Grenville Channel and the Skeena River

By Kevin Monahan

Sometimes called “Granville Street” or “The Ditch,” Grenville Channel is a straight and unobstructed 45-mile-long channel running between Wright Sound in the south and Chatham Sound in the north. Grenville Channel is an important segment of the Inside Passage. It is used by cruise ships, tugs and barges, recreational boats and fishing vessels. The shortest route between Prince Rupert and Kitimat includes Grenville Channel and yet—we still do not have a full understanding of the nature of tidal currents in this complex waterway.

According to the Canadian Hydrographic Service’s *Sailing Directions*, tidal currents flow into and out of each end of Grenville Channel. Flood currents are said to meet near Evening Point, about 25 miles from the south entrance, and ebb currents separate about one mile further to the northwest.

The *Sailing Directions* also indicate that currents in Grenville Channel reach a maximum of 2 knots, and the ebb current continues to run for 1 ½ hours after Low Water.

Typically, boaters try to follow the general rule “In with the flood—out with the ebb”, often with an overnight stop at Lowe Inlet; and then are stymied by contrary currents in the central portion of the channel (south of Evening Point), where south-setting currents may reach as much as 6 knots especially near Lowe Inlet during spring tides. North-setting ebb currents of 3 or 4 knots are often observed in the same area. In the wider northern portion, the currents rarely exceed 2 knots.

The Canadian Hydrographic Service does not provide current predictions for Grenville Channel, but it does provide secondary corrections for high and low water at Lowe Inlet, based on Bonilla Island and at Lawyer Islands tide station (in Chatham Sound) based on Prince Rupert tide station. These corrections can be found in *Ports and Passes* and the *Canadian Tide and Current Tables, Vol. 7*.

It is the height of tide at each end of the channel (in Chatham Sound and Wright Sound) that drives the flood current from the north and south to the central parts of the channel. The timing and strength of these currents would be reasonably predictable if that was all there was to it, but a number of other factors combine to make the direction and strength of the currents in the southern portion of Grenville Channel (between Wright Sound and Evening Point) very difficult to predict.

For instance, the location of the meeting and separating point of the flood and ebb currents is not fixed, as one might think. Instead, its location is extremely variable.

Meteorological Effects

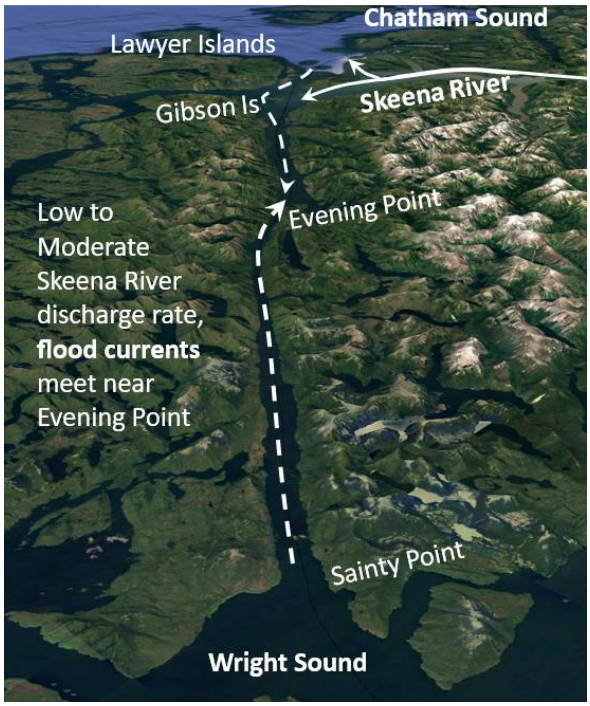
Under certain meteorological conditions, onshore winds pile water up in Chatham Sound, while outflow winds from Douglas Channel depress sea levels in Wright Sound. This tends to reinforce the southward flowing ebb current in the southern portion of the channel. As a result, the meeting point of the flood currents moves SE toward Wright Sound.

