Admiral Bayfield Pioneer Nautical Surveyor

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Admiral Bayfield
Pioneer nautical surveyor

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The Canadian Hydrographic Service produces and distributes *Nautical Charts*, *Sailing Directions*, *Small Craft Guides*, *Tide Tables*, and *Water Levels* of the navigable waters of Canada, and *Marine Science Papers*.

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Admiral Henry Wolsey Bayfield
1795–1885

Introduction

Admiral Henry Wolsey Bayfield pioneered hydrography in Canada. From 1816 to 1856 he surveyed the Great Lakes, the St. Lawrence River and Gulf (islands, inlets, and bays) and the coasts of the Maritime Provinces. Admiral Bayfield provided navigation charts, detailed maps of shorelines, and the first *Sailing Directions for the Gulf and River of St. Lawrence.* This is the biography of the man who surveyed practically the entire shoreline from Lake Superior to the Atlantic Ocean, and who retired 11 years before Confederation.

Admiral H. W. Bayfield, R.N.

"I freely own that I am ambitious to complete the great labor which you have mentioned, extending from the head of Lake Superior to the western shores of Newfoundland," Commander Henry Wolsey Bayfield wrote in May 1832 to Captain Francis Beaufort, Hydrographer of the British Admiralty. When Bayfield retired from the surveying service 24 years later, he had achieved his ambition. He had surveyed lakes Superior, Huron, and Erie, had assisted in the survey of Lake Ontario and the St. Lawrence River as far east as the Galops Rapids, and had completed the survey of the river from Montreal to the Gulf. Finally, he had surveyed the coastlines, bays, and harbor inlets of the provinces and islands washed by the Strait of Belle Isle, Chaleur Bay, the Northumberland Strait, and the broad waters of the Gulf of St. Lawrence.

This magnificent achievement was the result of 40 years' hard work by a skillful, dedicated, and imaginative nautical surveyor whose career had begun in the Royal Navy at the age of 11.

Henry Wolsey Bayfield was born January 21, 1795, in Hull, England, an important harbor on the North Sea. Little is known of his parents except their names — John Wolsey Bayfield and his wife, Eliza Petit. Henry had one sister to whom he was devoted, and who became the wife of Sir G. O. Page Turner. Henry's education was apparently by private tutor. His childhood was spent under the cloud of threatened invasion by Napoleon Bonaparte, whose army defeated the combined forces of Austria and Russia at Austerlitz in 1805, and the army of Prussia at Jena in 1806. But the British fleet was strong, and Admiral Lord Nelson's victories, culminating in the Battle of Trafalgar in 1805, inspired in every British schoolboy the desire to join the Navy. Henry Bayfield was accepted as a "young gentleman" volunteer (supernumerary) on HMS *Pompey* two weeks before his 11th birthday. In the next nine months, Henry served also on the *Queen* and the *Duchess of Bedford*, and was slightly wounded when the *Duchess* beat off two Spanish gun boats in the Strait of Gibraltar.

Henry's commanding officer, Captain Francis Spilsbury, said later in a letter to Viscount Melville, First Lord of the Admiralty, that ". . . tho' a youth he [Bayfield] displayed presence of mind that would well become the greatest warrior." Henry's behavior won for him his first promotion. He became a volunteer, first class, on the *Beagle*, in September 1806. On this ship, as midshipman, he saw service in Quebec City and Halifax in 1810. The following year, Bayfield was on the *Wanderer* off the coasts of Portugal and Spain, and in 1814 he sailed again for Canada.

When the War of 1812 ended in December 1814, Bayfield was with the British flotilla on Lake Champlain. He was promoted to lieutenant in March 1815, but continued to serve as midshipman or acting master for another year. His war service came officially to an end in January 1816 when he was transferred from HMS *Champlain* to HMS *Prince Regent*, the British naval headquarters at Kingston, Upper Canada (Ontario). There he was recruited by Captain W. F. W. Owen, Senior Officer Commanding on the Lakes and Naval Surveyor, to assist in the Great Lakes survey begun the previous year.

Summer of 1816 found Acting Lieutenant Henry Bayfield on HM Sloop *Star* assisting in the survey of Lake Ontario, and sounding the channels in the St. Lawrence River among the Thousand Islands and as far east as the Galops Rapids, 10 miles beyond Prescott. This was Bayfield's training period as a naval surveyor. Captain Owen was greatly pleased with the progress of his apprentice surveyor. He commended Bayfield in a letter of July 22, 1816, to J. W. Croker, Secretary of the Admiralty, for his "Assiduity and ability," adding prophetically that ". . . his services will ever be valuable in this branch of his profession."

At the conclusion of Bayfield's first season as surveyor, the *Star* was paid off. Lieutenant Bayfield was about to return to England but Captain Owen urged him to remain with him as assistant surveyor, and Bayfield ". . . without hesitation accepted the employment proposed." Unexpected advancement came in June 1817 when Captain Owen was abruptly recalled to England. Twenty-two-year-old Henry Bayfield was placed in charge of the surveys of lakes Erie and Huron but with a greatly reduced establishment. He was left with an inexperienced assistant, Midshipman Philip E. Collins, and two boats, the *Troughton* and the *Ramsden*. The larger vessels were all ". . . paid off and laid up in ordinary."

