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Governance as a driver of change in the Canadian boreal zone

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39 Footnote: This paper is part of a collection of manuscripts that are the outcome of the Boreal 2050
40 project. The series of papers explores the drivers of change in the boreal zone, potential futures of the
41 boreal zone, and how to manage risks to the sustainability of the boreal zone to 2050.

42

43 **Abstract**

44 The Canadian boreal forest is primarily public land, owned and managed by provincial
45 governments on behalf of the public interest. Boreal forest governance consists of a complex
46 patchwork of federal and provincial legislation, policies, tenures, and delegated authorities designed to
47 achieve multiple (and often conflicting) social, ecological and economic objectives. We examine the
48 implications of boreal governance arrangements for sustainable management of ecosystem services.
49 The paper shows how current multi-level governance arrangements that evolved from Canada’s
50 *Constitution Act* are not effective at managing the cross-scale and cross-sectoral challenges of
51 ecosystem services and have created a crisis of legitimacy for forest decisions. We show how the rise
52 of non-state arrangements, marketization and decentralization are partly a response to governance gaps
53 for ecosystem services as well as a reflection of global trends in forest governance. Past trends related
54 to governance themes (the role and scope of government, the level of integration and coordination,
55 Indigenous empowerment, and geopolitical influences) are used to motivate future governance
56 scenarios.

57
58 *Keywords:* boreal; ecosystem services; governance; geopolitics; Indigenous peoples

60 **1. Introduction**

61 Governance is an important driver of change in Canada’s boreal zone and has implications for
62 the sustainability of provisioning and non-provisioning ecosystem services.¹ Drivers of change are
63 major forces, or collections of forces that shape the social and ecological conditions of a system.
64 Identifying, describing and analyzing drivers of change is a first step to conducting scenario analysis,
65 which is a tool for considering alternative futures and policy implications for the boreal zone under

¹ The Millennium Ecosystem Assessment defines non-provisioning ecosystem services as the non-commodified benefits that people derive from ecosystems such as water storage and purification, climate regulation and biodiversity (MEA 2000).

conditions of high uncertainty and complexity (Kahane 2012; Steenberg et al. 2019). This paper is part of a series for the Boreal 2050 project (Creed and Serran 2019), which examines drivers of change to the boreal zone including demand for provisioning ecosystem services (Erdozain et al. 2019), demand for non-provisioning ecosystem services (Lamothe et al. 2019), industrial innovation and infrastructure (Musetta-Lambert et al. 2019), demographics and social values (Nitoslawski et al. 2019) and atmospheric change (Yeung et al. 2019). These driver papers were used to inform a scenario analysis (Steenberg et al. 2019) and risk management analysis (Serran et al. 2019), which lead to policy recommendations to ensure the future sustainability of the boreal zone. Creed et al. (2019) provides an overview of the approach taken for the Boreal 2050 Project.

The boreal zone is an extensive, circumpolar terrestrial biome situated in the northern hemisphere that covers 1.9 billion hectares of surface area across 12 countries (Brandt 2009). Canada's 552 million hectare boreal zone, representing over 29% of the global boreal forest and over 55% of Canada's land base (Brandt 2009; Brandt et al. 2013, La Roi 2013), plays a vital role in delivering ecosystem services locally, regionally, and internationally. Canada's boreal contains a significant proportion of the world's surface freshwater, including 25% of the world's wetlands and peatlands which provide internationally important carbon storage and climate regulation, nutrient cycling, water storage, and aquatic habitat services (Kurz et al. 2013). Canada's boreal also provides habitat for iconic species such as polar and grizzly bear, wolverine, and caribou. These non-provisioning services must be managed in the face of increasing pressures from forestry, road building, mining, and oil and gas extraction.

