YUKON RIVER HYDROLOGY

Main Messages

- The Yukon, meaning "great river" in several First Nation languages, is indeed one of the great rivers of North America. It flows over 3300 km from the Coastal Range of British Columbia north and northwest into the Bering Sea.
- Originally the Yukon River was much shorter, flowing south into the Pacific Ocean. Nearly three million years ago, advancing glaciers from the south and southeast blocked the river and forced it to reverse its flow northwest into its present channel.
- The Yukon is dynamic. Water levels vary depending on snow melt and precipitation. The river constantly alters its channel, carving away banks in one location, depositing silt and gravel in another.
- The Yukon River is home to a variety of fish, animals and insects. It also flows within the traditional territory of several First Nations in the Yukon and Alaska.
- All First Nations consider themselves stewards of the river and are concerned about keeping the water clean and preserving its resources.

There's names, First Nation names [for the Yukon River] right from the head, all the way right down, til it goes right out, flows into the ocean. Begin with its Tlingit name, next one is Tutchone name, the Whitehorse people. Comes down to Carmacks people, the Pelly, all the way down, right clean all the way through.

– Pearl Keenan, 1995, *Yukon River Symposium*.

The Yukon River at low water flowing by Klondike City, 1898. *YA 6291 / Roozeboom Coll.*

…every place name, every tributary, every river system running in the Territory and elsewhere already has names in our original languages and so it's important to show them… because our ancestors travelled every inch of these important river systems and tributaries running into it, fished every branch, travelled every height of land, and the river system was the main transportation means for our peoples to survive in those days.

– Gerald Isaac, 1995, *Yukon River Symposium*

As a transboundary waterway… the Yukon River system flows across the border of two countries, draws water from the traditional territories of dozens of First Nations, and passes by hundreds of native and non-native settlements and camps. The river is a transportation corridor; it provides critical habitat for fish and wildlife; it is a resource unto itself. Aboriginal people have strong cultural ties to it, and many native and non-native people have lifestyles that depend on it.

– Jody Cox, from: *The Upper Yukon River, The Salmon and the People: A History of the Salmon Fisheries,* 2000.

The Story

Introduction

The most south-easterly root of the Yukon River begins as a freshet flowing out of Llewellyn Glacier in the Coastal Range of northwest British Columbia, less than 25 km from the Pacific Ocean. The stream spills into Atlin Lake one of the five great headwater lakes feeding the head of the river. The Yukon River then flows over 3300 kilometres (2000 miles) through the Yukon Territory and Alaska before emptying into the Bering Sea. Its immense drainage area of approximately 847,000 square kilometres (327,000 square miles) makes it the fourth largest river basin in North America.

The Yukon River is fed by eight major tributaries and numerous smaller rivers. In the Yukon, the major rivers are the Teslin, Pelly, Stewart and White. In Alaska, the Porcupine, Tanana, Koyukuk and Chandalar rivers swell the river further. Each stream increases the volume of water and sediments. The White River, originating in the icefields of the St. Elias Mountain Range, is named after the milky colour of its water. This is caused by *silt* in the water, a fine powder formed when the slow-moving glaciers pulverize the rocks beneath. Boaters travelling the river after the confluence with the White notice that the water makes a fine grinding sound against their watercraft.

The Yukon was named by Hudson's Bay Co. trader John Bell in 1846. "Youcon" was Bell's version of a Gwich'in word meaning "Great River." There are many other aboriginal names for the Yukon River, most of which translate as "Big River" or "Great River."

Confluence of Yukon and Klondike Rivers.
Yukon Government photo.

Paleo-History of the River

Until nearly three million years ago, the Yukon River flowed south into the Pacific Ocean. This southward-flowing river system laid down the rich placer gold deposits of the Klondike area.

