



PROTECTED AND CONSERVED COASTAL AREAS IN CANADA: INSIGHTS WITH RESPECT TO TARGET 3 OF THE KUNMING-MONTREAL GLOBAL BIODIVERSITY FRAMEWORK

Christopher J. Lemieux¹, Trina D. King¹, Scott R. Parker² and Daniel T. Kraus³

*Corresponding author: clemieux@wlu.ca

¹Department of Geography & Environmental Studies, Wilfrid Laurier University, Waterloo, Ontario, Canada, N2J 2N6

²Parks Canada, Protected Areas Establishment and Conservation, Parks Canada, Tobermory, Ontario, NOH 2R0

³Wildlife Conservation Society Canada, Toronto, Ontario, Canada, M5S 3A7

ABSTRACT

Despite coastal area being recognised as an important subcomponent in protected and conserved areas targets for over a decade, it has been orphaned in both national and international reporting. In this paper, we provide the first progress report on protected and conserved coastal area in Canada. While 13.6 per cent of Canada's coastal area is protected and conserved, there is substantial variation across Canada's three oceans and Great Lakes, jurisdictional authorities, and marine/terrestrial ecosystems. Importantly, Manitoba (37.3 per cent) and the Yukon (45.1 per cent) have already achieved the 30 per cent coastal protection target of the *Kunming-Montreal Global Biodiversity Framework* (KM-GBF). However, Newfoundland and Labrador (7 per cent) and the Northwest Territories (8 per cent) currently fall significantly short. Very poor protection is evident in several marine bioregions and terrestrial ecozones, including across the Arctic, the Newfoundland and Labrador Shelves (0.7 per cent) and the Hudson Bay Complex (5.1 per cent). The Great Lakes require urgent and focused conservation attention, with lakes Ontario (3.6 per cent) and Erie (3.7 per cent) exhibiting a dismal amount of coastal protected and conserved area. Our results highlight the importance of explicitly reporting on the status of coastal area protection and we outline several considerations that can be used by the global conservation community to support more effective coastal protection, accounting and reporting *vis-à-vis* Target 3 of the KM-GBF.

Key words: protected areas, conserved areas, biodiversity, targets, planning, reporting, accounting

INTRODUCTION

While representing only 5 per cent of the world's terrestrial area, coastal areas contain disproportionate biological significance, including threatened and highly productive ecosystems, key habitats, and the provision of a wide variety of ecosystem services to billions of people the world-over (MEA, 2005). With approximately 40 per cent of the world's population living within 100 km of the coast, coastal regions support the livelihoods of billions of people (United Nations, 2017). At the same time, population-related development pressures have led to a loss of coastal biodiversity, reduced water quality, and impaired resilience to storms and other natural hazards (Herbert-Read et al., 2022; Sandifer & Sutton-Grier, 2014). These impacts are being further compounded by the increasing threats posed by climate change (Hanley et al., 2020; IPCC, 2018) and

collectively undermine the health and productivity of coastal ecosystems and the services they provide.

Despite their ecological and social significance, coastal areas have been poorly considered in conservation planning and reporting, especially as related to protected areas and "other effective area-based conservation measures" (OECMs). Aichi Biodiversity Target 11 of the United Nations (UN) Convention on Biological Diversity (CBD) *Strategic Plan for Biodiversity 2011–2020* called on Parties to conserve "10 per cent of **coastal and marine area...**" through protected areas and OECMs by 2020 (CBD, 2010) (emphasis added). However, *Protected Planet Report 2020*, the final report by UNEP-WCMC and IUCN on the global status of Aichi Biodiversity Target 11 (UNEP-WCMC IUCN & NGS, 2021), only reported marine and terrestrial protected and

conserved area and did not explicitly report on the status of coastal area. We are also not aware of a single national report submitted to the CBD that accounted for coastal area protection *vis-à-vis* Aichi Biodiversity Target 11. Part of the reporting challenge may stem from the fact that there is no standard working definition of ‘coastal area’ (Neumann et al., 2015). While the coast is generally recognised as the place where marine and terrestrial environments interact (e.g. coastal protected areas are “within or adjacent to the marine environment...”) (SCBD, 2004), defining or operationalising how far inland or seaward a coastal area boundary extends, varies with purpose and context (Alvarez-Romero et al., 2011; Mikhaylov & Plotnikova, 2021). Furthermore, because coastal areas overlap different, and often independent, marine and terrestrial governance and technical cultures, mapping and accounting extent of such areas requires a complicated degree of harmonisation between datasets (Bartier & Sloan, 2007).

Renewed and ambitious area-based conservation commitments, as well as the mounting severity of pressures being exerted on coastal ecosystems, compels the need for much greater focus on coastal areas by both the scientific and policy communities. These are critical ecosystems subject to pressures unique to the land–water interface and warrant specific conservation tracking and action. Reporting on implementation progress, as outlined in CBD Article 26, is required by Parties, and can assist countries in identifying commitments that are being successfully met, gaps and constraints to implementation (CBD, 2006). Reporting on the status of the effective implementation of coastal area protection in particular can assist relevant authorities, stakeholders and partners in formulating focused strategies to develop mutually supportive initiatives at various scales of implementation and address important gaps and needs including, but not limited to, integrated spatial planning at the land–water interface (including ecological representation and connectivity) and addressing concerns over the quantity vs. quality of protection, particularly in the marine realm (Lemieux et al., 2022).

Surrounded by oceans on three sides, Canada has the longest coastline in the world, including 243,042 km of marine coast and 10,014 km of freshwater coast along the Great Lakes/St. Lawrence River (Statistics Canada, n.d.). Canada also has some of the planet’s largest expanses of coasts under very low anthropogenic pressure (Allan et al., 2023; Williams et al., 2022). Coastal ecosystems in the country support thousands of terrestrial and aquatic wildlife species, including many species at risk, aggregations of migratory birds, and provide essential nursery habitat for fish of commercial and cultural importance (Federal

Provincial and Territorial Governments of Canada, 2010). Approximately 40 per cent of Canada’s population lives along a marine coast or within the Great Lakes basin (NRCAN, 2023). Coastal tourism in Canada represents nearly 25 per cent of total tourism employment (excluding the Great Lakes) (Government of Canada, 2021) and access to ocean and coastal territories is particularly important to Indigenous ‘cultural continuity’ – including traditional management and harvesting practices (e.g. Lepofsky et al., 2021), inter-generational transfer of knowledge (e.g. Morin et al., 2018) and social and ceremonial purposes (Bennett et al., 2018).

Canada’s coastal ecosystems are also under threat. Approximately two-thirds of Atlantic coastal saltmarshes have been lost, 70 per cent of Pacific estuary marshes in British Columbia have been lost or degraded (Environment Canada, 1991), and about 50 per cent of the original Great Lakes coastal wetlands have been lost (with some losses as high as 90 per cent in southwestern Ontario) (ECCC, 2022a; EPA, 2006). Climate change with its associated impacts such as sea level rise and increased coastal erosion, is now a significant issue for coastal areas across Canada, particularly in the North (Ford et al., 2018; Lemmen et al., 2017).