Bayfield and Collins completed the survey of Lake Erie in 1818, and then moved to Penetanguishene to begin work on Lake Huron. This survey proved to be very time-consuming. Ten weeks were required to survey 45 miles of the north shore because, Bayfield explained, ". . . in that distance, we have ascertained the Shape, size & situation of upwards of 6,000 Islands, flats and Rocks; the main shore too is broken into deep Bays and Coves . . ." Altogether about 20,000 islands were surveyed in Lake Huron, among them the 100-mile-long Manitoulin Island.

On Lake Huron, and later Lake Superior, the surveyors had to take provisions for six weeks at a time, as there were no settlers living on the shores of those lakes. "Two Boats, not larger than ships cutters, carried our whole stock of conveniences, of which we had fewer than the native Indians," Bayfield wrote years later. "I had not room even for a matress, but slept, in all weathers, in the Boat, or on the shore upon a Buffaloe robe under the Boat's mainsail thrown over a few branches placed on the ground. Many a night have I slept out, in this way, when the Thermometer was down to near Zero, and sometimes even below it. Yet even this was not so wearing as trying to sleep, in vain, in the warm nights of summer . . . in the smoke of a Fire to keep off the clouds of Moschettoes which literally darkened the air." Sometimes the surveyors and crew suffered from ague, sometimes from scurvy, and they had no medical aid.

When Lieutenant Bayfield returned to his winter quarters at Penetanguishene in late October 1822, he reported that he had completed ". . . the Survey of Lake Huron up to the Rapids of the Neepish, at the entrance of Lake George."

In the spring of 1823, Bayfield and his assistant, Midshipman Collins, set out for Lake Superior. They now had a schooner, the *Recovery*, chartered from the Hudson's Bay Company, with Bayfield as Acting Commander. But, he said, ". . . having no officer to command her in my absence and finding I could get on faster in the Boats, she could only be used in supplying us with provisions at distant points, in carrying the necessary supplies, provisions across the Lake for winter consumption or occasionally making runs with the Chronometer." Wintering at Fort William during the Lake Superior survey, Bayfield and Collins were completely isolated from the settled parts of the country and received mail from England only once in six months. How exciting it must have been when Captain John Franklin arrived at Fort

William in May 1825, on his second Arctic expedition. Franklin left two instruments, a defective chronometer and a broken barometer, with Bayfield to be returned to the British Admiralty for repairs.

Bayfield had his own problems with instruments. "The Rocky shores of Lake Huron have so shook our Time Keepers, that in their present state they are useless," he wrote in November 1822. Before starting the Lake Superior survey, he asked to be supplied with a new or repaired time keeper, a boat sextant, a theodolite, a telescope, two Massey's patent logs, a Cater's compass, a small boat compass ". . . so fitted as to avoid the effect of the motion of the Boat," a pair of proportional compasses, a set of magnetical bars, and a pentograph.

In the three summers of 1823 to 1825, Bayfield and Collins circumnavigated Lake Superior in their small survey boats, examining all the bays and islands. Hitherto, this lake had been almost unknown except to Indians and fur traders. At the end of the 1825 season, the two surveyors returned to England. Bayfield told the Admiralty Hydrographer that he had ". . . finished the Surveys of Lakes Superior, Huron, & Erie which I have brought with me but which will require some time to prepare for their Lordships inspection, Lake Huron being as yet in Pencil & Lake Superior not yet plotted."

It took two years' work in the Admiralty's Hydrographic Office in London to complete the charts including (in addition to the general charts of the three lakes) plans of the connecting waters — River and Lake St. Clair, Detroit River, St. Joseph Channel, St. Mary River — and plans of Penetanguishene and other harbors. Bayfield was proud of his accomplishment. He assured the Hydrographer that ". . . the Charts of the Lakes which I have just finished are as critically correct in all the details as to render any future Survey of them unnecessary for Nautical or general purposes, but it is highly desirable that they should be filled up with Soundings, which except to a certain extent from the shores I could not obtain without a Vessel." Bayfield annotated his lake charts with comments on the natural features of the coasts, the timber, geological formations, and nature of the soil.

In recognition of their services, the two Great Lakes surveyors received promotions — Bayfield to commander in 1826, Collins to lieutenant in 1827. By this time, Bayfield, aged 32, had developed great skill in surveying. He was highly disciplined, his moral fiber toughened by years of enforced self-reliance and the constant battle with the elements. He saw a challenge in the prospect of connecting his survey of the Great Lakes with a survey of the St. Lawrence River and Gulf. He pointed out to the Hydrographic Office that there was no chart whatever of the river between Montreal and Quebec, and from Quebec to Anticosti Island there were only the "very incorrect" charts made many years previously by Colonel J. F. W. Des Barres, who had based them on the 1765 surveys of Samuel Holland. (Bayfield did not mention the charts made in the 1760s by Captain James Cook.) "There are few parts of the Globe in which more accidents occur to Vessels than in the dangerous Gulf and River St. Lawrence," Bayfield wrote to Croker, adding that he believed loss of life could be lessened and commerce extended ". . . by an accurate Survey of the River and the entire Gulf of St. Lawrence from the Western Shores of Newfoundland to Montreal." Bayfield asked for authority to execute this survey. The Admiralty granted his request, and on September 1, 1827, Commander Bayfield arrived at Quebec harbor with two assistants, Lieutenant Philip Collins and Midshipman Augustus Bowen. A year later, Dr William Kelly joined the service as surgeon. He remained over 20 years, attending to the medical needs of officers and crew and assisting with astronomical and meteorological observations.