During the first Yukon Ice Age when the southern Yukon was buried under ice, the river course was blocked by glaciers moving in from the east and southeast. A huge lake formed in front of the advancing ice, forcing the river to change its course northwest through Alaska. When the last of the glacial ice left the southern Yukon some 10,000 years ago, First Nations people discovered a new food source, salmon migrating thousands of kilometres from the Bering Sea.

River Characteristics

The Yukon River has many moods. In spring, the river ice breaks up dramatically – the grinding ice can be destructive, tearing out sections of riverbank and heaping immense ice floes along the banks. When the interior mountain snow pack melts in late June, the river rises over the gravel bars and beaches, covering some of the best camping spots. By late summer, the river levels have fallen and there is a distinct fishy smell in the air during salmon spawning season. On chilly autumn mornings, it may be several hours before the sun burns off the dense river fog formed by frosty air meeting warmer water. In October, the water seems slower and thicker as small ice crystals or *frazil ice* begins to form in the frigid waters and the anchor ice moves out from shore to eventually cover the moving stream.

The Yukon River is always changing its course. The powerful current erodes riverbanks in

some locations and deposits gravels and sediment to create new bars in others. During the sternwheeler days, small gas boats reconnoitred the river in early spring and set up markers to show changes to the main channel. Being able to "read" the ever-changing river, to find the main channel and avoid hidden rocks and bars, was a necessary skill for every riverboat pilot.

Ice/Flooding

River flooding can result from high water levels due to snowmelt and rainfall. On the Yukon River, however, the most severe floods happen because of ice jams during spring break up. Most flooding are caused by blocks of ice piling up in a narrow part of the river; water builds up behind the ice dam causing floods. Flooding also happens when the blockage gives way and the pent up water surges downstream flooding low-lying areas. Dawson City and Tr'ochëk, located on flat, low lying land, have experienced this type of spring flood several times in the last century. The powerful currents carrying huge blocks of ice may also alter the river course by gouging out banks and bars.

In the Yukon, Indian and Northern Affairs Canada was responsible for flood forecasting and monitoring (these responsibilities were transferred to YTG on April 1, 2003). Hydrologists do this work by collecting information on streamflow, snowpack and climate.

(For more on Dawson City floods, see the storyline "Dawson Waterfront History.")

Yukon River Home

Along the banks of the Yukon River, is the *riparian zone*, the place where land and water meet. A plentiful water supply ensures that plant growth is more rapid and denser than further inland. Dying plants – including sweepers, or fallen trees that have been undercut by the current – may shelter juvenile fish or the entrance to an otter's den. Decaying vegetation supplies food to insects. These are eaten by bigger creatures, which in turn are the food of larger predators such as salmon, pike, eagles and bears.

Boat in the floodwaters on a Dawson street.
PC/Townsend Coll. 31/027, #310.

The river and its valley are a natural highway for fish and birds. Gravel bars are good resting spots for migrating birds. Sloughs, where the current moves more slowly, are excellent nesting places for ducks and shorebirds and feeding areas for moose. Bear lumber down to the riverbank in late summer to eat berries and catch fish. Islands in the river are sheltered places for moose to give birth to their calves.

The richness of life in the river valley has always attracted people. Traditionally, First Nation people spent most of the summer and early fall along the river banks fishing, hunting, gathering edible plants and trading and visiting with other First Nations. After contact was made with outside traders, posts and settlements were built along the rivers that provided the newcomers with transportation, fish and game, and often, richer soils for growing gardens. The Yukon River continues to be important to the many First Nations people who live along its banks and rely on the river's resources. First Nations work with other governments to ensure the water is clean and to protect its fish and animals.