Despite these challenges, Canada is well-positioned to play a significant global role in coastal conservation. The federal government committed to conserving 30 per cent of terrestrial, inland water, marine and coastal area by 2030, consistent with Target 3 (the ‘30x30’ target) of the recently adopted UN CBD *Kunming-Montreal Global Biodiversity Framework* (KM-GBF) (Trudeau, 2021). This commitment is important in light of current pressures and threats related to economic development on Canada’s coast, including substantive fisheries and failures to protect species at risk (Auditor General of Canada, 2022), ongoing and proposed offshore hydrocarbon resource development (Noble et al., 2013), northern development expansion plans (Hirsh-Pearson et al., 2022), as well as anticipated population growth in coastal cities (primarily through immigration) and changing settlement patterns (Neumann et al., 2015). Finally, ongoing land claims and associated community planning, including the emergence of Indigenous Protected and Conserved Areas (IPCAs) and related Indigenous-led conservation initiatives, could positively influence conservation outcomes across many coastal ecosystems in Canada (ICE, 2018).

Given the gaps in knowledge and reporting on coastal conservation, our objectives are to: 1) establish the current status of protected and conserved coastal area in Canada; 2) stratify protected and conserved coastal



Inuit elders from Nunavik and Nunatsiavut visit their childhood homes in Nachvak Fjord, Torngat Mountains National Park, Newfoundland and Labrador. ©Parks Canada/ H. Wittenborn.

area by jurisdictional authority and broad ecosystem types (e.g. marine bioregions/terrestrial ecozones); and, 3) discuss future directions to support effective coastal protected and conserved area planning, accounting and reporting. In so doing, we provide an important baseline understanding of the status, trends and issues related to coastal protection in Canada. This is also important for measuring progress over the remainder of the decade given that the coastal area protection subcomponent from Aichi Target 11 persists in KM-GBF Target 3.

METHODS

Here we provide a summary of the case study area and our analysis approach. More detailed methods including limitations can be found in Supplementary Online Material 1. The 2021 Canadian Protected and Conserved Database (CPCAD) was used to assess the state of protected and conserved area (ECCC, 2022b). CPCAD is an authoritative database comprised of both spatial (e.g. boundary) and attribute data. CPCAD is managed by Environment and Climate Change Canada (ECCC), the national focal point to the CBD, and jurisdictional authorities (e.g. provinces/territories, private land organisations) submit their databases to ECCC on an annual basis. As of December 2021, more than 9,000 terrestrial conserved areas and 750 marine conserved areas encompass approximately 13.5 per cent and 13.9 per cent of Canada's total terrestrial and marine area, respectively.

The methodology to measure the spatial distribution of protected areas in the coastal zones of Canada was completed in ArcGIS Pro 2.9.x. There is no standardised

approach for defining coastal area (Neumann et al., 2015). Our delineation is based on a 4 km 'buffer zone' that includes a 2 km inland and a 2 km water buffer that straddles the shoreline. The resulting buffer zone retained key shoreline attributes (e.g. Great Lake name, terrestrial ecozone, marine bioregion and province/territorial name), and underwent dissolve processes to simplify the rendering of the coastal zone by jurisdiction. Two spatial datasets were used to delineate shorelines, the input used to define the 'coastal zone'. Spatial data depicting the representation of Canada's diverse ecological makeup, divided into 18 terrestrial ecozones (Figure 1 Supplementary Online Material 1), 12 marine bioregions/ecozones (Figure 2 Supplementary Online Material 1) and one freshwater bioregion/ecozone, was provided by the National Ecological Framework and the National Framework for Marine Protected Areas (Government of Canada, 2011, 2013).

RESULTS

For the purposes of this article, we report on protected and conserved coastal area only. Results pertaining to protected and conserved coastal length is included in Supplementary Online Material 2. Area is the standard reported on at the national level in Canada and by Protected Planet/World Database on Protected Areas (WDPA).

Our analysis reveals that coastal protected and conserved area in Canada across all provinces and territories (and including all governance types) is 13.6 per cent (Table 1, Figure 1). This total is slightly above the total national terrestrial area protected and conserved (13.5 per cent)

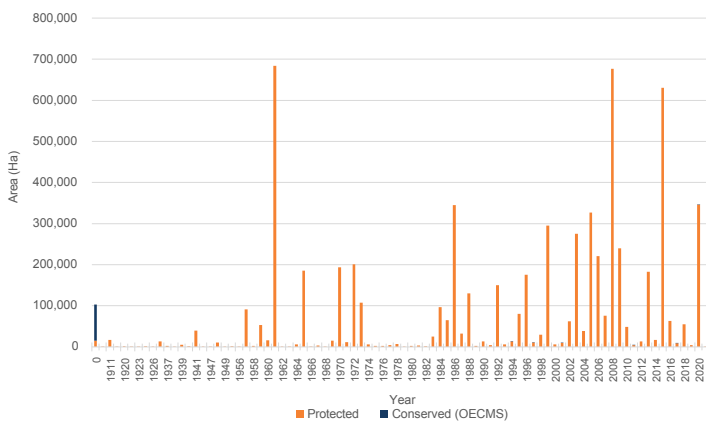
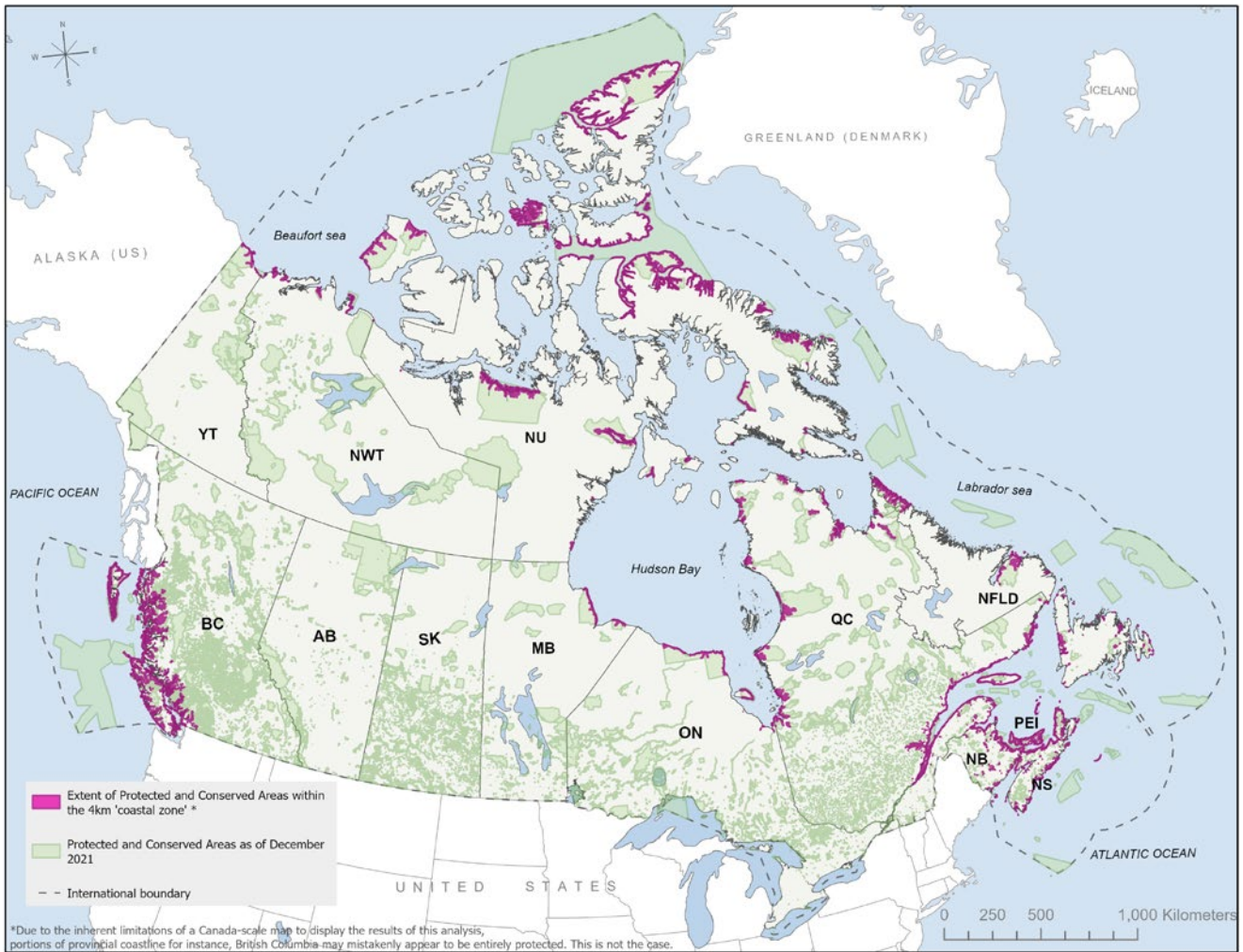