Canadian governance is an important driver of boreal ecosystem services. Forest governance refers to the formal and informal institutional arrangements that determine how and for whom forest management decisions are made. More formally "forest governance comprises all formal and informal, public and private regulatory structures (i.e., institutions consisting of rules, norms, principles, decision

90 procedures, concerning forests, their utilisation and their conservation), b) the interactions between
91 public and private actors therein, and c) the effects of either on forests” (Geissen and Buttoud, 2014, p
92 1). Shifts in governance are driven by geopolitical and discursive influences. Geopolitics refers to the
93 relative economic and political power of nations and regions, and the relationships between them
94 (Hoberg, 2008a). Canada is a small open economy, and thus geopolitics as expressed through various
95 international agreements between government and non-government actors has a significant influence
96 on Canadian boreal governance. Ideological shifts towards neoliberalism and increasing demands for
97 democratizing decision making have been important in shaping trends towards marketization and
98 decentralization in Canadian forest governance (Rayner et al. 2010; Krott et al. 2014; Parkins et al.
99 2016).

100 In this paper, we describe how governance influences decisions and outcomes for ecosystem
101 services derived from Canada’s boreal zone. Specific boreal governance issues explored in the
102 literature include: general forest governance (Howlett 2001a; Hoberg 2008b); Indigenous governance
103 (Morse et al. 2005; Berkes and Davidson-Hunt 2006; Smith 2015); community based governance
104 (Teitelbaum 2006; Fortier et al. 2012); social and economic dimensions (Bogdanski 2006); climate
105 change (Rayner et al. 2013); tenure (Haley and Nelson 2007); and conservation (Murray et al. 2015;
106 Nilsson 2015). However much of this literature is dated given changes in legislation since 2010. In
107 addition, these studies tend to be forestry specific rather than cross-sectoral, and don’t address general
108 risks to non-provisioning ecosystem services. Five governance themes related to the role and scope of
109 government, cross sectoral coordination, Indigenous empowerment and geopolitics, are framed to
110 describe the evolution of boreal governance over the last 50 years and to explore implications for
111 boreal ecosystem services. Looking forward, the five themes are used to develop fictional narratives of
112 potential contrasting governance scenarios for the boreal zone through which to explore risks to boreal
113 ecosystem services to 2050 (Kahane 2012; Steenberg et al. 2019). Given the importance of Treaty and

Indigenous rights in the boreal zone, we highlight the role of Indigenous governance (Trosper 2008; Kozlowski 2015). Finally, we show feedbacks between governance other drivers of change in the boreal zone such as technology and climate change, and implications for cumulative risks to ecosystem services.

2. Analytical Framework

Any framework for understanding governance is a necessary simplification of complex evolving interactions between a range of diverse actors and interests (FAO 2011). Building on Ostrom's institutional analysis and social-ecological governance framework (Ostrom 1999, 2007, 2009), Figure 1 shows how actors are embedded in forest management systems and institutional arrangements that result in authority and responsibility over boreal forest decisions. The governance system adapts to external drivers and pressures through social, economic and political processes to generate resource allocations and levels of protection for ecosystem services. Criteria for evaluating governance performance include accountability, fairness, transparency, effectiveness and efficiency (FAO 2011; WRI et al. 2013).

Governance elements comprise the basic units of governance analyses and include the actors and the formal and informal institutions that forbid and constrain behaviors and decisions. Relevant actors may reside within or outside the boreal zone and include all Indigenous and non-Indigenous communities that participate or have a stake in governance processes or boreal ecosystem services. Actors may be individuals, companies, communities or non-government organizations (NGOs) that represent the interests of different groups, and the different levels of government that represent state institutions for decision making.

Institutions determine the processes, scope of authority and accountability for forest management decisions (i.e., "who decides what about the management of our forests" (Hoberg 2008b,

p. 8)) and how diverse forest values are represented in decisions. *Formal* institutions include hard instruments such as property rights, legislation and associated regulations and soft instruments such as policies and state-led processes that engage actors in decision making (Howlett 2001b; Kant and Berry 2005; Hoberg 2008b). *Informal* institutions refer to non-state instruments such as voluntary agreements and third-party certification.² Legal authority is distinct from the responsibility for resource decisions (Cashore et al. 2010; FAO 2011). Understanding these two related outcomes, responsibility and authority, is important for understanding boreal zone governance (e.g., Haley and Nelson 2007; Parkins et al. 2016).