Bayfield began immediately to make plans for his great work. He contracted for a 140-ton schooner, the *Gulnare*, ". . . to be a good, strong, first class Vessel, coppered and copper fastened," built to his specifications, and delivered to him in the spring of 1828, "Manned and Victualled for the Season." She was to be equipped with two boats. In addition, Bayfield ordered two six-oared cutters to be built as survey boats. These would be owned by the Admiralty, but not the *Gulnare*, which was hired for the summer months each year. She was the first of three *Gulnares* in the surveying service, each one larger and stronger than her predecessor. Smaller sailing ships were also added to the service in subsequent years.

Bayfield spent 14 years, from 1827 to 1840 inclusive, with headquarters in the city of Quebec, conducting the St. Lawrence survey. It covered the entire north shore of the St. Lawrence River, Lake St. Peter, Montreal and Quebec harbors, the Saguenay River as far as navigable, the northern coast of Gaspé, the Strait of Belle Isle, the coast of Labrador from Belle Isle to Cape St. Lewis, part of the west coast of Newfoundland, Anticosti, the Magdalen and other St. Lawrence islands, Chaleur Bay, the New Brunswick coast of Northumberland Strait, and the rivers Miramichi, Restigouche, and Richibucto with their main harbors.

During the years of this survey, Bayfield was in his prime. In summer, he worked from sunrise to sunset, six days a week and sometimes on the Sabbath. He set high standards which he expected his officers to follow. He was intolerant of laziness, carelessness, or drunkenness, and he must have seemed a hard master to men (especially the crew) who did not share his puritanical ideals. "Stopped the grog of the drunken men & of the 3 men & 3 boys who have given their allowance to others contrary to my orders," he wrote in his Journal, when he discovered that the seamen were playing cards for grog. Bayfield was largely self-trained and he was impatient with officers who did not show similar concern for self-improvement. He criticized one assistant, for instance, for ". . . his idle habits . . . that is he will never study to perfect himself in his duty or in anything else." But Bayfield was generous with praise when he felt his officers merited it, and he encouraged them to study for promotion even when it meant a year's absence in England, to the great inconvenience of the survey.

Nautical surveying was very demanding work, calling for skill in handling boats as well as knowledge of the techniques of sounding, and making the necessary observations to measure distances. Much of the work was done in boats 25 feet long. "In these small boats," Bayfield recorded in his Journal, "besides the provisions for the Crews & ourselves, we carry Tents for the men & ourselves, oil cloths, bedding & changes of cloathes for each, Instruments, Axes, camp Kettles, lines, leads, anchors & cables, &c., so that there is only room left for each persons feet to go down so that they may not sit & pull yet they are not so deep but that they will bear a very considerable sea in safety if ably managed." The vagaries of the weather presented a constant hazard. On the north shore of the St. Lawrence opposite Anticosti, strong winds blew most of the time, ". . . rolling in a heavy swell and a Fog so dense that we could not see a Cable's length," said Bayfield. The fog penetrated ". . . even to our bedding, rusting and destroying everything." Here also the surveyors were pestered with mosquitoes. "Never saw the Moschettoes & Black Flies more thick, their bites covered us with blood while observing & we could not open our mouths without swallowing them. The torment of them was beyond description." This was in the summer of 1832.

The next year, at Little Natashquan on the same coast, Bayfield was surprised to find the famous American ornithologist, J. J. Audubon, studying and sketching the water fowl for his *Birds of America*. The two men exchanged visits on board their respective schooners. Audubon's life-size drawings impressed Bayfield as being "most beautifully painted."

A month later, Bayfield and an assistant were marooned in a wind and rain storm for five days on a barren, granite island. "We could do nothing for everything was too wet and cold to write or calculate observations without risking an ague by becoming quite chilled through," Bayfield wrote. On the fifth day, "We began today to catch Puffins & young Gulls & to collect muscles & clams to make our provisions run out as long as possible."

When the weather became too severe in the fall to work in the exposed waters of the Gulf, the surveyors moved to Lake St. Peter or the sheltered waters of the river between Montreal and Quebec. In late October, surveying activities ended for the season, and the men returned to their office in Quebec. There they spent the winter and spring putting on paper the results of their observations of the preceding summer, sending the plans and charts to the Admiralty Hydrographic Office in London to be engraved. The proof sheets came to Bayfield later for approval.

He examined the engraved charts with the eye of a perfectionist, insisting on accuracy, good style, and the most appropriate scale for each particular chart. "I feel my own credit in great measure concerned, not only in their accuracy, altho' that is by far the most important matter, but also in their appearance when finished," Bayfield told the Hydrographer. He criticized the style of one engraved chart as appearing ". . . loose & coarse. . . in the Hills, the lines are wide apart and rough, the dotted lines of the shoals, the representation of the slate reefs that dry at low water, and the pointing by no means neat." But the style was less important than the scale which, Bayfield said, should vary with the area covered by the chart and its particular purpose. That of the Magdalen Islands, for example, should be ". . . on such a scale that Vessels could, by its aid, approach the islands closely and fearlessly in every part." Ships should be able to ". . . avail themselves of anchorages under different parts of their shores, instead of beating about the Gulf in thick fogs and uncertain tides and currents as they hitherto have done, and been frequently wrecked in consequence."

A tragic event occurred in September 1835, when Lieutenant Collins, Bayfield's assistant for 18 years, suddenly died of apoplexy while surveying the Magdalen Islands. Captain Bayfield (he had been promoted in 1834) found as replacement Lieutenant John Orlebar who, in time, became his most valued and trusted assistant.

