

## **More Than a Few Northerly Running Rivers in the World**

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### **Introduction**

Never had I read or heard such a misleading statement about the world's rivers before I came to Florida in 1991. There is a common belief in northeast Florida, especially in the city of Jacksonville, that there are only two rivers in the world that flow north. Of course, one is the St. Johns and the other one is the Nile. For over fifteen years, I have been reminded of this so-called geographical fact too many times. It seems that history repeats itself in my geography classes in the beginning of every term. I am sure that a few of my students will mention this statement to me during this upcoming academic year. Thus, in addition to my emphatic reply of "no, no, no" and sending them to a map of the world, I plan in the future to refer them to this article which will prove that, contrary to popular opinion, there are more rivers in the world running north than any other direction!

Nowadays, numerous occurrences of a slightly modified version of the above statement can be found on the Internet. The new and improved electronic version of the myth asserts that a certain river--usually in the US--is one of the few rivers in the world running north. The authors of this version are still not sure as to how many rivers flow north, but they are sure that the number must not be very large. It is highly likely that those who believe in the above erroneous statements also believe that rivers cannot and should not flow north. Apparently, to them north is always higher in elevation than south. The above inaccurate statements are based on this incorrect assumption.

The purpose of this paper is to correct that mistaken assumption and the associated statements. After a brief explanation of the scientific facts associated with the orientation of rivers in general, an approximate number of major rivers that flow north will be provided. Direction of rivers has less to do with magnetic forces than gravity, topography, and geomorphology. It is believed that as long as the source of a river is

higher than the mouth, it will follow a path of least resistance to utilize energy efficiently. Although small rivers, and those with no clear patterns, were not included, more than 245 rivers in the world that flow north were identified, unarguably a little more than only two or a few! Thus, contrary to what it intends to suggest, the title of the film *Where the Rivers Flow North* (1994) hardly defines a unique or limited territory.

The largest amount of water carried north and the largest number of less-known northerly running rivers are found in Siberia and in the two largest river systems in the world, the Amazon, and the Congo. All three regions are among the more remote places in the world, out of sight and out of mind to many.

### **The Only Two**

It was in one of my World Geography classes in the Fall Term of 1991 that, for the first time in my life, I heard from one of my students the shocking geographical misstatement. It was during the very first week of the term that the student tried to teach me a geography lesson that I had apparently failed to learn. On the first Friday of the term, after everybody else had left the room, a student sitting in the front on my right side, stood up and said "Good morning, Sir." She then took a few steps toward me, so we were almost talking face to face.

She first politely introduced herself and said that she was working as a journalist for the only big daily newspaper in Jacksonville, the Florida Times Union. Then, she proceeded to say, "Sir, do you know that there are only two rivers in the world that flow north? One is the St. Johns and the other is the Nile." I was speechless and astonished! I could not believe my ears. All I could say was "no, no, no!" Then, I asked her about her reference. "Everybody knows this," she replied. She then said that she had not seen it in a book, but had heard it many times. This was the last time I saw her. She never came back to class.

She was the first, but not the only person who tried to teach me this seemingly important geographical lesson. More importantly, I do not know how I missed it or how it missed me. I have been in the business of education all my life. By the age of seventeen, after finishing a Teachers' Training College, I became a teacher. At that time, one had



to be at least 18 to be employed as a teacher by the government of Iran. Thus, I became the youngest teacher in that country in 1961.

Thirty years later in 1991, when I heard the above statement, I was a mature person with a doctoral degree in hand and many years of teaching experience. Yet, this geography myth was so powerful that a student could not wait to tell me about what they thought I needed to learn from them. Since then I have heard the above outrageous statement from a few of my students every single term. My response still is “no, no, no!” However, to guide them towards scholarly independence, in a direction of finding out for themselves, I refer them to a world map where rivers are shown in blue.

### **One of the Few**

By the end of June of 2007, it was during an online session of data gathering for another project that the above geography myth, albeit in a somewhat different wording, showed up again. It is very interesting to note that the writers of these statements avoid the word ‘only’ and try to generalize their myth. These sources now use another phrase. They believe that a particular river in the USA is “one of the few in the world that flows north.” Below are only a few examples:

1. The Fox is one of the few North American rivers that flows north. The Fox River is a river in eastern and central Wisconsin.
2. The Genesee River in the state of New York is one of the few rivers in the world that flows south to north.
3. In Ashe County, North Carolina, “the county's main river is the New River, one of the few major rivers...”
4. The Red River of the North is one of the few rivers...
5. The Saint Johns River in Florida is one of the few that flows north.