Governance processes refer to the access and input different actors have in decision-making processes and the capacity and influence these different actors have on agenda setting. One of the most important components of the legitimacy of the governance system is the balance of power across actors for forest decisions (Dietz et al. 2003). Together, authorities, responsibilities, execution and public processes determine the accountability, effectiveness, efficiency, participation and transparency of the governance system. Finally, no governance system is closed. Specific institutions and policies evolve from abstract governance concepts and international forces that exert themselves through international agreements and trade (e.g., Cashore et al. 2010; Secco et al. 2014). Discourses around neoliberalism and the role of governments and markets, sustainability, decentralization, globalism and Indigenous rights have all framed trends in international as well as Canadian forest governance.

² Informal institutions encompassing social norms and networks (Dietz et al., 2003), while an important factor in forest governance, are beyond the scope of this paper.

3. Driver Description – Current Status

3.1. Governance Elements

3.1.1. Actors

Stakeholders in boreal forest governance include: municipal, provincial and federal government bodies that have jurisdiction and decision-making powers affecting forest ecosystems; industries that extract or utilize forest resources; Indigenous peoples and local communities within the boreal zone; and the users and beneficiaries of ecosystem services that may or may not reside in the boreal zone. Rural and forest-based communities in the boreal zone are reliant on forest ecosystem services and deeply embedded in boreal governance processes (Beckley et al. 2002), however the locus of responsibility and authority lies in federal and provincial government departments, whose bureaucracy resides largely outside of the boreal.

Users and beneficiaries of boreal ecosystem services include Indigenous peoples and local communities living within the boreal zone who rely on healthy terrestrial and aquatic habitats for hunting, fishing, drinking water, recreation and culture. Users and beneficiaries also include the broader public—citizens of Canada and other countries—who value the nationally and globally significant biodiversity, hydrologic, and climate functions of the boreal zone. One of the challenges of governing ecosystem services is addressing the cross-scale and cross-sectoral interactions between local communities who receive the economic benefits of resource development and the impacts on downstream and downwind stakeholders who are often not involved in boreal forest decisions. Indigenous people represent approximately one-third of the population and are particularly important for boreal governance (Morse et al. 2005; Wyatt 2008; Angell and Parkins 2011; Trosper 2008; Kozlowski 2015). Most of the boreal is under numbered treaty (treaties 1-11 cover an area from northern Ontario, across the Prairies and into northeastern BC, the Yukon and Northwest Territories) and the scope and interpretation of Treaty rights with respect to boreal forest decisions is evolving

181 quickly in the face of multiple court challenges. Municipal local government decision makers often
182 reside within the boreal zone. However, government represents bureaucrats and decision makers at
183 national, provincial and municipal levels, with most federal and provincial officials with
184 responsibilities and authority over boreal decisions living outside of the boreal zone.

185

186 *3.1.2. State Institutions*

187 Boreal governance involves a patchwork of federal and provincial legislation and policy related
188 to land and water use, industrial development, human health and environmental impacts. Forest
189 governance derives from Canada’s federalist structure of government that divides authorities between
190 national and provincial governments with spheres of responsibility set out under the *Constitution Act*
191 (1867; 1982) (Cargnello and Flumian 2017). Section 92A of the *Constitution Act* gives authority for
192 land and resource management to the provinces and territories who then allocate dispositions and
193 tenures for the use of or extraction of resources (Howlett 2001a). Provinces and territories are also
194 responsible for developing infrastructure on public lands such as pipelines, roads and water distribution
195 and treatment facilities, although the federal government has a role in infrastructure that crosses
196 jurisdiction (Mullon and Ceddia 2003). Municipalities often have delegated powers to regulate industry
197 through by-laws and zoning requirements and approval conditions for projects within municipal
198 boundaries (Nemetz 2013).