Figure 1b. Terrestrial protected and conserved coastal area establishment in Canada over time

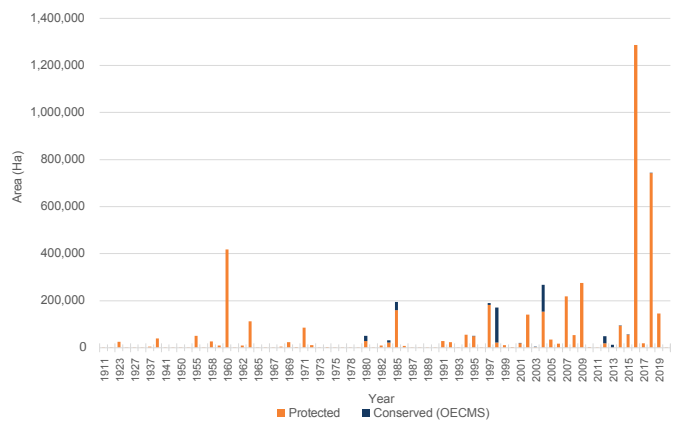


Figure 1c. Marine protected and conserved coastal area establishment in Canada over time.

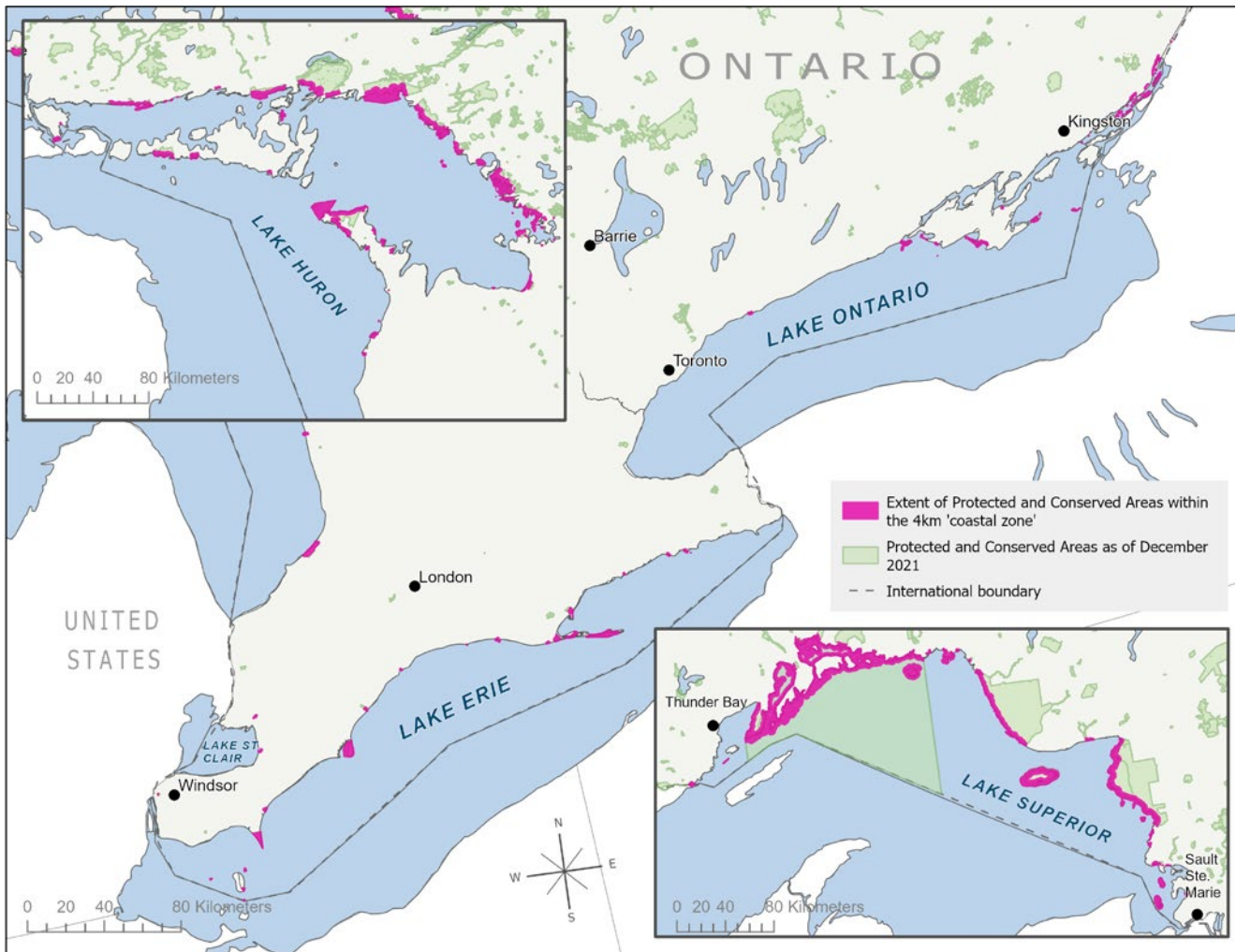


Figure 2. Coastal protected and conserved area in the Great Lakes region

but below the total marine area protected and conserved (13.9 per cent). However, substantial variations among provinces and territories exist. While Manitoba and Yukon have ostensibly achieved KM-GBF Target 3 for coastal protected and conserved area coverage, many others have much work to do over the remainder of the decade. Notable is the Northwest Territories, which protects and conserves only 8.0 per cent of its coastal area, and the maritime provinces (in particular Newfoundland and Labrador (7 per cent) and Nova Scotia (9.8 per cent)).

Trend analysis depicted in Figure 1 also reveals very little OECM establishment in coastal areas in recent years. Areas recognised as marine OECMs have largely occurred away from coastal areas. Finally, coastal protected and conserved area in the Great Lakes is currently poor (Table 2 and Figure 2). Lake Ontario (including the St. Lawrence River) and Lake Erie exhibit only 3.6 per cent and 3.7 per cent of their coastal area protected and conserved, respectively. While Lake Superior exhibits nearly 45 per cent coastal area

protected and conserved, much of this is the result of a single, large National Marine Conservation Area (NMCA) (Lake Superior NMCA). Notably, no OECMs have been recognised along the Great Lakes coasts.