The above newly improved version of the old myth/mistake, especially using the word few is very interesting. The authors are still unsure of the number of rivers flowing north in the world. But, they know that it is more than two. Actually, if the Nile's name were added to the above list, there would be a total of five rivers. Thus, the previous statement, that there are “only two” north-flowing rivers, is absolutely incorrect.

However, the new statement is misleading too. The word few may mean a very small number, not many, or hardly any. In the case of rivers running north in the world, this word is not scientific and is not easy to quantify. Hence, it has to be replaced by a more tangible and concrete number. After discussing factors that affect the flow of rivers, this more accurate number will be given.

### **Why Rivers Flow the Way They Do, as Exemplified by the St. Johns River**

A river is a natural waterway that carries run-off fresh water over a landscape from higher to lower altitudes. It is an important integral part of the hydrologic cycle. A river is a system that represents the most efficient energy utilization. The water within a river comes from precipitation through surface runoff, groundwater recharge such as natural springs, and natural reservoirs such as glaciers. The direction of the flow of each river in the world is determined by the topography of the region located between the area of origin and destination, the headwater and the mouth.

Rivers, like all other objects, flow downhill due to gravity. They all take the paths of least resistance. This path thus could take any direction, i. e., east, west, north, south, and many others in between. The topography of a region, in turn, is shaped and reshaped by the tectonic forces at work and the region's final version of the lay of the land shaped and reshaped by geomorphological forces. Earthquakes, volcanic activities, and glaciers modify rivers' directions.

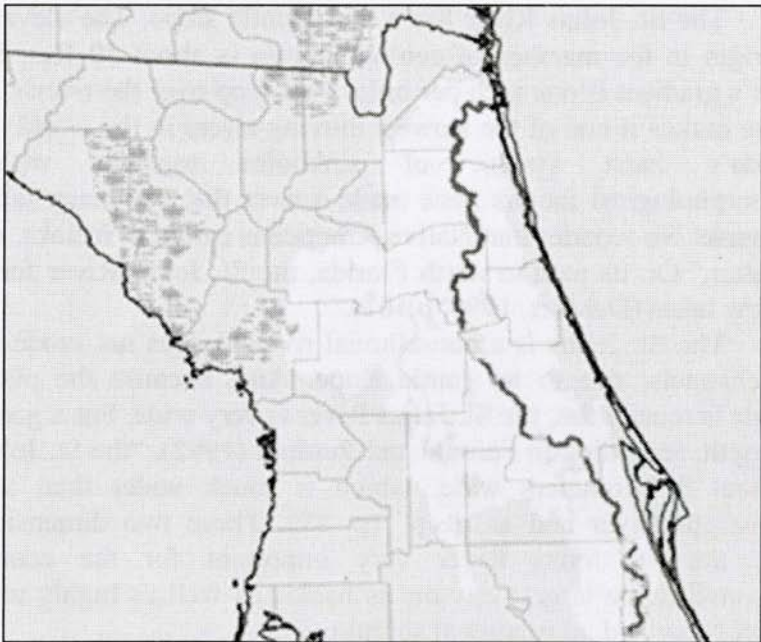
When the water of a river is collected in an area of lowland and surrounded by higher grounds, it becomes a stagnated body of water similar to a lake. It starts to flow again as soon as it overcomes the higher grounds. Rivers that meander and go through many turns and twists may wander in many directions. With low gradients and very gentle slopes on flat land, rivers may flow almost in full circles.



It is important to repeat that flow is not influenced by the compass directions. Unfortunately, some people are unaware of the scientific facts that come into play in determining the flow of rivers. Some associate the word north with being uphill and the word south with being downhill. To them, north is always higher than south. This may be seen as the original myth leading to false conclusions about directions that rivers take. This incorrect assumption gave birth to the inaccurate statements that inspired this article. In order to learn more about the north-running rivers, we need to learn that in many parts of our planet north is actually lower than south, including the above examples, and in reality, rivers are able to flow from south to north.