Captain Bayfield was frequently consulted by the Admiralty and the government of Lower Canada (Quebec) on problems connected with navigation on the St. Lawrence. In testimony before an 1829 navigation committee of the Lower Canada House of Assembly, Bayfield pointed out that there were three channels in the river that could safely be used by ships but the river pilots knew only one. The Assembly consequently passed a law requiring pilots in future to qualify for taking ships through each of the three channels. The Admiralty was requested to supply copies of Bayfield's river charts for the pilots' use.

When rebellion broke out in Lower Canada in November 1837, the British Government asked Bayfield for advice on the earliest date in the spring by which British troops might be able to land at the harbor of Quebec.

Lighthouses were important for safety in navigation. Bayfield advised the authorities on the best positions for lighthouses on the coasts and islands of the St. Lawrence, and later, on the coasts of the Atlantic Provinces and Sable Island.

Bayfield's interests as a surveyor were not limited strictly to navigation. While on Lake Superior, he collected samples of rocks and minerals that were forwarded to the British Museum. A paper of his on this subject, "Outlines of the Geology of Lake Superior," was published in the first issue of the *Transactions of the Literary and Historical Society of Quebec* in 1829. Bayfield was an honorary member of this society. He contributed a second brief paper, "Remarks on Coral Animals in the Gulf of St. Lawrence," to the *Transactions* in 1831. This told how the surveyors had hooked, by accident, specimens of coral off the coasts of Gaspé and Anticosti.

Bayfield had no formal training in science but he was observant, had an analytical mind, and read scientific literature. As he surveyed the north shore of the St. Lawrence, he collected geological specimens as well as specimens of the organic remains on Anticosti and the Mingan Islands. He presented complete sets of these collections to the Literary and Historical Society of Quebec and the Geological Society, London, England, and a set of the geological specimens to King's College, Cambridge University. He prepared a paper, "Notes on the Geology of the North Coast of the St. Lawrence," that the Geological Society published in *Transactions* in 1837. Other Bayfield papers published by the Society were: "On the Transportation of Rocks by Ice" (1836), and "On the Junction of the Transition and Primary Rocks of Canada and Labrador" (1845). Besides geology, Bayfield was keenly interested in such phenomena as fogs, tides, and the aurora borealis. He contributed articles on terrestrial refraction in the St. Lawrence, on chronometers, and other navigational subjects to *Nautical Magazine*.

Astronomical observations formed part of Bayfield's work, and he was a Fellow of the Royal Astronomical Society, as well as a member of the Société géologique de France, and an honorary member of the Royal Canadian Institute. Before the first magnetic observatory in Canada was established in Toronto in 1839, the Admiralty consulted Bayfield about the best location. He recommended Toronto rather than Montreal or Quebec on the basis that Toronto was more likely to be free from the magnetic influence of mountains. Five years later, Bayfield was consulted again when the first observatory in Quebec City (built 1854) was being considered.

In his years as a surveyor on the Great Lakes, Bayfield's life was almost devoid of female society. He was shy and reserved. Nevertheless, after moving to Quebec, he mingled ". . . in the pleasures of the festive season," as the *Quebec Mercury* put it, and at age 43, in April 1838, he married Fanny, only daughter of Captain (later General) Charles Wright of the Royal Engineers. Mrs Bayfield assisted her husband in the early years of their marriage by copying his official letters (all handwritten, often several pages long, and in duplicate), and the manuscript for some chapters of his book on sailing directions. Captain and Mrs Bayfield became the parents of four sons and two daughters. Bayfield was a devoted husband and father.

In May 1841, Captain Bayfield transferred his headquarters from Quebec to Charlottetown, Prince Edward Island, a harbor that had a longer navigation season than Quebec and was more central to the projected surveying activities. Before Bayfield's departure from Quebec, the Master of Trinity House (the body that regulated St. Lawrence shipping and the conduct of river pilots) presented him with a testimonial expressing appreciation of his "talents and scientific acquirements" and thanking him for "the advice and assistance he has on different occasions rendered to this corporation."

The surveyors concentrated their efforts on the coasts of Prince Edward Island and Nova Scotia for the next 15 years. At the beginning of this period, Bayfield had two assistants, Lieutenants John Orlebar and G. A. Bedford, who had replaced Bowen in 1839. When Bedford left for another post in 1844, he was succeeded by Lieutenant John

Hancock, Orlebar's cousin. A junior assistant, William Forbes, joined the staff in 1845, and a draughtsman,Thom. Des Brisay, was engaged to prepare the charts and assist in surveying.

It was customary for one or two of the assistants to go off in survey boats for a few days or weeks to work on parts of the survey while Bayfield and another assistant worked elsewhere. But there was never any doubt as to who was in charge. Bayfield gave explicit instructions before his assistants left on an expedition; they reported to him frequently in person or by letter; and he examined thoroughly the results of their work. Relations were usually harmonious between Bayfield and his officers. In particular, Bayfield had the utmost confidence in his senior assistant, Lieutenant Orlebar (promoted to commander in 1845), and gave him increasing responsibility. When the Captain took a much-needed holiday in England in the fall and winter of 1844–45, he left Orlebar in charge of the hydrographic office in Charlottetown.

Bayfield and Orlebar were both devoutly religious. On summer Sundays, whenever possible, religious services were held on the *Gulnare*. "Read the morning service as usual, to which Capt. Orlebar added an appropriate sermon, selected for the occasion." This was a typical Sunday entry in Bayfield's Journal. Occasionally people from the shore attended the service.