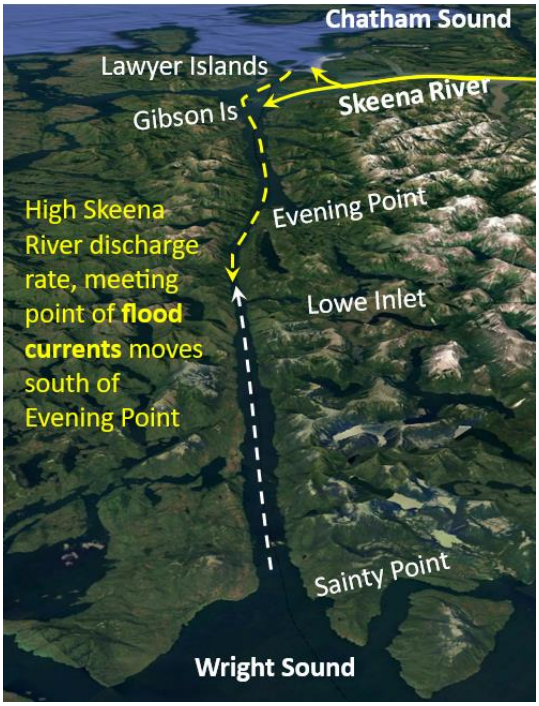
The Skeena River

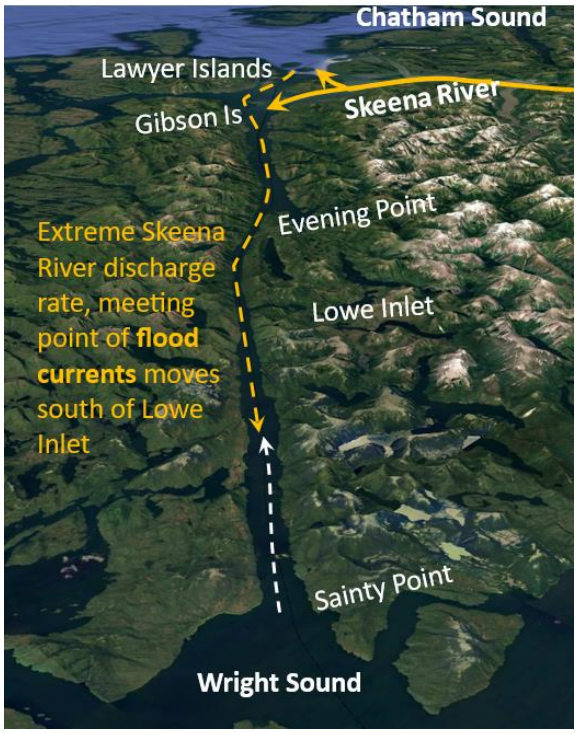
The most significant cause of variability is the changing amount of freshwater outflow from the **Skeena River**. The Skeena River is the second-longest river entirely within British Columbia, arising on the southern margin of the Spatsizi Plateau and flowing 570 km (350 miles) to Chatham Sound. The Skeena drains 54,400 km^2 (21,000 mi^2) in northwestern British Columbia, an area almost the size of Scotland.

In late spring and early summer, the Skeena River deposits vast amounts of snowmelt into the northern end of Grenville Channel. Most of this water flows north into Chatham Sound, or west into Ogden Channel, although a considerable quantity flows into the northern portion of Grenville Channel. This freshwater floats on top of the more saline water and becomes the

principal mover of surface currents. South of Evening Point, the pressure of this outflow opposes the flood current, reducing the speed of the flood and shortening its period by advancing the Turn to Ebb (TTE) and delaying the Turn to Flood (TTF), especially between Evening Point and Lowe Inlet.







