to Fort William (now Thunder Bay).

The route itself went overland from the Grand Portage post to the Pigeon River (bypassing the river's lower falls), then upriver to South Lake and over the continental divide at Height of Land Portage (400 m high) to North Lake. This crossing of the divide was an occasion for ceremony and initiation rites for the fur-trading voyageurs. The canoes followed lakes and rivers to Rainy Lake and eventually to Lake Winnipeg. The inset map shows the centrality of Grand Portage at the intersection of three great watersheds.

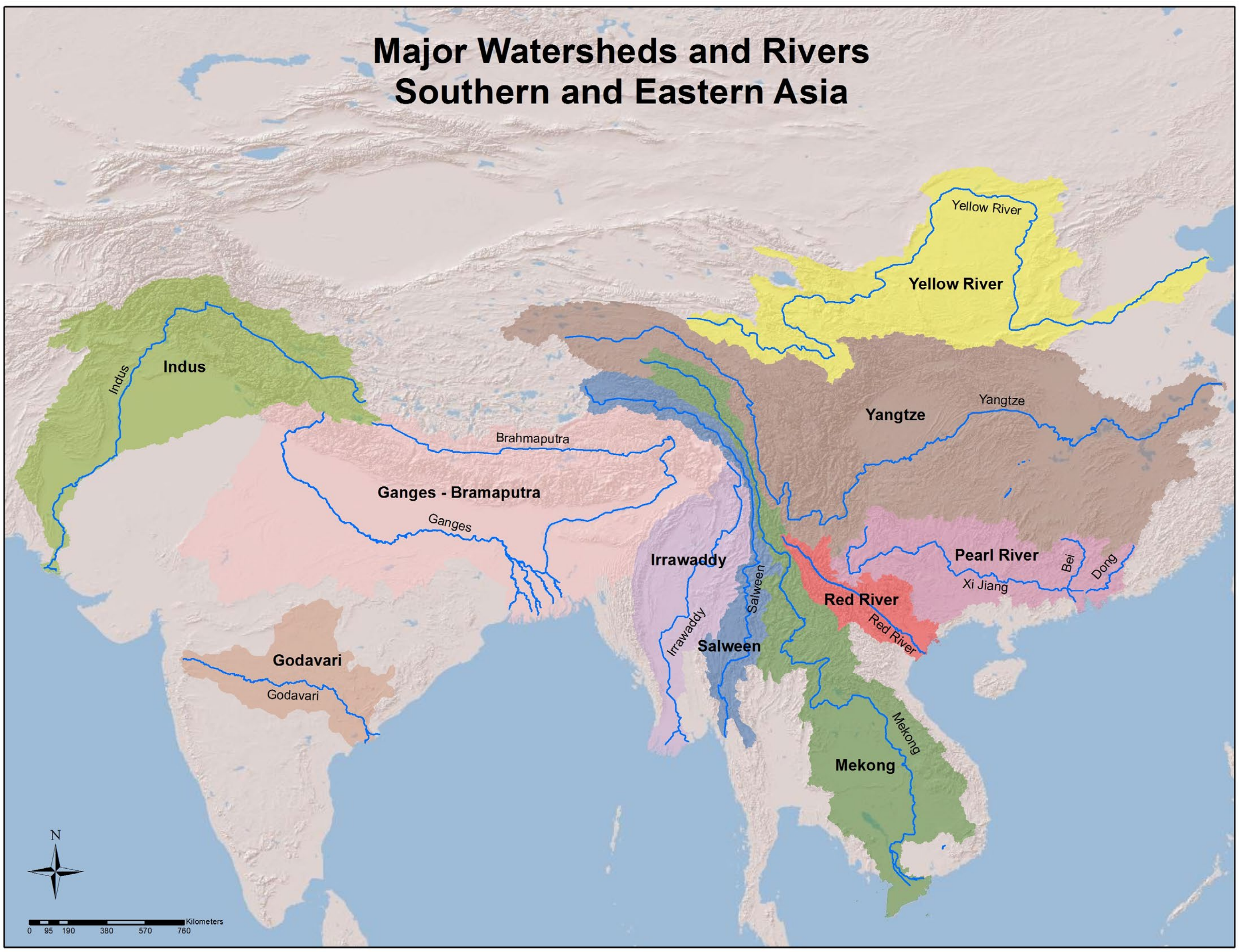
Students could use these maps as a framework for learning the major watersheds. Then they can go to Google and zoom in and out to learn details of tributaries and their watersheds or the location of towns in relation to rivers, portages, and divides. (One problem I note, however, is that Google Maps does not readily display the scale of magnification or distance for maps, which makes comparing maps more difficult.) One can make up various interactive exercises with comparisons or layers of maps. Comparing watershed maps with population-density maps will confirm the importance of waterways in attracting population, but will also show exceptions. Students will see that the canals, dams, and other engineering

Map of the major watersheds and rivers in Africa.
Courtesy of the University of Pittsburgh Library System map collection.

feats of the past few centuries have changed the flow of much water, but have done little to change the boundaries of watersheds.