There is also a significant variation across *marine bioregions* (Table 3). Among Canada's three oceans, the Arctic coast is the least protected and conserved (14.5 per cent) and the Pacific coast the most (23.8 per cent). Apart from the Gulf of Saint Lawrence, no marine bioregion has achieved 30 per cent coastal area protected and conserved, with many bioregions exhibiting extremely poor overall protection. Perhaps not surprising, considering economic development activities such as nearshore hydrocarbon development and extensive fishing activities, the Newfoundland-Labrador Shelves has only 0.8 per cent of its coastal area protected and conserved. Hudson Bay also exhibits poor protection overall (5.1 per cent). Despite the proliferation in OECMs recognised in Canada in recent years (see Atlantic and Pacific Oceans in Table 3), none have been recognised in the Arctic Ocean.

Table 1. Coastal area protected¹ and conserved² in Canada, by province/territory (2 km inland and 2 km marine buffer).

Province/ territory	Total coastal area (ha)	Protected areas (total #)	Protected area (ha)	Total area protected (%)	Conserved areas (total #)	Conserved area (ha)	Conserved area (%)	Total area protected & conserved (%)
British Columbia	7488512.1	800	1719795.1	23.0%	19	88487.70	1.2%	24.1%
Manitoba	421504.2	4	157271.7	37.3%	0	0.00	0.0%	37.3%
New Brunswick	1478174.7	136	71607.1	4.8%	3	130939.50	8.9%	13.7%
Newfoundland and Labrador	9258034.5	64	617553.2	6.7%	7	29244.80	0.3%	7.0%
Northwest Territories	8098617.5	17	646187.7	8.0%	0	0.00	0.0%	8.0%
Nova Scotia	2288192.2	218	106072.3	4.6%	2	119158.60	5.2%	9.8%
Nunavut	48648012.5	48	5543286.3	11.4%	0	0.00	0.0%	11.4%
Ontario ³	647100.1	8	176053.8	27.2%	0	0.00	0.0%	27.2%
Prince Edward Island	487746.1	188	15321.3	3.1%	9	79257.30	16.3%	19.4%
Quebec	7265618.9	908	2079954.1	28.6%	3	23668.30	0.3%	29.0%
Yukon	205063.0	3	92426.9	45.1%	0	0.00	0.0%	45.1%
TOTAL	86286576.2	2,394	11225529.9	13.0%	43	470756.40	1.7%	13.6%

¹ protected areas ² conserved areas (OECMs) ³ marine area only (excludes Great Lakes)

Table 2. Coastal area protected and conserved¹, by Great Lake (2 km inland and 2 km marine buffer).

Province	Total coastal area (ha)	Protected areas (total #)	Protected area (ha)	Total area protected (%)
Lake Erie*	301,214.80	24	11,125.16	3.7%
Lake Huron**	1,255,436.13	52	118,308.48	9.4%
Lake Ontario***	497,863.01	39	18,047.68	3.6%
Lake Superior	716,182.80	35	316,049.20	44.1%
TOTAL	2,770,696.74	150	463,530.53	16.7%

¹ no conserved areas (OECMs) are reported for the Great Lakes

* includes Lake St. Clair and St. Clair River/Detroit River

** includes St Mary's River and adjoining channels

*** includes St. Lawrence River (up to Montreal, Quebec)

With respect to *terrestrial ecozones* (Table 4), once again the Great Lakes (Mixed Wood Plains) exhibits poor coastal protection (at 8 per cent), and the greatest protected and conserved area exists within the Pacific Maritime (24.3 per cent). Only the Hudson Plains has achieved the '30x30' target, and many Arctic terrestrial ecozones remain poorly protected and conserved. The largest terrestrial ecozone included in the study, the Northern Arctic, exhibits only 8.4 per cent protection,

and many others have no coastal protected and conserved areas whatsoever (Taiga Cordillera, Taiga Plains). While the Boreal Shield terrestrial ecozone has a relatively high number of (relatively small) protected areas within the 2 km coastline buffer, overall representation remains low (at 8.8 per cent). Like the Mixed Wood Plains, most of this ecozone is within the province of Ontario.

Table 3. Coastal area protected¹ and conserved² in Canada, by marine bioregion (2 km inland and 2 km marine buffer).

Marine bioregion	Total coastal area (ha)	Protected areas (total #)	Protected area (ha)	Total area protected (%)	Conserved areas (total #)	Conserved area (ha)	Conserved area (%)	Total area protected & conserved (%)
ARCTIC	24,719,826.5	46	3,577,484.5	14.5%	0	0.00	0.0%	14.5%
Western Arctic	3,985,258.7	11	547,562.1	13.7%	0	0.00	0.0%	13.7%
Arctic Archipelago	6,076,326.3	4	975,013.9	16.0%	0	0.00	0.0%	16.0%
Eastern Arctic	6,643,275.3	10	1,645,771.8	24.8%	0	0.00	0.0%	24.8%
Hudson Bay Complex	8,014,966.3	21	409,136.7	5.1%	0	0.00	0.0%	5.1%
ATLANTIC	6,217,367.6	544	604,960.8	9.7%	24	382,268.60	6.2%	15.9%
Newfoundland-Labrador Shelves	3,506,707.1	12	18,851.6	0.5%	4	7,598.40	0.2%	0.8%
Scotian Shelf	796,203.4	20	3,794.2	0.5%	2	148,470.30	18.7%	19.1%
Gulf of Saint Lawrence	1,914,457.1	512	582,314.9	30.4%	18	226,199.90	11.8%	42.2%
PACIFIC	2,682,887.6	194	551,211.6	20.5%	19	88,487.72	3.3%	23.8%
Strait of Georgia	497,014.5	58	26,926.1	5.4%	17	1,562.49	0.3%	5.7%
Southern Shelf	288,432.3	28	64,135.3	22.2%	0	0.00	0.0%	22.2%
Northern Shelf	1,897,440.8	108	460,150.2	24.3%	2	86,925.23	4.6%	28.8%
TOTAL	33,620,081.7	784	4,733,656.9	14.1%	43	470,756.40	1.4%	15.5%

¹protected areas ² conserved areas (OECMs)

Table 4. Coastal area protected¹ and conserved² in Canada, by terrestrial ecozone (2 km inland and 2 km marine buffer).