199

200 *Federal*

201 The federal government does not have direct influence over land use in the boreal zone, except
202 on federal lands, which include national parks (e.g., Wood Buffalo National Park in Alberta) and
203 Indian Reserve lands set aside under the *Indian Act* (1876). Environment & Climate Change Canada
204 and Parks Canada are responsible for national parks and protected areas. The *Canada National Parks*

205 *Act* (2000) allows the federal government to create federal protected areas with intrinsic value to
206 Canadians within provincial lands (Eagles et al. 2010). There are currently six national parks protecting
207 64,500 km² of the boreal ecozone, as well as one proposed national park reserve that will protect an
208 additional 14,000 km² in the Northwest Territories (Lothian 2018). Instead, the federal government
209 influences boreal land management through legislation and policy that informs provincial land-use
210 regulations and/or planning processes, or through legislation that gives federal jurisdiction over certain
211 kinds of projects and/or their environmental impacts. Natural Resources Canada (NRCan) has direct
212 jurisdiction over pipelines, transmission lines, and major energy infrastructure, as well as hydro,
213 forestry, and energy activities, that take place on Federal lands. NRCan is responsible for forest
214 protection. Under the *Forestry Act* (1985), NRCan's role on non-federal forest lands is limited
215 primarily to conducting research on forestry and silviculture systems, forest communities and
216 economics, and forest ecosystems. The *National Energy Board (NEB)* is an independent board that
217 reports to the Minister through the *National Energy Board Act* (1985). Under the *NEB Act*, the *Canada*
218 *Oil and Gas Operations Act* (1985), and the *Canada Petroleum Resources Act* (1985), the NEB
219 conducts environmental assessments and issues approvals for the construction, operation, and
220 abandonment of pipeline and power line infrastructure that crosses international or provincial
221 boundaries and oil and gas exploration and production on federal lands. The *Dominion Water Power*
222 *Act* (1985), also administered by NRCan, gives the federal government jurisdiction for hydroelectric
223 projects on federal lands,

224 The Federal government also leads cross-jurisdictional efforts to implement sustainable forest
225 management across the country, including developing criteria and indicators for sustainable forest
226 management with the provinces, and assessing and reporting on forests.

227 Major federal acts that are directly responsible for the environment include the *Canadian*
228 *Environmental Protection Act (CEPA)* (1999), the *Canadian Environmental Assessment Act (CEAA)*

(2012), the *Fisheries Act* (1985), the *Navigation Protection Act (NPA)* (1985), the *Species at Risk Act (SARA)* (2002) and the *Migratory Birds Convention Act (MBCA)* (1994). The *CEPA*, administered jointly by Health Canada and Environment and Climate Change Canada (ECCC), regulates environmental pollutants and toxic substances and sets standards for human health and environmental impacts. The *CEPA* takes a science-based ecosystem approach to setting standards and cooperates with other governments and Indigenous people to remove threats to biodiversity and human health through the control and management of the release of toxic substances from hydrocarbon, electricity, and mining projects (Government of Canada 2004). The *NPA*, administered by Transportation Canada, regulates the impacts of projects (e.g., bridges and dams) on water levels ensuring that navigation is protected on commercially important waterways. The *Fisheries Act* gives authority to the federal government to protect and manage the impacts of projects on fish populations of commercial, recreational, and Indigenous significance and is one of the most powerful instruments for boreal ecosystem protection (Hutchings and Post 2013). Both Acts were amended in 2012, and again in 2018, by the federal government to increase competitiveness by restricting the scope of review to commercially and culturally significant ecosystem services. The *CWA*, *MBCA*, *Fisheries Act* and *SARA* provide the legal basis for protected areas and requiring habitat protection.

The *SARA* is one of the most important pieces of legislation to influence habitat protection in the boreal zone. In 2012, Environment and Climate Change Canada (then Environment Canada) issued a recovery strategy for the boreal woodland caribou (Environment Canada 2012) requiring provinces to develop woodland caribou recovery plans that achieve 65% undisturbed habitat for woodland caribou ranges within 40 years. While Environment and Climate Change Canada led the development of the recovery strategy, it relies on the provinces to implement the strategy. If they do not, the Federal government can issue a protection order for caribou that could halt industry development. Unfortunately, woodland caribou habitat overlays important forest and energy resources. After decades

253 of development, options for habitat recovery are limited. In March 2018, Alberta's Minister of
254 Environment and Parks announced a partial suspension of caribou range planning and requested federal
255 assistance for habitat restoration. This situation reflects a virtual standoff between the provinces and the
256 federal government with respect to ability to curtail resource development on forest lands for habitat
257 protection.