Throughout geological times, many rivers have changed their courses. Before the break-up of the super continent of Pangaea and before the beginning of the mountain building process that happened nearly 250 million years ago on the west coasts of North and South

**Figure 1. The St. Johns River.**



*Source: Karl Musser, Wikipedia.org.*

America, both the Amazon and Mississippi rivers were emptying their water into the Pacific rather than the Atlantic Ocean.

At this time, the continent of Africa did not have its own coastlines; thus before the most recent continental drift, many rivers including the Nile had interior deltas located on very large interior shallow lakes. This is why post-drift African rivers have built new deltas elsewhere on the coast, with sudden changes in the direction of their flow, and descending from the high plateau, most of them have rapids and waterfalls. This is why about half of the world's potential hydroelectric-power is found in Africa.

The orientation of the St. Johns River, see Figure 1, is not an exception to natural laws. It is rather an illustration of nature's efficiency. Over 100,000 years ago most of the land that now is occupied by the St. Johns River basin was an arm of the Atlantic Ocean. The river itself was a part of an extended system of bays, inlets, lagoons, lakes, and tributaries. The separation started during the last ice age, about 15-20,000 years ago, when Florida was almost 2.5 times larger than today.

The St. Johns River has a very gentle slope. The elevation near its origin in the marshes of central Florida is about 30 feet. St. Johns River's gradient is one inch per mile. This drop over the river's 310-mile course makes it one of the slowest moving rivers in the world. This and Florida's karst system of sinkholes together with other geomorphological factors have made a river that has many lakes along its course. No wonder that Native Americans called it Welaka, or 'River of Lakes.' On its path to north Florida, the St. Johns River forms eight shallow lakes (DeMort, 1990, p.101).

The St. Johns is a non-alluvial river. It does not erode its banks and channels, due to its gentle slope. And, because the platform of Florida is mostly flat, the St. Johns River is very wide. For a good part of its length, according to Fernald and Purdum (1992), "the St. Johns River is about 3 kilometers wide, which is much wider than the lower Mississippi River and as deep" (p. 59). These two dimensions have made the St. Johns River very important for the economy of Jacksonville, the largest city on its banks, as well as highly utilized by the US Navy and international shipping lines.



Many large rivers in the world, when they empty their waters in the oceans, change the temperature, salinity, and the color of these bodies of water. The fresh water of the Amazon penetrates into the Atlantic Ocean up to 200 miles. Yet, in the delta of the St. Johns River, especially in periods of low water, tides may cause a reverse flow as far south as Lake Monroe, nearly 160 miles upstream.

Finally, the St. Johns River creates one of the most important estuaries in the nation. This estuary is a very significant ecotone, where two or more ecosystems overlap. One of the most important aspects of this ecotone is its amazing diversity in quality and quantity of many different plant and animal species, all of which cooperate with one another to make this estuary very productive and livable.

As will be explained in the next section, the St. Johns River is not one of the only two--or even one of the few-- rivers flowing north. It is one of many doing so. It follows laws of nature rather than mistaken human assumptions.

### **One of Many**

In addition to the St. Johns River, the Withlacoochee River flows north from central Florida's Green Swamp to the Gulf of Mexico west of Ocala. APLQuickRef's answer about the orientation of rivers is that "many of the world's rivers flow north." However, names of only three rivers are given. These names include the Willamette River in the State of Oregon, not previously mentioned in the present paper. Thus, up to now we have the names of seven rivers in the US alone.

Using Mapquest and Mappoint, in his answer to the question of "how many US rivers flow north?" Thomas Baglin (2005) has supplied us with a list of 48 new names of rivers in 16 states. According to him, the largest numbers of northerly rivers in the US are found in three states. Alaska has nine, Washington has eight, and New York has six rivers. But for some reason, he has not listed Florida's northerly running rivers. This increases the number for the US alone to 50 rivers.

Matt Rosenberg has pointed out that "there are countless examples of rivers flowing northward." He believes that "there are dozens, if not hundreds, of them around the world." This is the first time that somewhat concrete numbers such as "dozens" and "hundreds" have

been provided. In addition to the Nile, he provides us with six names. One is already listed above. The five remaining rivers include Russia's Ob, Lena, and Yenisey Rivers, Canada's Mackenzie River, and California's San Joaquin River.