Related Stories

- Dawson Waterfront History
- Salmon
- Fish Camp Stories

Ways to Tell the Story

Photos & Graphics

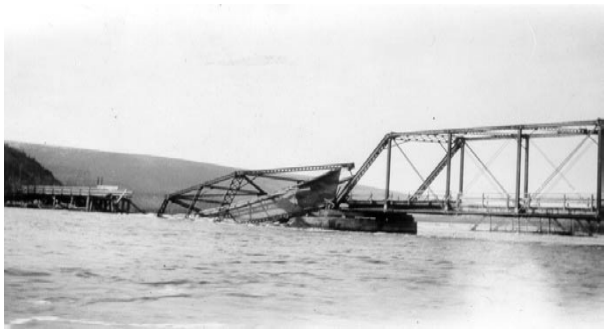
- Charts showing seasonal variations in water levels, flood cycles, etc.
- Maps showing: the Yukon River and its major tributaries; the original route of the Yukon River before it was redirected north by glaciation; and the immense area of the territory that is part of the Yukon River drainage.

Albums

- Visitors would probably enjoy seeing pictures of the river in winter, the ice bridge, spring break up, as well as photos of some of the species and historic vessels that used the river as a habitat and transport corridor.

Talks

- Collect some of the many aboriginal names for the Yukon River and share them, and the translations, with visitors. People love to hear interesting statistics about the river: the speed of the current at Dawson, how much silt travels by town, etc.



Collapse of the Klondike River Bridge during Spring break-up. *PC/Townsend Coll. #236, 31/016*

- Point out some of the features of the Yukon River: gravel bars, undercut banks, etc.
- River rocks may be turned over to show aquatic insects.

Pamphlets

- Provide visitors with a pamphlet outlining some of the major points of interest of the trip, a few photos and a map.

Further Resources

Maps & Plans

- Maps showing the Yukon River and its tributaries, the vast part of the territory that is part of the Yukon River drainage, etc.
- Diagrams showing variation in stream flow over the summer, the formation of ice dams, etc.

The Yukon River at Dawson

- At Dawson, the Yukon River narrows to a width of about 305 metres (1000 feet) wide.
- At this point, as much as 60 tons of silt may pass by every 60 seconds.
- During peak flow in June, up to 6000 cubic metres of water flow by Dawson each second.
- In Dawson, the ultimate sign of spring is the break up of the Yukon River ice in May. Since 1897, the people of Dawson have conducted an “ice lottery” with a cash prize going to the person with the closest guess for the exact time the ice will go out.

Photographs

- see above suggestions for displays & albums.

Publications

Brabets, Timothy P., Bronwen Wang & Robert H. Meade
2000 Environmental & Hydrologic Overview of the Yukon River Basin, Alaska and Canada. Anchorage, Ak.: US Dept of the Interior, US Geological Survey.

Canada, Dept. of Environment
"Your Yukon" is a series of columns about the Yukon environment published in the Yukon News and available on the following website:

http://www.taiga.net/yourYukon/index.html

2001 Column 256: "Flood forecasting is different in the north."

Column 255: "Flooding is a year-round business."

Column 254: "A world underwater."

2000 Column 176: "The Dawson Ice Lottery."

1999 Column 138: "Reading the river's stories."

Column 136: "Searching for the source."

Column 128: "Which way did the river run?"

1998 Column 81: "Welcome to the riparian zone."

Column 24: "Watching water levels."

Dobrowolsky, Helene
2001 *Hammerstones: A History of Tr'ochëk, Moosehide and the Tr'ondëk Hwëch'in.* Draft ms. prepared for the Tr'ondëk Hwëch'in and Parks Canada.

2000 Tr'ochëk / Klondike City Bibliography. (a compilation of sources relating to the Tr'ochëk / Lousetown / Klondike City settlements and the Tr'ondëk Hwëch'in First Nation, most available from Yukon Archives). Revised: March 2003

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1980 *Historical Streamflow Summary, Yukon and Northwest Territories, to 1979*. Inland Waters Directorate, Water Resources Branch, Water Survey of Canada, Ottawa, Ont.

Midnight Arts & Boreal Research Associates
1997 Inland Water Transportation System Research Project, vol. 1 – Resource Material & vol. 2, Historic Photographs. Prepared for Parks Canada, Whitehorse. (See Hydrology Stories under the Navigation theme.)