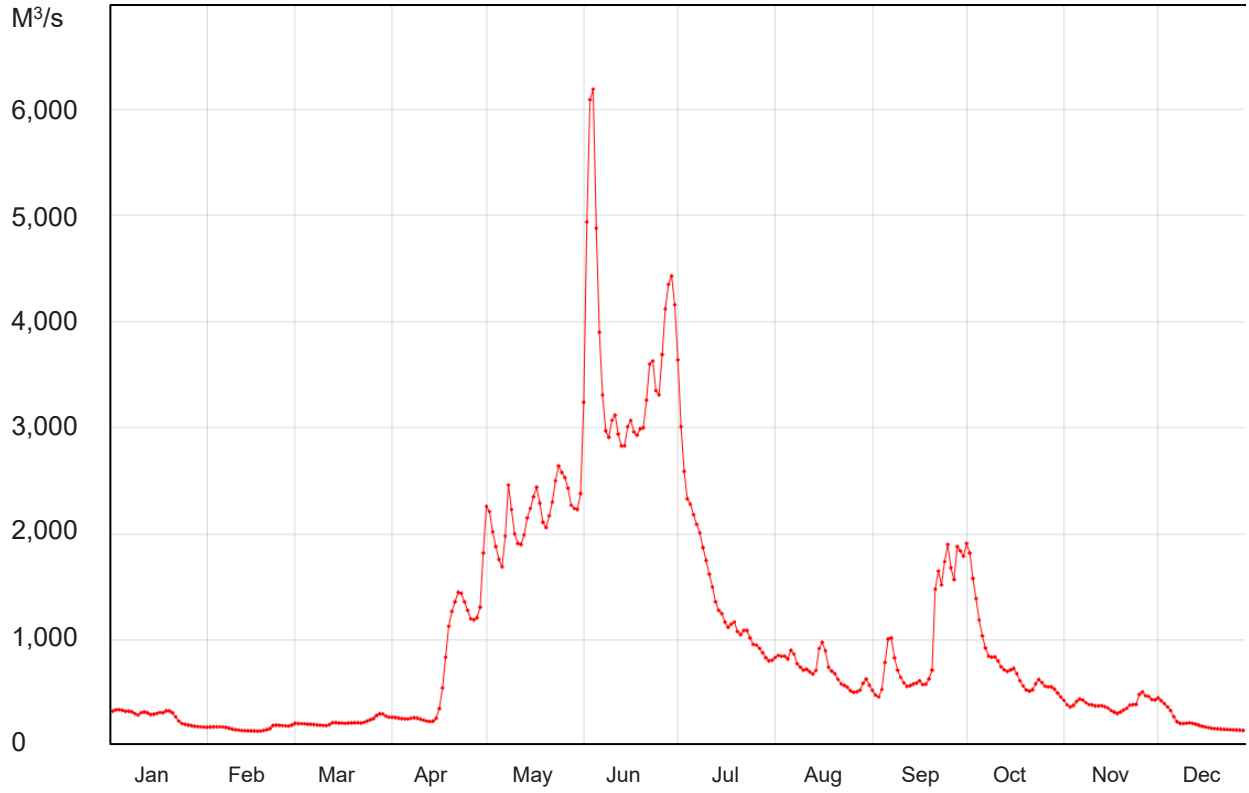
In May, June and July the Skeena River discharge is mostly composed of snowmelt from mountains hundreds of miles away. This is the time of the maximum flow each year. However, freshet conditions may also occur in late fall and winter due to heavy coastal rainfall.

These high Skeena River flows cause the meeting point of the flood currents from Chatham Sound and Wright Sound to move to the SE. However, the separation point of the ebb currents remains fairly constant – about one mile to the NW of Evening Point

For many boaters, the unpredictability of the direction and strength of the currents arises after a night spent at Lowe Inlet on their way to Prince Rupert. Planning on a moderate flood current in their favour as they head north, they are shocked to find they are heading into a 4- to 6-knot opposing current. This situation is most common in May, June or early July.

130 kilometres (81 miles) upstream from the river's mouth, lies the small settlement of Usk. Environment Canada maintains a current flow meter at Usk, and the data for daily discharge rate in cubic meters per second (m^3/s) is published at https://wateroffice.ec.gc.ca/report/real_time_e.html?stn=08EF001 Unfortunately, there is no current meter located closer to the mouth of the river, but the data from Usk provides a good representation of the relative volume of the discharge into Grenville Channel.

Historical daily discharge rates are also available from Environment Canada at https://wateroffice.ec.gc.ca/report/historical_e.html?stn=08EF001 According to the historical data, in the 20 years from 2003 to 2022, the discharge rate has fluctuated from a low daily average of 95 m^3/s in January 2017 to a high of 7,550 m^3/s in June 2007. The instantaneous rate has been found to be even higher – reaching almost 9,500 m^3/s for a few hours.



Graph showing Skeena River discharge during 2021. Note the two snowmelt events in early June and again in late June. Also note the secondary peak in late September (probably due to coastal rainfall). Source wateroffice.ec.gc.ca

During low to moderate river flows, it is unlikely that the meeting point of the flood currents moves very far from its predicted location at Evening Point. But when the discharge rate is high, the meeting point moves further toward Wright Sound, and under extreme freshet conditions, the flood current from the north (reinforced by the Skeena River flow) moves to the south of Lowe Inlet and may even penetrate all the way to Wright Sound. The data suggests that when the discharge rate is more than 5,000 m^3/s, skippers should be prepared for currents in southern Grenville Channel to be setting toward the SE during the predicted flood, with the strongest currents associated with the greatest displacement of the meeting point to the SE.

Effect of Large Tides

During large tides, especially a large flood, the effect of the Skeena River outflow is diminished. However, the flood current cannot completely counteract the effect of the Skeena River, because the fresh surface water is the primary driver of the surface current, especially in the Northern portion of the Channel.