Terrestrial ecozone	Total coastal area (ha)	Protected areas (total #)	Protected area (ha)	Total area protected (%)	Conserved areas (total #)	Conserved area (ha)	Conserved area (%)	Total area protected & conserved (%)
Arctic Cordillera	3,532,624.6	7	592,722.3	16.8%	0	0	0.0%	16.8%
Atlantic Maritime	3,368,943.8	603	209,269.0	6.2%	16	342,173.8	10.2%	16.4%
Boreal Shield	4,979,208.5	244	395,802.5	7.9%	8	40,094.9	0.8%	8.8%
Hudson Plains	1,328,867.3	18	424,398.5	31.9%	19	88,487.7	6.7%	38.6%
Mixed Wood Plain (Great Lakes)	170,063.1	80	13,575.4	8.0%	0	0.0	0.0%	8.0%
Northern Arctic	25,085,511.2	23	2,107,426.0	8.4%	0	0.0	0.0%	8.4%
Pacific Maritime	4,802,831.3	606	1,168,583.5	24.3%	0	0.0	0.0%	24.3%
Southern Arctic	5,994,674.6	18	1,040,202.0	17.4%	0	0.0	0.0%	17.4%
Taiga Shield	2,889,352.6	11	539,893.7	18.7%	0	0.0	0.0%	18.7%
Taiga Cordillera	8,975.2	0	0.0	0.0%	0	0.0	0.0%	0.0%
Taiga Plain	503,379.3	0	0.0	0.0%	0	0.0	0.0%	0.0%
TOTAL	52,664,431.6	1610	6,491,872.9	12.3%	43	470,756.4	0.9%	13.2%

¹protected areas ² conserved areas (OECMs)

DISCUSSION

Our results revealed mixed progress in coastal protected and conserved area in Canada. As Canada continues to make progress towards 30 per cent protected and conserved area coverage, considerable work will also be required to achieve the subcomponents of Target 3 (that were not achieved in Aichi Biodiversity Target 11) related to equity, connectivity and effectiveness. To this end, our discussion addresses considerations in three key areas: 1) elevating Indigenous-led conservation; 2) mainstreaming integrated coastal management and systematic conservation planning; and, 3) developing national protected and conserved area database accounting and reporting. While by no means comprehensive, our discussion can be used to advance further discussion on coastal area protection and reporting in Canada and indeed internationally.

Consideration 1: Elevate Indigenous-led conservation in coastal regions

In recent decades, more protected areas have developed cooperative management agreements in a coastal area context with respective Indigenous peoples. The various forms of agreements, which can range from relationship building to consensus management bodies, can help reinforce a foundation for self-determination, traditional stewardship practices, Indigenous knowledge systems, and human well-being (ICE, 2018). As an example, at Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve and Haida Heritage Site, the Haida Nation and the Government of Canada have developed the 'Gwaii Haanas Gina 'Waadluxan KilGuhlGa Land-Sea-People Management Plan' (Haida Nation and Parks Canada, 2018). This landmark plan demonstrates how two nations can achieve coastal conservation through cooperation and consensus. Unfortunately, it remains one of very few examples of this type of initiative in Canada (and indeed globally).

IPCAs also enable Indigenous-led conservation and contribute to biodiversity conservation targets in an equitable manner (ICE, 2018). Although CPCAD can include IPCAs, none were identified within the CPCAD database at the time of this assessment. However, in 2021 the Mamalilikulla First Nation declared the Gwaxdlala/Nalaxdlala IPCA under its own laws and recently Canada announced fisheries closures and the establishment of a marine refuge to help further protect this IPCA (Fisheries and Oceans Canada, 2023). More broadly, Gwaxdlala/Nalaxdlala is also part of the Northern Shelf Bioregion Marine Protected Area (MPA) Network, whose action plan provides a blueprint for conservation and collaborative governance between 15

First Nations, the province of British Columbia and the Government of Canada (MPA Network BC Northern Shelf Initiative, 2023). Future coastal area assessments and updates to CPCAD will no doubt include IPCAs (Assembly of First Nations, 2023), but also other opportunities to recognise Indigenous-led area-based conservation and advance 'land-sea-people' thinking which is critical for coastal conservation.

Consideration 2: Mainstream integrated coastal management and systematic conservation planning

Our results revealed that Canada must still protect over 5 million ha of coastal area to achieve the 30x30 target in addition to ensuring that protected and conserved areas are representative, well-connected and are of particular importance for biodiversity.

Integrated coastal management (ICM) and coastal governance structures (Gonçalves & Pinho, 2022; Pittman & Armitage, 2016; Eger et al., 2021) are essential to coastal conservation and explicitly supported by the CBD (CBD, 2022a). Canada's *Oceans Act* (2014) represented a significant step towards ICM, however implementation has been slow and uncoordinated. Early attempts at integrating planning through the 'Great Lakes Heritage Coast' initiative was abandoned by the Ontario government in the early 2000s. However, some promising new initiatives are emerging. A *Coastal Marine Strategy Policy Intentions Paper* for British Columbia was released in 2022 (Government of British Columbia, 2022) that presents a vision for protecting the ecological, cultural and economic benefits provided by the coastal marine environment and was informed by First Nations knowledge, Western science and existing planning documents, and is expected to inform coastal policy in British Columbia. With recent initiatives in ICM and commitments to achieve the KM-GBF, the timing seems propitious to revisit past efforts and synthesise insights from ongoing ones to identify how various governance arrangements can be used to take a systematic planning approach to coastal conservation. Ensuring ecological representation is necessary for meeting the KM-GBF targets and has been a central tenant of terrestrial and marine protected areas planning in Canada, including national parks and many provincial park planning initiatives for nearly half a century (e.g. Parks Canada, 1997). However, Canada has yet to undertake an integrated, systematic approach to conserving the full diversity of Canada's coastal areas. Our study can be used to identify regions where additional coastal protected and conserved areas should

be prioritised to ensure representation including the Northern Arctic, Boreal Shield and the Great Lakes.

Many coastal sites that are of particular importance for biodiversity remain unprotected (e.g. seagrass ecosystems (Griffiths et al., 2020). Systematic planning for coastal protected and conserved areas can be supported by global and domestic initiatives to identify Key Biodiversity Areas (KBAs) (IUCN, 2016; WCS Canada Coalition, 2021). While there is continual improvement in our knowledge and mapping of coastal ecosystems (e.g. Costa et al., 2020) that can guide conservation efforts, the classification, range and conservation status of most coastal ecosystems remains unknown. Furthermore, very little is known about how the inclusion of ecosystem services provided by coastal areas can be more effectively integrated into systematic conservation planning (e.g. carbon storage, flood control, health and well-being benefits derived from tourism and recreation).

A national systematic planning framework, focused on inventorying coastal areas and flows of ecosystem services, could offer scope for identifying synergies between area-based conservation (including OECMs), climate change mitigation and adaptation, and ecosystem services. Establishing a national coastal protected and conserved area working group that convenes practitioners and knowledge-holders in protected and conserved areas, coastal and ocean management, and watershed management to collaborate in a national-level working group (or advisory panel) could work to advance both systematic conservation planning and ICM management strategies. The working group could identify KBAs at the coastal interface, governance challenges with respect to ICM, track progress in coastal conservation, and provide insights into effective and equitable governance across regions, all in relation to the various quantitative and qualitative dimensions of KM-GBF Target 3.

Consideration 3: Develop coastal area accounting and reporting in Canada

Even with the call in Aichi Target 11, and echoed again in the KM-GBF Target 3, to explicitly protect coastal areas, there has been a lack of systematic assessment and reporting of these areas in Canada. By assuming coastal areas are captured in marine targets fails to account for their terrestrial component, and that coastal systems reflect a land and water interface (MEA, 2005). As mentioned, one reason for this, as we have attempted to address here, is the challenge of recognising that the coast is a distinct area, where governance and management needs to be observed in two directions, effectively integrating both aquatic and terrestrial areas (Van Assche et al., 2020).

Our accounting approach captures the land–water interface within a 4-km shoreline buffer. While it may be considered robust, in the sense that it recognises protection if it is either land or water based, we recognise that the most desirable design is where land and water protection are connected. Here we found that only 5.6 per cent (23,445 km) of Canada’s marine and 14.1 per cent (2,942 km) of Canada’s Great Lakes shoreline included protection that straddled this land and water interface.