Midnight Arts, Brenda E. Carson, Juri Peepre
1994 "River Environment," story outline in *Fort Selkirk Interpretive Manual*. Prepared for Selkirk First Nation and Yukon Gov't., Heritage Branch.

Yukon, Dept. of Renewable Resources & Environment Canada
1996 *Yukon State of the Environment Report, 1995*.

Yukon, Dept. of Renewable Resources
2000 *Yukon State of the Environment Report, 1999*. Government of Yukon with Canada, Council of Yukon First Nations, City of Whitehorse and Raven Recycling.

What's in a Name? The Yukon River is "Great" in every language!

Language	Name	Translation
Southern Tutchone	Tágà Shäw	great river
Northern Tutchone	Tagé Cho	great river
Hän	Chu kon'dëk	sparkling water river
Gwitchin	Yu-kun-ah	great river
Tanana	Niga-to	great river
Koyukon	Yookkene	big river
Ingalik (Deg Hit'an)	Yukkhane	great river
Yupik (Central Ak.)	Kuigpak	great river

Watching ice take out the Klondike R. bridge during spring break-up, 1898. *YA/Tappan Adney Coll. 81/9, PHO 260, 58. Dept. of Rare Books and Special Collections of the McGill Univ. Libraries*

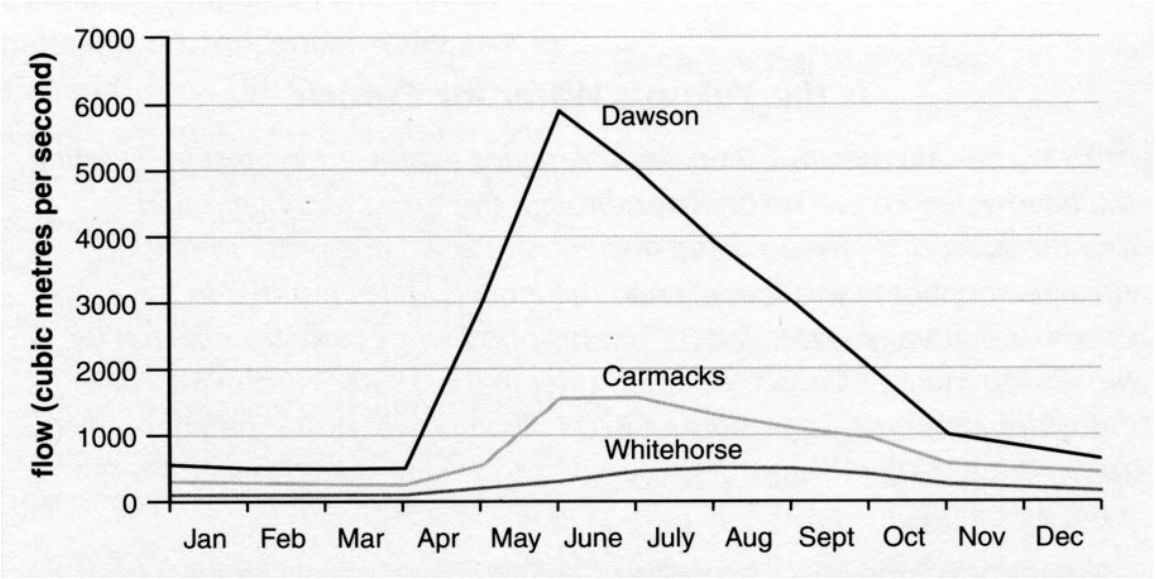

Figure 1. Long-term monthly average flows of the Yukon River at Whitehorse (1943-1998), Carmacks (1951-1995), and Dawson City (1945-1980). The volume of water in the Yukon River increases moving downstream from Whitehorse to Dawson City. The peak flow at Dawson City in June results from the melting snow pack in the interior. From: *Yukon State of the Environment Report 1999*, p. 19.