The *Gulnare* became infected with dry rot and, in 1844, Captain Bayfield had her replaced by a new *Gulnare*, "... a fine large schooner of 180 Tons," built in Charlottetown under his close supervision. This ship, in turn, deteriorated, and had to be replaced after only eight seasons. The third *Gulnare*, "much larger and superior in every way," was built in Quebec City. This 212-ton ship went into service in June 1852.

Bayfield was anxious to obtain the exact measurements of distances between the meridians of St. John's, Charlottetown, Halifax, and Quebec, and he repeated his observations several times to ensure accuracy. Similarly, when his former commander, Captain W. F. W. Owen, was surveying the Bay of Fundy, Bayfield went to Baie Verte twice (in July 1843 and July 1844) to assist Owen in measuring with rockets the meridian distance across the Nova Scotia isthmus from Baie Verte to the Cumberland Basin. Bayfield also established the meridian distance between Boston and Halifax, with the cooperation of Captain Owen and the Cambridge Observatory at Boston.

A controversy developed in 1846 over deepening the ship channel in Lake St. Peter and the course it should follow. Captain Bayfield was summoned to Montreal to make recommendations to a special Committee of the Executive Council of the Canadian Government. His report sparked further controversy due, in Bayfield's opinion, "... to the petty, party animosities which this question has involved."

Bayfield's surveying program was interrupted in August 1847 by instructions from the Admiralty to go to Cape Pine, on the southern extremity of Newfoundland's Avalon Peninsula, to determine the best position for a lighthouse. His observations on this assignment led him to conclude that Cape Pine was not accurately placed on the Admiralty chart then in use.

By 1848, Bayfield and his assistants had surveyed the entire coastline of Prince Edward Island with its bays and deep harbor inlets, the Northumberland Strait coast of Nova Scotia, and the northeastern extremity of the Gaspé coast (it had been incompletely surveyed before). In the fall of 1847, they began work on Cape Breton Island, a major task which, including the Strait of Canso, Île Madame, the coast and harbors of Cape Breton, and the Bras d'Or Lakes, required five years to complete. The traffic in the Strait of Canso impressed Bayfield. He wrote in October 1847, "The importance of an accurate survey, on a large scale of this Strait will appear evident, when I state, that no less than 7,000 vessels were recorded on the books of the Light-House Keeper to have passed through it last year."

An unexpected request came from the Admiralty in July 1851 to verify the position of Sable Island and make recommendations concerning a lighthouse. Captain Bayfield, with Commander Orlebar and Lieutenant Hancock, sailed to the island in the *Gulnare*. They travelled across the island on horseback, through the thick sand, taking measurements and making observations. After three days, Bayfield and Orlebar departed, leaving Hancock to complete the survey. Bayfield recorded in his Journal on August 20, 1851, that they had "... completely surveyed the island, and its bars; and determined accurately the position of its two extremes, & the principal establishment, astronomically & chronometrically thus affording a foundation for any further operations that may at any time be deemed necessary."

Bayfield's career as a surveyor was now drawing to a close. His vigor was declining and he suffered from rheumatism. His last major undertaking was the survey of Halifax, 1852–53. This work included

the entire harbor of Halifax with the adjacent headlands and bays — Bedford Basin, Sambro harbor and ledges, and Dartmouth harbor. Later, the survey was extended along the southern coast of Nova Scotia from Halifax to Cape Canso.

A continuing project of Bayfield's was the preparation of *Sailing Directions for the Gulf and River of St. Lawrence* (including the coastal waters of the Maritime Provinces and the Bras d'Or Lakes). He worked on this book, chapter by chapter, year after year, from 1828 to 1855, sending each chapter when finished, to the British Admiralty to be printed. The work was published in three stages, in 1837, 1847, and 1857. Finally, in 1860, it was published in two volumes under the title *The St. Lawrence Pilot.* (Several editions have since been published.) A list of latitudes and longitudes, compiled laboriously by Bayfield, was issued in 1857 as *Maritime Positions in the Gulf and River St. Lawrence, on the South Coast of Nova Scotia.* Bayfield concluded his writings with *The Nova Scotia Pilot*, published in two parts (1856 and 1860).

Henry Bayfield retired from the surveying service in 1856 when he became a rear admiral. He was promoted to vice admiral in 1863 and to admiral in 1867. Admiral Bayfield continued to live quietly in Charlottetown until his death, February 10, 1885, at the age of 90.