While CPCAD is an essential source of data for reporting coverage, it has limitations for completing coastal area assessments. For instance, the quality of boundary digitisation for many protected areas demonstrated a mismatch with the shoreline vector, and metadata limitations made it difficult to know if the boundary followed the HWM or another cadastral boundary. Thomas et al. (2014) noted similar concerns with boundaries in their evaluation of marine protected areas (MPAs) using the WDPA. Further, a single IUCN category was assigned to the entire site, which could obscure differences in zoning within a site (e.g. areas of strict protection versus sustainable use). Designation of the Great Lakes, and other inland waters, as a terrestrial biome is also counter to the marine conservation aspirations of both the US and Canada and made identification of marine areas calculations more challenging.

The subcomponents of KM-GBF Target 3 related to connectivity, equity and effectiveness were not examined in our assessment. Data limitations constituted the primary reason for not addressing them. For instance, while there are some local and regional efforts underway to assess coastal connectivity (e.g. Friesen et al., 2019), there was no national scale assessment to draw upon. Similarly, while equity is beginning to receive the attention it needs, there was no established reporting system available (Gurney et al., 2023). In terms of effectiveness, the Protected Planet’s Protected Areas Management Effectiveness database revealed that some form of assessment had been completed for approximately 28 of the coastal sites, but this coverage was incomplete (UNEP-WCMC IUCN & NGS, 2021). With that said, a more robust monitoring and reporting process has been proposed in the KM-GBF that includes not only the headline indicator (e.g. coverage of protected and conserved area for Target 3), but indicators for subcomponents such as effectiveness, equity and connectivity (CBD, 2022b).



Pinery Provincial Park on Lake Huron, Ontario has rare and fragile Oak Savanna and Coastal Dune ecosystems © Chris Lemieux.

CONCLUSIONS

Our analysis provides the first baseline assessment of coastal protected and conserved areas in Canada. While past conservation and reporting has focused on terrestrial and marine realms, the new KM-GBF 30x30 target is an opportunity to broaden these important efforts to explicitly consider inland waters (Moravek et al., 2023) and coastal areas. As this paper has shown, there is a need to increase coastal protected and conserved area across Canada. Filling the gaps in coastal protection and representation to meet KM-GBF Target 3 by 2030 is an enormous challenge. To some extent, this could be the result of both a lack of a comprehensive picture of what coastal area protection should look like *vis-à-vis* integrated planning at the national and regional levels, and a lack of guidance in relation to the implementation of subcomponent elements of international area-based conservation targets.

Canada has an unparalleled global opportunity to effectively conserve coastal ecosystems. The country's marine and Great Lakes coasts are not just expansive, but in many areas remain intact and support important biodiversity and ecosystem services. Yet, many regions remain critically under-protected. The lack of protected

area in several (mostly) undeveloped regions, including the Arctic, presents an opportunity to continue important work with (and being led by) Indigenous communities to implement best practices in protected and conserved areas design, including subcomponents of Target 3 (e.g. representation, equity, connectivity). For example, the draft *Nunavut Land Use Plan* includes increased limited-use designations that benefit species such as Barren-ground Caribou and limiting ice breaking along critical migratory pathways (Nunavut Planning Commission, 2021). It also acknowledges the importance of conservation planning for parks, conservation areas, and the protection of other areas of community interest (including coastal areas). The effective protection, conservation and restoration of coastal ecosystems will also support national and sub-national climate change mitigation and adaptation strategies (CCA, 2022). We hope that our analysis will provide a baseline to monitor progress towards protecting and conserving 30 per cent of Canada's coastal ecosystems by 2030 and provide a case study to encourage all countries to include coastal ecosystems in protected and conserved areas planning and KM-GBF Target 3 accounting and reporting going forward.

SUPPLEMENTARY ONLINE MATERIAL

1. Detailed methods
2. Results by length of coast protected

ABOUT THE AUTHORS

Christopher J. Lemieux is a conservation social scientist with expertise in a variety of protected and conserved area policy, planning and management issues. His current research focuses primarily on conservation standards, international and national protected area reporting and accountability, and the human health and well-being benefits associated with nature contact. <https://orcid.org/0000-0002-4780-2006>

Trina King specialises in geomatics, parks and protected areas, and health geography. She is contract faculty and a staff member in the Department of Geography and Environmental Studies, and provides expert support to faculty and other researchers.

Scott R. Parker is an aquatic ecologist with over thirty-two years of experience in conservation and protection in Canada's national parks and national marine conservation areas. He is also an adjunct professor at the University of Waterloo.

Daniel T. Kraus is a transdisciplinary conservation scientist with expertise in Canadian biodiversity, conservation and landscape ecology. He has over twenty-five years of experience in field ecology, environmental planning and conservation in the public, private and NGO sectors. <https://orcid.org/0000-0001-8885-0461>