These suggestions are generalizations only. In fact, the most predictable thing about Grenville Channel currents seem to be their unpredictability.

Skeena River Discharge	Southern Portion Sainty Point to Lowe Inlet (based on Bonilla Island)	Central Portion Lowe Inlet to Evening Point (based on Bonilla Island)	Northern Portion Evening Point to Gibson Island (based on Prince Rupert)
Low (Nov, Dec, Jan, Feb, March) **to Moderate** (April, Aug, Sept, Oct)	**Flood** • TTF occurs 1 hr 30 min after LW (Bonilla) • Flood current flows North up to 3 kn **Ebb** • TTE shortly after HW (Bonilla) • Ebb current flows S up to 4 kn	**Flood** • TTF occurs 1½ hr after LW (Bonilla) • Flood current flows N up to 3 kn **Ebb** • TTE occurs shortly after HW (Bonilla) • Ebb current flows South up to 4 kn	**Flood** • TTF occurs shortly after LW (Prince Rupert) • Large tides partially counteract the effect of Skeena River. • Flood current flows S - rarely exceeds 2 kn **Ebb** • TTE occurs shortly after HW (Prince Rupert) • Ebb current flows N - rarely exceeds 2 knots
High (May, June, July)	**Flood** • TTF occurs 1½ hr after LW (Bonilla) • Flood current flows N up to 3 kn **Ebb** • TTE occurs a few minutes after HW (Bonilla) • Ebb current flows S up to 4 kn	**Flood** • TTF occurs 1½ hr after LW (Bonilla) • Meeting point of flood currents moves south of Evening Point, possibly as far as Lowe Inlet • Flood current flows South up to 3 kn. Near Lowe Inlet, it flows N. **Ebb** • TTE occurs a few minutes after HW (Bonilla) • Separation point of ebb currents remains near Evening Point - flows S up to 4 kn	**Flood** • TTF occurs a few minutes after LW (Prince Rupert) • Flood current flows S - rarely exceeds 2 kn **Ebb** • TTE occurs a few minutes after HW (Prince Rupert) • Ebb current flows N - rarely exceeds 2 kn
Extreme Events (Expect the unexpected)	**Flood** • TTF occurs 1 hr 30 min after LW (Bonilla) • Flood current may flow N or S, depending on location **Ebb** • TTE occurs shortly after HW (Bonilla) • Ebb current flows S up to 4 kn	**Flood** • TTF occurs 1½ hr after LW (Bonilla) • Meeting point of flood currents moves south of Lowe Inlet • Flood current flows S up to 3 kn. Near Wright Sound it flows N. **Ebb** • TTE occurs shortly after HW (Bonilla) • Separation point of ebb currents remains near Evening Point - flows S up to 6 knots	**Flood** • TTF occurs a few minutes after LW (Prince Rupert) • Flood current flows S - rarely exceeds 2 kn **Ebb** • TTE occurs a few minutes after HW (Prince Rupert) • Ebb current flows N significantly reduced in strength

Weather Interactions

Finally, though Grenville Channel appears to be well protected, a heavy chop develops when strong currents in the northern, more open part of Grenville Channel oppose strong winds from the NW or SE, making travel very uncomfortable. At those times, conditions in the northern portion of Grenville Channel may actually be worse than in the open waters of Chatham Sound.

NOAA (the United States *National Oceanic and Atmospheric Administration*) used to provide secondary current corrections for Grenville Channel. However, NOAA stopped the practice of providing predictions and corrections for foreign tides and currents in 2021.

The corrections for Grenville are now obsolete, having been based on the Wrangell Narrows reference station, 220 nautical miles distant. Also, the corrections made no allowance for the effect of Skeena River outflow. At the time of printing, all software predictions for currents in Grenville Channel are still based on the US information and should be treated as generalizations only.

According to NOAA

Grenville Channel Current Station (Based on Wrangell Narrows)											
Location	Dir. Of Flood	Position		Time Differences				Speed Ratio		Avg Speed	
		Lat N	Long W	TTF	Max Flood	TTE	Max Ebb	Flood	Ebb	Max Flood	Max Ebb
4.5 mi.	°T	° ‘	° ‘	h min	h min	h min	h min	kn	kn	kn	kn
NW of Lowe Inlet	320	53 36	129 41	+1 23	+1 17	+1 09	+1 38	0.4	1.6	1.4	3.4

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