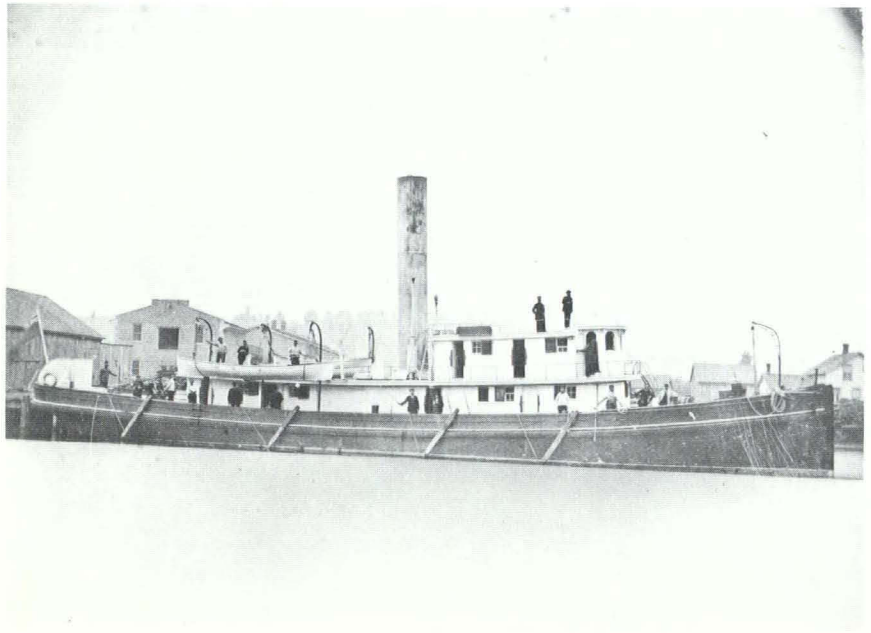
Over 100 charts by Bayfield are in the Map Division of the Public Archives of Canada, Ottawa. For practical purposes, they have been supplemented or superseded by more recent charts. Bayfield's surveying methods were necessarily primitive. He measured depths of water by lead line and patent sounding machine, and features of the coast (inlets, shoals, and rocks) by triangulation and the theodolite. His chief instruments for determining latitude and longitude were chronometers and the sextant. His charts and sailing directions were as accurate as he could make them, however, and for over 50 years they guided innumerable ships through treacherous waters along the waterway of the Great Lakes and St. Lawrence River and Gulf (except for Lake Ontario and the upper St. Lawrence, the surveys of which were only partially his). This exceptional man provided the foundation for hydrography in Canada, and his successors have built on his pioneering work.

As a man, Bayfield was highly respected by all who knew him — his superiors in the Admiralty, the officers he commanded, Canadian government officials, and, of course, his many friends. He was a 19th-century gentleman, distinguished in appearance, courteous and kindly, but reserved and formal. An apt appreciation of Bayfield was expressed by Captain J. G. Boulton, R.N., a retired hydrographic surveyor, who said, "The Admiralty Surveying Service has produced good men, from Cook onwards, but I doubt whether the British Navy has ever possessed so gifted and zealous a Surveyor as Bayfield. He had a marvellous combination of natural talent with tremendous physical energy, and was, I feel convinced, a man who would have gained the summit of any profession he might have honoured, for his one thought was his work."

The Canadian Hydrographic Service traditionally names one of its ships in Bayfield's honor. His service to Canada has been commemorated by plaques in Charlottetown and Penetanguishene, and by the adoption of his name for a river and village in Ontario, villages in New Brunswick, Nova Scotia, and Prince Edward Island, and for Bayfield Sound off Manitoulin Island.

Ships Named *Bayfield*

Bayfield I



The first surveying vessel to be named in honor of the pioneer nautical surveyor, Admiral Henry Wolsey Bayfield, was the tugboat *Edsall*, bought by the Canadian Hydrographic Service in 1884. The name was changed to *Bayfield* by Order-in-Council, May 17, 1884.

HM Dominion Surveying Steamer *Bayfield* was a wooden screw tug of 100 tons, built in the United States in 1863 and purchased from William J. Murray of St. Catharines, Ontario, for $15,000. She was the first hydrographic steamer in the Canadian surveying service. After being remodelled and refitted, the *Bayfield* began service in Georgian Bay in the summer of 1884. Further alterations were made in the next two years (she was housed in and a cabin added) to provide more accommodation and to make the tug more comfortable for the staff.

Most of the *Bayfield's* service was in Georgian Bay, Nottawasaga Bay, the North Channel of Lake Huron, Manitoulin Island, the north and east coasts of Lake Huron, and the north coast of Lake Erie. Ordinarily, the ship wintered in Owen Sound, but in 1895, following the summer's surveying activity in Lake Erie, she was docked for the winter at Port Dalhousie, Lake Ontario. Finally, in 1902, although condemned as unfit for further service, the *Bayfield* was used for a few months in the resurvey of the east coast of Lake Superior. That fall, the *Bayfield* returned to Owen Sound, bringing 19 seasons as a survey vessel to an end.

Bayfield II

The resurvey of Lake Superior required a ". . . larger, stronger, faster and more economical vessel. . ." than the old and small *Bayfield*, Chief Hydrographer William J. Stewart stated as early as 1899. Such a vessel was found in the *Lord Stanley*, purchased in 1901 by the Department of Marine and Fisheries from Davie & Co., Quebec, for $50,000. This was a twin-screw, ocean-going tug of 276 tons gross, 114 tons net, that had been built in Scotland in 1889. Powered by steam, the vessel was 140 feet long, 24.1 feet in breadth and had a maximum draft of 10.5 feet. Her hull was steel, her stern elliptical, and she had a superstructure of one deck with two masts, but her equipment was primitive. There was no wireless or radio system and the compass was magnetic. For surveying purposes, the ship was equipped with a survey launch, two gigs, and a few dories.

The new survey vessel got off to an unlucky start. On her way to Lake Superior from Sorel in the spring of 1902, her rudder and stern post were badly damaged in Toronto harbor. The *Lord Stanley* had to return to Sorel for repairs, and the only surveying service she saw that summer was in the ship channel of the St. Lawrence River.

The following year, the *Lord Stanley* was renamed *Bayfield*, thus continuing the tradition that one survey vessel should bear the name of Admiral Henry Bayfield.