REFERENCES

- Allan, H., Levin, N., & Kark, S. (2023). Quantifying and mapping the human footprint across Earth's coastal areas. *Ocean & Coastal Management*, 236, 106476.
- Alvarez-Romero, J. G., Pressey, R. L., Ban, N. C., Vance-Borland, K., Willer, C., Klein, C. J., & Gaines, S. D. (2011). Integrated land-sea conservation planning: The missing links. *Annual Review of Ecology, Evolution, and Systematics*, 42, 381–409.
- Assembly of First Nations. (2023). *Marine Indigenous Protected and Conserved Areas Opportunities and Recommendations for Realizing Canada's Commitments to Reconciliation and Marine Conservation (Summary Report)*. <https://afn.bynder.com/m/105cff837b910cfa/original/Marine-Indigenous-Protected-and-Conserved-Areas-Summary-Report-January-2023.pdf>
- Auditor General of Canada. (2022). *Report 7: Protecting aquatic species at risk. Reports of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada*. (p. 46). https://www.oag-bvg.gc.ca/internet/docs/parl_cesd_202210_07_e.pdf
- Bartier, P., & Sloan, N. (2007). Reconciling maps with charts towards harmonizing coastal zone base mapping: A case study from British Columbia. *Journal of Coastal Research*, 23(1), 75–86.
- Bennett, N. J., Kaplan-Hallam, M., Augustine, G., Ban, N., Belhabib, D., Brueckner-Irwin, I., Charles, A., Couture, J., Eger, S., Fanning, L., ... Bailey, M. (2018). Coastal and Indigenous community access to marine resources and the ocean: A policy imperative for Canada. *Marine Policy*, 87, 186–193. <https://doi.org/10.1016/j.marpol.2017.10.023>
- CBD. (2006, November 2). *Article 26: Convention on Biological Diversity*. Secretariat of the Convention on Biological Diversity. <https://www.cbd.int/convention/articles/?a=cbd-26>
- CBD. (2010). *Strategic Plan for Biodiversity 2011–2020 and the Aichi Targets "Living in Harmony with Nature."* <https://www.cbd.int/sp/>
- CBD. (2022a). *Conservation and sustainable use of marine and coastal biodiversity (CBD/COP/15/L.15)*. <https://www.cbd.int/doc/c/f917/ba16/86cec32f9dd6a832216c3773/cop-15-l-15-en.pdf>
- CBD. (2022b). *15/5. Monitoring framework for the Kunming-Montreal Global Biodiversity Framework (CBD/COP/DEC/15/5)*. <https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-05-en.pdf>
- CCA. (2022). *Nature-Based Climate Solutions: Expert Panel on Canada's Carbon Sink Potential* (p. 290). The Expert Panel on Canada's Carbon Sink Potential, CCA. https://cca-reports.ca/wp-content/uploads/2022/12/Carbon-Sinks_EN_Final.pdf
- Costa, M., Le Baron, N., Tenhunen, K., Nephin, J., Willis, P., Mortimer, J. P., Dudas, S., & Rubidge, E. (2020). Historical distribution of kelp forests on the coast of British Columbia: 1858–1956. *Applied Geography*, 120, 102230.
- ECCC. (2022a). *Assessing the sensitivity of Great Lakes coastal wetlands to climate change*. <https://www.canada.ca/en/environment-climate-change/services/great-lakes-protection/taking-action-protect/coastal-wetlands/assessment-coastal-wetlands.html>
- ECCC. (2022b). *Canadian Protected and Conserved Areas Database [Datasets]*. <https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/protected-conserved-areas-database.html>
- Eger, S., de Loë, R., Pittman, J., Epstein, G., & Courtenay, S. (2021). A systematic review of integrated coastal and marine management progress reveals core governance characteristics for successful implementation. *Marine Policy*, 132, 104688.
- Environment Canada. (1991). *The Federal policy on Wetland Conservation*. <https://publications.gc.ca/collections/Collection/CW66-116-1991E.pdf>
- EPA. (2006). *State of the Great Lakes: What is the state of Great Lakes coastal wetlands?* https://archive.epa.gov/solec/web/pdf/coastal_wetlands.pdf
- Federal Provincial and Territorial Governments of Canada. (2010). *Canadian biodiversity: Ecosystem status and trends 2010* (p. 142). Canadian Councils of Resource Ministers.
- Fisheries and Oceans Canada. (2023, February 5). *First marine refuge within the Northern Shelf Bioregion is established* [News releases]. <https://www.canada.ca/en/fisheries-oceans/news/2023/02/first-marine-refuge-within-the-northern-shelf-bioregion-is-established.html>
- Ford, J. D., Couture, N., Bell, T., & Clark, D. G. (2018). Climate change and Canada's north coast: Research trends, progress, and future directions. *Environmental Reviews*, 26(1), 82–92.
- Friesen, S. K., Martone, R., Rubidge, E., Baggio, J. A., & Ban, N. C. (2019). An approach to incorporating inferred connectivity of adult movement into marine protected area design with limited data. *Ecological Applications*, 29(4), e01890.
- Gonçalves, C., & Pinho, P. (2022). In search of coastal landscape governance: A review of its conceptualisation, operationalisation and research needs. *Sustainability Science*, 17(5), 2093–2111.
- Government of British Columbia. (2022). *A Coastal Marine Strategy for British Columbia Policy Intentions Paper*. <https://engage.gov.bc.ca/app/uploads/sites/121/2022/12/Coastal-Marine-Strategy-Intentions-Paper.pdf>
- Government of Canada. (2011). *National Framework for Canada's Network of Marine Protected Areas*. <http://www.dfo-mpo.gc.ca/oceans/publications/mpanf-cnzpm/page01-eng.html>