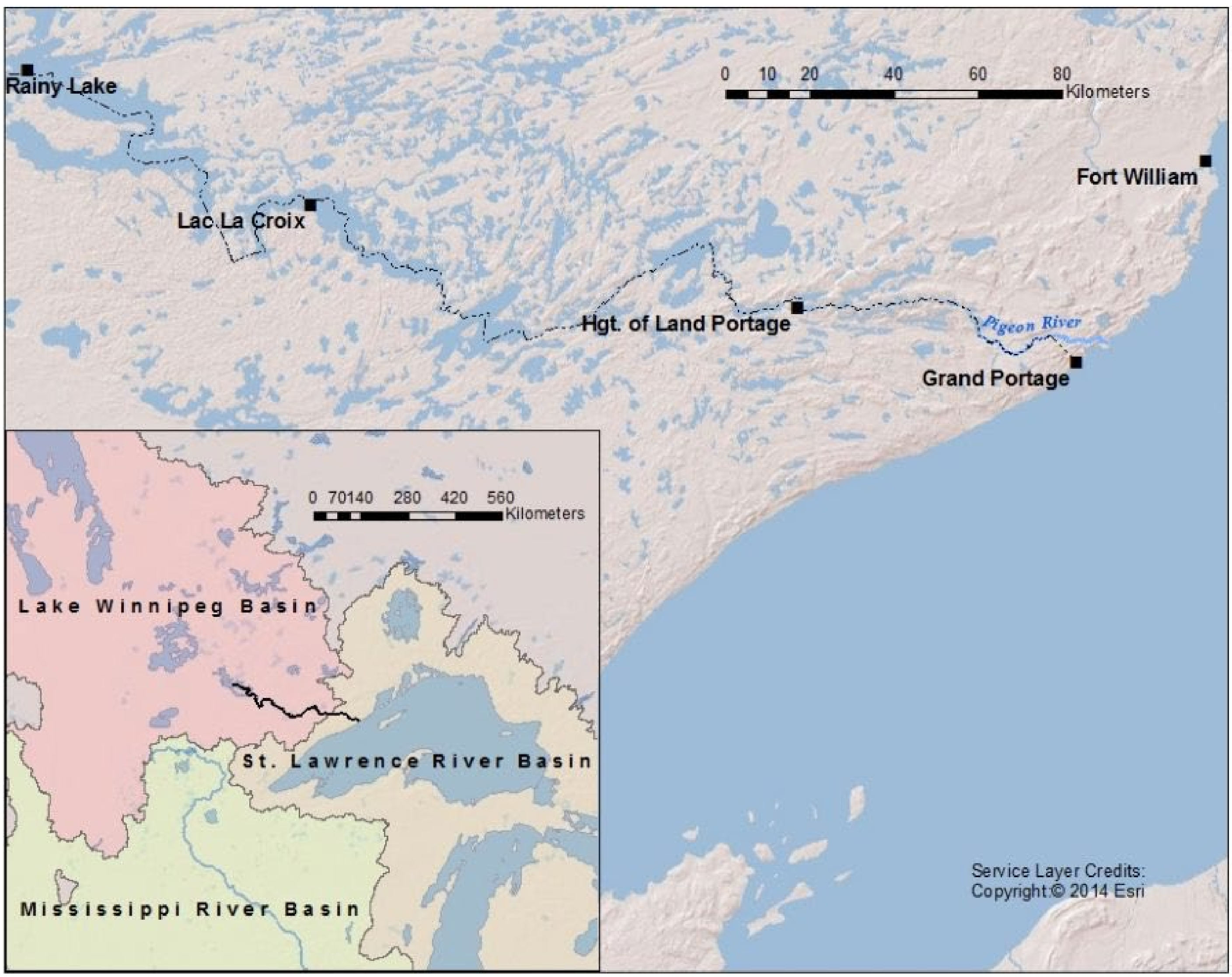
In this work, and with the assistance of skilled mapmakers Boris Michev and Daniel Andrus, I have found that comparable, consistent, and useful maps of watersheds can be constructed. The maps I downloaded had many deficiencies: they showed either watershed boundaries or rivers, but rarely both; they gave too many rivers or not enough; they labeled poorly. Working with my colleagues, we were able to make a set of decisions about the features that are best represented for historical watershed maps. Thus, the name of the principal river (or lake) becomes the name of the watershed, but tributaries may remain unlabeled. Showing relief along the watershed boundaries is helpful, yet too much relief makes maps harder to read.

In conclusion, I am reaffirmed in my desire to see development of maps that display the role of hydrology in structuring society over the course of history, to support the teaching of world history. The maps shown here work best for the Holocene Era—the past 10,000 years of stable climate—a time of consistent interrelation of humans and waterways. But I have also learned of complexities and alternatives in mapping



Map of the major watersheds and rivers in southern and eastern Asia. Courtesy of the University of Pittsburgh Library System map collection.

hydrology, and that we need to enhance further our tools for cartography to address issues of scale and dynamics. One could focus on recent times and human modifications: canals, dams, and lakes; one could map the shifts in sea levels, glaciation, and watercourses during the Last Glacial Maximum; one could map the hydrology of populous littoral regions. This exercise has also reminded me of an old dream that arose in the early days of IT and has yet to be implemented, to my knowledge: an interactive map for the centuries of sail, showing the oceans with the shifting directions of winds and currents during the year, and with the timing and direction of ships' trajectories—a map designed to make the best of winds and currents. That is the map that will begin to show dynamic interaction and scale in a cartographic representation that truly enhances understanding of how hydrology works.



Map of the St. Lawrence and Lake Winnipeg basins.
Courtesy of the University of Pittsburgh Library System map collection.

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About the Author

Patrick Manning is Andrew W. Mellon Professor of World History, Emeritus, at the University of Pittsburgh, where he served as founding director of the World History Center from 2008 to 2015. Trained as a historian of Africa, he expanded his scope to world history in the 1990s. His books include *Navigating World History* (2003), *The African Diaspora* (2009), *Migration in World History* (2nd ed. 2012), and *Big Data in History* (2013). He served as president of the American Historical Association in 2016.