The CGS *Bayfield* served six summers, 1903–08 inclusive, as a survey vessel along the northwestern shore of Lake Superior. In 1909, several harbors on lakes Huron and Erie were surveyed as the *Bayfield* made her way from Owen Sound to Lake Ontario, for the resurvey of that lake. Work proceeded westward from the shore of Prince Edward county to Hamilton Bay in the summers of 1909–15, when the resurvey was completed.

The *Bayfield* spent one more summer (1916) in Lake Superior before being loaned to the Royal Canadian Navy for wartime patrol duties in the Atlantic. She was refitted and returned to the surveying service in 1919. After the harbor of Kingston was resurveyed, the *Bayfield* returned to Lake Superior to resume work there on the east coast. This survey was completed in 1920.

The following year, the *Bayfield* was transferred to the Gulf of St. Lawrence where she was employed for most of her remaining years as a survey vessel in recharting the Magdalen Islands and several harbors on the Northumberland Strait and Bay of Chaleur. The aging ship required repairs, however, and was out of commission in 1922 and from 1924 to 1926. She was on loan to the Department of National Revenue for preventive service on the Canadian east coast for two years, 1927–28.

In 1929, the *Bayfield* was outfitted with a nonrecording echo sounder. Unfortunately the sounder proved to be inaccurate, and when the surveyors were charting the dangerous "Superior Shoal" in the main ship channel of Lake Superior in 1930, they had to resort to the old-fashioned lead line for sounding.

The *Bayfield* was taken out of commission in 1931 at the close of her final season in the resurvey of the Magdalen Islands and Northumberland Strait. She had been actively employed in the surveying service for 21 of her 30 years as a vessel of the Canadian Hydrographic Service.

The ship was sold in 1937, resold in 1944, and converted to a freighter. She met a watery death in a wreck off the coast of Newfoundland in 1949.

The Bayfield Launch

For several years after the second *Bayfield* was taken out of service in 1931, her survey launch continued to be used. The launch was built on the Atlantic coast in 1925 and was put into service that year to assist the *Cartier* in the survey of the Mingan Islands. (At that time CGS *Bayfield* was out of commission waiting repairs.)

After 1931, the *Bayfield* launch was employed in the surveying service wherever required, such as the resurvey of Charlottetown harbor and Hillsborough Bay in 1935. She was shipped to Lake St. Peter in 1940 to be used with the *Boulton* in the resurvey of that lake and the St. Lawrence River. This work continued toward Montreal in the 1940s. The *Boulton* was taken out of commission in late 1946, and her echo-sounding machine was transferred to the *Bayfield* launch so sounding in the St. Lawrence could be continued. When the water in the river was exceptionally deep in 1947, a Bludworth deep recorder was installed in the launch to enable the surveyors to continue their work.

Bayfield III

A third *Bayfield* was commissioned in 1949 by the Canadian Hydrographic Service. She was a 49½-foot cabin cruiser, built in Meaford, Ontario. This *Bayfield* was in continual surveying service in the Great Lakes and tributaries until 1963.

Bayfield IV

The current *Bayfield* went into service as a survey vessel in the lower St. Lawrence in June 1974. She was built in Kristiansand, Norway, in 1960 for the Grand Marine Company, Chicago, and was then chartered by the University of Miami for biological research in the Bahamas, Florida Keys, and Gulf of Mexico. In 1966, John David Eaton of Toronto bought the ship, converted her to an ocean-going yacht, and renamed her *Hildur*. On Mr. Eaton's death in 1973, Environment Canada purchased the yacht, had her refitted at the Port Weller Shipyard, and changed her name to *Bayfield*.

The CGS *Bayfield* is exceptionally well appointed. Decks and furnishings are of teak and the ship is air-conditioned throughout. The galley is well equipped, with ample refrigeration space. Stabilizers, in conjunction with extra wide bilge keels, make the vessel very comfortable when under way. The ship's operational complement is nine men, and there is accommodation for six hydrographers or other scientific personnel.

The *Bayfield* is 102½ feet long, 21½ feet in the beam, and has a maximum draft of a little over 8 feet. She is powered by two diesel engines of 290 horsepower each. Her fuel capacity of 9000 gallons gives her a cruising range of 3600 miles. Freshwater capacity is approximately 12 tons, and she is fitted with a saltwater condenser.

Navigational equipment includes two magnetic compasses, a Sperry gyroscope compass with six repeaters, sounding equipment with sonar, LORAN A and C positioning equipment, and two DECCA radars. Communications equipment consists of two very high frequency radios and one single side band radio.

Sources of Information

The biography of Bayfield is based largely on the following manuscript documents in the Public Archives of Canada, Ottawa: Correspondence with the British Admiralty, MG12, Admiralty 1, vol. 1573–87, 2263–67, 2544, 2792, 3444–45, and unnumbered volumes in film reels A-423 and A-424; Capt. Henry W. Bayfield papers, MG24, F28, vol. 1, Correspondence with the Admiralty, 1816–39; vol. 2, Notes on survey of the Great Lakes, 1816–25; vol. 3–8, Captain Bayfield's Journal, St. Lawrence survey, July 20, 1829–Dec. 31, 1853 (except for two gaps, April 5, 1836–Dec. 31, 1840, and March 1, 1848–Dec. 31, 1850).