Michael Onken (1998) has a list of 12 rivers in the world that flow north. Of this list, only eight are new to us. They include: from Europe, the Rhine, Elba, Oder, and Vistula flow mostly northward through Germany and Poland; from Canada, the Athabasca; from South America, the Araguaia, Xingu, and Tapajos. More importantly he argues that "over two thirds [almost 70%] of the rivers of Brazil and Bolivia flow North through the Amazon rainforest." This indicates the importance of rivers flowing north in South America.

Fundis (2001) has identified a total 117 rivers that flow north in the world. Of this, 51 are found within the US and 66 of them are found elsewhere. Her list contains the names of 20 rivers in Asia, 10 in Europe, 10 in South America, 10 in Australia, 7 in Canada, and 7 in Mexico. She even has recognized one river that flows north on the island of Puerto Rico. Her total number of 65 in North America, including Mexico and Puerto Rico, is the closest to reality that was encountered during this investigation. Unfortunately, she has listed only a single river name for the whole continent of Africa, the Nile.

Using the National Geographic Society's (1984) and Wikipedia's online color-maps, the total number of rivers that flow north in the world was estimated. In fact, with a total of 55 rivers, Africa has the second largest number of northerly running rivers in the world. Even the arid northwest corner, the Maghreb region, has many rivers that flow towards the north. At least 25 of the Congo River's tributaries originate in the south and flow north. This includes the four largest, namely, the Kwango, Kasai, Lomami, and the Lualaba. In size, Lualaba is second only to the Nile.

Although a dry continent, Australia has 25 rivers flowing north. Also, 50 rivers for Europe, 50 for Asia, and 45 of them for South America have the same orientation. The mainland European major rivers that have their origin in the south include the Caronne, Loire, Rhine, Weser, Elbe, Oder, North Dvina, and the Pechora River. Even the



Thames River in England and the Danube River, the longest in Europe, have many tributaries coming from the south.

Many of the major Asian rivers like the Indus, Ganges, Huang Ho, and the Yangtze have tributaries that are northbound. Turkey has eight rivers that flow north. The two most important rivers in Central Asia, Amu Darya and Sir Darya, which start in Afghanistan, have the same flow patterns. However, the most important northerly rivers in Asia are found in Siberia, including the Amur, Kolyama, Lena and its tributary Aldan, Yenisey and its tributaries of Tunguska and Angara, and Ob and its three tributaries of Irtysh, Ishim, and Tobol.

Like Siberia, South America has a large number of large rivers flowing north. Outside the Amazon basin, they include the San Francisco River, Paranaiba, Tocantins, Araguaia, and Orinoco River. In addition, seven of the Amazon River's major tributaries including the Tocantines, Xingu, Tapajos, Madeira, Purus, Jurua, Ucayali, and Marannon join the largest river in the north.

It is important to note that Siberia, the Amazon, and the Congo basins have the majority of the largest and longest rivers with destinations in the north. Yet, many people know little about these mighty rivers. Furgurson (1984) argues that the Yenisey River, for example, is "more voluminous and longer than Mississippi. Yet, hardly visible to the rest of the world" (p. 235). Thus, because it is so remote and usually frozen, it escapes people's eyes and minds.

The final tally of 245 rivers is a conservative estimate. It does not take into account many smaller rivers whose twisting courses flow only partly north. A more precise total should consist of thousands of rivers. It is safe to say that over 250 major rivers in the world actually flow north.

## **Conclusion**

The purpose of this paper was to correct a persistent and inaccurate geographical assumption and two statements about the number of rivers flowing north in the world. Some people equate north with "uphill" and thus think that rivers are unable to go north. This misconception has become the basis for incorrect geographical statements that there are only two rivers in the world that flow north, and

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a certain river is one of the few rivers in the world running north. This assumption and these statements have no scientific foundations and thus are entirely misleading.

It is believed that the orientation of a river is determined more by the efficient use of energy than anything else. Actually, research proves that there are many rivers that flow north. There is no doubt that most people will be surprised to learn that there are more rivers in the world running north than in any other direction. Counting only major rivers and tributaries, the study arrived at 245. The largest number and the most important ones are located in Siberia, the Amazon, and the Congo basins. People around the world are less in touch with and do not know much about the most important rivers in these remote parts of the earth, a planet on which the majority of rivers flow north.

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