- Government of Canada. (2013, December 13). *A National Ecological Framework for Canada*. <https://sis.agr.gc.ca/cansis/nsdb/ecostat/index.html>
- Government of Canada, S. C. (2021, July 19). *Canada's oceans and the economic contribution of marine sectors*. <https://www150.statcan.gc.ca/n1/pub/16-002-x/2021001/article/00001-eng.htm>
- Griffiths, L. L., Connolly, R. M., & Brown, C. J. (2020). Critical gaps in seagrass protection reveal the need to address multiple pressures and cumulative impacts. *Ocean & Coastal Management, 183*, 104946.
- Gurney, G. G., Adams, V. M., Álvarez-Romero, J. G., & Claudet, J. (2023). Area-based conservation: Taking stock and looking ahead. *One Earth, 6*(2), 98–104.
- Haida Nation and Parks Canada. (2018). *Gwaii Haanas Gina 'Waadluxan Kil G uhl G a Land-Sea-People Management Plan* (p. 36). file:///Users/clemieux/Downloads/Gwaii%20Haanas%20LSP%20Plan%202018_EN_lowres.pdf
- Hanley, M. E., Bouma, T. J., & Mossman, H. L. (2020). The gathering storm: Optimizing management of coastal ecosystems in the face of a climate-driven threat. *Annals of Botany, 125*(2), 197–212.
- Herbert-Read, J. E., Thornton, A., Amon, D. J., Birchenough, S. N., Côté, I. M., Dias, M. P., Godley, B. J., Keith, S. A., McKinley, E., & Peck, L. S. (2022). A global horizon scan of issues impacting marine and coastal biodiversity conservation. *Nature Ecology & Evolution, 6*(9), 1262–1270.
- Hirsh-Pearson, K., Johnson, C. J., Schuster, R., Wheate, R. D., & Venter, O. (2022). Canada's human footprint reveals large intact areas juxtaposed against areas under immense anthropogenic pressure. *Facets, 7*(1), 398–419.
- ICE. (2018). *We Rise Together: Achieving Pathway to Canada Target 1 through the creation of Indigenous Protected and Conserved Areas in the spirit and practice of reconciliation*.
- IPCC. (2018). *Global Warming of 1.5°C: An IPCC Special Report*. IPCC. <https://www.ipcc.ch/sr15/>
- IUCN. (2016). *A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0*. IUCN. <https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf>
- KBA Canada Coalition. (2021). *A National Standard for the Identification of Key Biodiversity Areas in Canada*. Wildlife Conservation Society. <https://doi.org/10.19121/2021.Report.39502>
- Lemieux, C. J., Kraus, D. T., & Beazley, K. F. (2022). Running to stand still: The application of substandard OECMs in national and provincial policy in Canada. *Biological Conservation, 275*, 109780.
- Lemmen, D. S., Warren, F. J., James, T. S., & Mercer Clarke, C. S. L. (2017). *Canada's marine coasts in a changing climate* (p. 274). Government of Canada. https://publications.gc.ca/collections/collection_2016/mcan-nrcan/M174-12-2016-eng.pdf
- Lepofsky, D., Toniello, G., Earnshaw, J., Roberts, C., Wilson, L., Rowell, K., & Holmes, K. (2021). Ancient anthropogenic clam gardens of the northwest coast expand clam habitat. *Ecosystems, 24*, 248–260.
- MEA. (2005). *Millennium Ecosystem Assessment: Current State & Trends Assessment (Chapter 19: Coastal Systems)*. <https://www.millenniumassessment.org/documents/document.288.aspx.pdf>
- Mikhaylov, A. S., & Plotnikova, A. P. (2021). The coasts we live in: Can there be a single definition for a coastal zone? *Baltic Region, 13*(4), 36–53.
- Moravek, J. A., Andrews, L. R., Serota, M. W., Dorcy, J. A., Chapman, M., Wilkinson, C. E., ... & Brashares, J. S. (2023). Centering 30×30 conservation initiatives on freshwater ecosystems. *Frontiers in Ecology and the Environment, 21*(4), 199–206.
- Morin, J., Lepofsky, D., Ritchie, M., Porčić, M., & Edinborough, K. (2018). Assessing continuity in the ancestral territory of the Tsleil-Waututh-Coast Salish, southwest British Columbia, Canada. *Journal of Anthropological Archaeology, 51*, 77–87.
- MPA Network BC Northern Shelf Initiative. (2023). *NAP – mpanetwork*. <https://mpanetwork.ca/nap/>
- Neumann, B., Vafeidis, A. T., Zimmermann, J., & Nicholls, R. J. (2015). Future coastal population growth and exposure to sea-level rise and coastal flooding – a global assessment. *PLoS One, 10*(3), e0118571.
- Neumann, B., Ott, K., & Kenchington, R. (2017). Strong sustainability in coastal areas: a conceptual interpretation of SDG 14. *Sustainability Science, 12*, 1019–1035.
- Noble, B., Ketilson, S., Aitken, A., & Poelzer, G. (2013). Strategic environmental assessment opportunities and risks for Arctic offshore energy planning and development. *Marine Policy, 39*, 296–302.
- NRCAN. (2023). *Good Practices for Integrated Climate Change Adaptation in Canadian Coastal Communities*. <https://natural-resources.canada.ca/sites/nrcan/files/climate-change/CoastalCommunitiesClimateChange-BestPractices-en.pdf>
- Nunavut Planning Commission. (2021). *Leading the Way Through Land Use Planning. Nunavut Land Use Plan (Draft July 2021)*. https://www.nunavut.ca/sites/default/files/21-001e-2021-07-08-2021_draft_nunavut_land_use_plan_english_0.pdf
- Parks Canada. (1997). *National Parks System Plan* (p. 106). <https://publications.gc.ca/collections/Collection/R64-197-1-1997E.pdf>
- Pittman, J., & Armitage, D. (2016). Governance across the land-sea interface: A systematic review. *Environmental Science & Policy, 64*, 9–17.
- Sandifer, P. A., & Sutton-Grier, A. E. (2014). Connecting stressors, ocean ecosystem services, and human health. *Natural Resources Forum, 38*(3), 157–167.
- SCBD (Ed.). (2004). *Technical advice on the establishment and management of a national system of marine and coastal protected areas*. Secretariat of the Convention on Biological Diversity. <https://www.cbd.int/doc/publications/cbd-ts-13.pdf>
- Statistics Canada. (n.d.). *Canada Yearbook: International Perspective*. Retrieved March 18, 2023, from <https://www150.statcan.gc.ca/n1/pub/11-402-x/2012000/chap/geo/geo01-eng.htm>
- Thomas, H. L., Macsharry, B., Morgan, L., Kingston, N., Moffitt, R., Stanwell-Smith, D., & Wood, L. (2014). Evaluating official marine protected area coverage for Aichi Target 11: Appraising the data and methods that define our progress. *Aquatic Conservation: Marine and Freshwater Ecosystems, 24*(S2), 8–23.
- Trudeau, J. (2021). *Minister of Environment and Climate Change Mandate Letter*. <https://pm.gc.ca/en/mandate-letters/2021/12/16/minister-environment-and-climate-change-mandate-letter>
- UNEP-WCMC IUCN & NGS. (2021). *Protected Planet Report 2020: Tracking progress towards global targets for protected and conserved areas*. <https://livereport.protectedplanet.net/>
- United Nations. (2017). *Factsheet: People and Oceans*. <https://www.un.org/sustainabledevelopment/wp-content/uploads/2017/05/Ocean-fact-sheet-package.pdf>
- Van Assche, K., Hornidge, A.-K., Schlüter, A., & Vaidianu, N. (2020). Governance and the coastal condition: Towards new modes of observation, adaptation and integration. *Marine Policy, 112*, 103413.
- Williams, B. A., Watson, J. E., Beyer, H. L., Klein, C. J., Montgomery, J., Runting, R. K., Roberson, L. A., Halpern, B. S., Grantham, H. S., & Kuempel, C. D. (2022). Global rarity of intact coastal regions. *Conservation Biology, 36*(4), e13874.

RESUMEN

A pesar de que desde hace más de una década se reconoce que la zona costera es un subcomponente importante en los objetivos de las áreas protegidas y conservadas, ha quedado huérfana en los informes nacionales e internacionales. En este documento, presentamos el primer informe de situación sobre la superficie costera protegida y conservada en Canadá. Aunque el 13,6% de la superficie costera canadiense está protegida y conservada, existen variaciones sustanciales entre los tres océanos y los Grandes Lagos de Canadá, las autoridades jurisdiccionales y los ecosistemas marinos y terrestres. Es importante señalar que Manitoba (37,3%) y el Yukón (45,1%) ya han alcanzado el objetivo de protección del 30% de las costas establecido en el Marco Mundial para la Biodiversidad de Kunming y Montreal. Sin embargo, Nunavut (3,5%) y Terranova y Labrador (7%) están muy por debajo. La protección es muy deficiente en varias biorregiones marinas y ecozonas terrestres, como en el Ártico, las plataformas de Terranova y Labrador (0,7%) y el complejo de la bahía de Hudson (5,1%). Los Grandes Lagos requieren una atención urgente y centrada en la conservación, ya que los lagos Ontario (3,6%) y Erie (3,1%) presentan una cantidad ínfima de superficie costera protegida y conservada. Nuestros resultados ponen de relieve la importancia de informar explícitamente sobre el estado de la protección de las zonas costeras y esbozamos varias consideraciones que pueden ser utilizadas por la comunidad conservacionista mundial para apoyar una protección de las costas, una contabilidad y una presentación de informes más eficaces de cara a la Meta 3 del KM-GBF.

RÉSUMÉ

Bien que les zones côtières soient reconnues depuis plus d'une décennie comme une sous-composante importante des objectifs en matière d'aires protégées et conservées, elles sont restées orphelines dans les rapports nationaux et internationaux. Dans cet article, nous présentons le premier rapport d'avancement sur les zones côtières protégées et conservées au Canada. Alors que 13,6 % des zones côtières du Canada sont protégées et conservées, il existe des variations substantielles entre les trois océans et les Grands Lacs du Canada, les autorités juridictionnelles et les écosystèmes marins/terrestres. Il est important de noter que le Manitoba (37,3 %) et le Yukon (45,1 %) ont déjà atteint l'objectif de 30 % de protection côtière du Cadre mondial pour la biodiversité Kunming-Montréal (KM-GBF). Toutefois, le Nunavut (3,5 %) et Terre-Neuve-et-Labrador (7 %) sont encore loin du compte. La protection est très faible dans plusieurs biorégions marines et écozones terrestres, notamment dans l'Arctique, sur les plateaux de Terre-Neuve et du Labrador (0,7 %) et dans le complexe de la baie d'Hudson (5,1 %). Les Grands Lacs requièrent une attention urgente et ciblée en matière de conservation, les lacs Ontario (3,6 %) et Érié (3,1 %) présentant une quantité lamentable de zones côtières protégées et conservées. Nos résultats soulignent l'importance d'un rapport explicite sur l'état de la protection des zones côtières et nous soulignons plusieurs considérations qui peuvent être utilisées par la communauté mondiale de la conservation pour soutenir une protection côtière plus efficace, la comptabilité et le rapport en ce qui concerne la cible 3 de la KM-GBF.