The Public Record Office, London, England, supplied a copy of Bayfield's baptismal certificate and an outline of his naval service (the latter available also in PAC). The Provincial Archives of Prince Edward Island, Charlottetown, provided information on Bayfield's children.

The best published source is an untitled paper on Admiral Bayfield, by J. G. Boulton, in *Transactions of the Literary and Historical Society of Quebec*, sessions 1908–09, No. 28 (Quebec, Que., 1910), p. 27–95. (Available in reprint form.)

Sources de renseignement

La biographie de Bayfield est basée en grande partie sur les documents suivants des Archives publiques du Canada (Ottawa): correspondance avec l'Amirauté britannique, MG 12 Amirauté 1, volumes 1573–87, 2263–67, 2544, 2792, 3444–45, et volumes non numérotés en bobines A-423 et A-424; les documents du capitaine Henry W. Bayfield, MG24, F28, volume 1, correspondance avec l'Amirauté, 1816–39; volume 2, notes sur les relevés dans les Grands lacs, 1816–25: volumes 3–8, journal du capitaine Bayfield, relevé du Saint-Laurent, du 20 juillet 1829 au 31 décembre 1853 (sauf pour deux périodes, du 5 avril 1836 au 31 décembre 1840, et du 1er mars 1848 au 31 décembre 1850).

Le bureau des dossiers publics de Londres (Angleterre) nous a fourni une copie du certificat de baptême de Bayfield et un aperçu de son service dans la marine (ce dernier disponible également aux Archives publiques du Canada). Les Archives provinciales de l'île-du-Prince-Édouard (Charlottetown), nous ont donné des renseignements sur les enfants de Bayfield.

La meilleure source publiée est un article sans titre sur l'amiral Bayfield, par J. G. Boulton dans *Transactions of the Literary and Historical Society of Quebec*; session 1908–09, n° 28 (Québec (Québec), 1910), pages 27–95 (disponible en nouvelle édition).

LAKE HURON.

SHEET III.

The Soundings are in feet.

SURVEYED BY CAPTn H.W. BAYFIELD, R.N. 1822.

Price 2/

Collins Inlet
Main and Islands are of Primitive rock producing only Pines Birches &c of stunted growth
Phillip Edward Island
Fox Islands
Limestone
Papoose Id
of Limestone
Indian tipees on the Top
Mouths of the French River
Falls 8 feet
Large River
High Granite Rocks
Bustard Islands
Small Lake
By this route small light Canoes can proceed to French River
Henvey Inlet
Byng Inlet
Rapid River
Elm & Maple
The Main and Islands of Granite Gneiss Sienite, Mica slate, and their subordinate formations.
Wooded with Pines of stunted growth.
Small fall from the Lake
Lake Falls 10 feet
Falls 8 feet Lake
FRANKLIN INLET
Trading Post
The Limestone Ids
Granite rocks
PARRY SOUND
Parry Island
The Main and Islands are of Granite, Gneiss, Micaslate or their subordinate formations, the whole barren producing only small Trees of the Pine species, with Birch and Poplar.
Mouse Deer Point
The Western Isles of Granite
Falls 30 feet
Bushby Inlet
Watcher Island
Hope Island
Giants Tomb
Beckwith Island
Christian Island
Rennies Bay
Roberts Bay
MATCHEDASH BAY
Moore Point
River Severn
Penetanguishene Harbour
Point Cockburn
River Wye
Gloucester I.
Point Yarwood
Point Spratt
Sand
White Spruce Id
Natawasauga River
Pines & fine Sandy beach
Low stony shores
Pine and spruce Timber
The blue Mountains
Sandy beach
Point Boucher
Stony shore
Rocky and Stony Shore
Creek 20 Yards wide at the entrance and 20 inside 3 feet over its bar. It becomes rapid 1/4 mile up.
Creek 6 feet over its bar rapids a short distance up
Point Rich
Campbell clift of clay
XX Clay bank
Rocky & stony
Point William
Narrow shingle beach
Limestone Cliff
Stony beach
Indian Winter Encampment
Creek too shoal at the entrance to admit boats.
COLPOYS BAY
Broken Limestone beach
Sandy beach
Cape Commodore
White Cloud Island
Griffiths Island
Hay Island
High ridge of Limestone Shingle beach
Very deep water between the Isles
Sydney Bay
Cape Paulet
Hope Bay
Sound
Jacksons Cove
Shoal Cove
Wooded Cliff
Broken Limestone beach
Indian Har.
Sandy beach
Cape Croker
Point Montresor
Barrier Island
Cape Dundas
Melville
Barrow Bay
Shingle beach
Gun Point
Cape Hangcliff
Isthmus Bay
Small Lake
Limestone cliff
Cape Chin
Narrow beach coarse shingle
Dyer Bay
Wingfield Basson 7 feet in the entrance
Point Wingfield
Limestone Cliffs
CABOTS HEAD
Stokes Bay
The Main land & Islands are Low and barren. Secondary Limestone containing great numbers of Fossil remains.
Cheaphato Islands
Chiefs Point
Falls of 20 feet over a ridge of Limestone
Three feet over the bar deeper within
Low sandhills and fine sandy beach
Indian Traders
River Saugink 6 feet over the bar it becomes shoal and rapid 100 Yds within the entrance.
Var 0° 30' W.
GEORGIAN BAY
OWEN
Longitude West from Greenwich
81°
80°

London Published according to Act of Parliament at the Hydrographical Office of the Admiralty 29th Sept. 1828.

J.& C. Walker Sculpt.