258 By far the most important legislation for regulating across multiple environmental impacts is
259 the *CEAA*, which requires an environmental assessment for activities listed as designated under the Act.
260 Designated activities cover nearly all major industrial projects constructed on public forest lands,
261 including pipelines, transmission lines, mines, pulp and paper mills, electricity generation, railways,
262 dams, and oil and gas facilities. The Minister may refer the assessment to a Review Panel within 60
263 days of commencement based on potential adverse impacts of the project and public concern. During
264 public hearings, individuals and organizations who are deemed to have legal standing (i.e., are directly
265 impacted by the decision) may make a submission to the panel. Where there is jurisdictional overlap,
266 the Minister can also establish a Joint Review Panel. The assessment requires consideration of
267 cumulative effects, where project impacts must be considered in the context of past and anticipated
268 future impacts. In 2012, the *CEAA* was amended to streamline the review process and make it industry
269 friendly, though changes were criticized by environmental groups for reducing environmental
270 protections and by industry as inefficient (Levine 2018).

271 Finally, Section 91 of the *Constitution Act* gives the federal government power to enter into
272 treaties and international agreements, where it then works with the provinces to implement. Important
273 multi-lateral treaties that impact forest ecosystem services include the *United Nations Framework*
274 *Convention on Climate Change* (United Nations 1992b) that aims to stabilize global greenhouse gas
275 emissions, the *Convention on Biological Diversity* (United Nations 1992a) that is a multilateral
276 agreement to conserve and sustainably use biological diversity, and the *Ramsar Convention on*

277 *Wetlands of International Importance Especially as Waterfowl Habitat* (United Nations 1971) that was
278 ratified by Canada in 1981. More recently, this also includes the *United Nations Declaration on the*
279 *Rights of Indigenous Peoples* (2007), which seeks to improve the standards related to the rights and
280 dignity of Indigenous peoples.

281

282 *Sub-Federal (Provinces/Territories)*

283 The legal framework for allocating rights to develop timber, mineral, oil and gas resources is
284 similar across the provinces and territories (e.g., Haley and Nelson 2007; LaForce et al. 2009;
285 Hoogeveen 2015). Over 90% of forested land is owned by the Crown and managed on behalf of
286 Canadians (Passelac-Ross and Smith 2002). Provincially, forest governance relies primarily on forest
287 tenure agreements which have been described as “public forest management for private timber
288 harvesting” (Howlett 2001a, p. 8). The provinces and territories regulate forest practices through formal
289 acts and regulations, which require companies to carry out a range of ecological and timber
290 management responsibilities in exchange for access to timber on Crown land. Historically, this was to
291 ensure a sustainable wood supply, but more recently public environmental concerns are reflected in
292 regulations and tenure agreements (Haley and Nelson 2007).

293 Mechanisms for allocating and regulating non-timber uses of public land include licensing (e.g.,
294 water licenses), permitting (e.g., hunting permits), planning and zoning (Sheppard 2005; Bakker and
295 Cook 2011). Rights for the exploration and development of subsurface resources such as minerals, oil
296 and gas are allocated to companies through auction. Subsurface rights often overlap and conflict with
297 surface rights, including harvest rights and non-use rights. Provinces and territories have a variety of
298 methods to coordinate timber vs. oil and gas development on the same land base. One extreme is
299 Alberta, where conflicts between various forest values are settled after rights have been allocated. In
300 Alberta, the *Surface Rights Act* (2000) requires oil and gas operators to negotiate access with occupants

of the land (i.e., forest companies with tenure) and provide compensation for lost merchantable timber. In Alberta, the dynamics of oil and gas exploration determine outcomes for timber and non-provisioning ecosystem services. In contrast, other provinces, such as Saskatchewan, deal with surface-subsurface conflicts prior to the allocation of rights, and potential conflicts are identified and negotiated prior to leases being awarded (Weber 2007).

3.1.3. Non-state Instruments

Non-state instruments are important for addressing ecosystem services in all provinces and territories (Howlett & Rayner 2006a). Third-party certification is a voluntary mechanism used in Canada and worldwide to address environmental and socioeconomic externalities associated with resource management through market signals and consumer demand (Tikina et al. 2012; Cashore et al. 2004; Cashore et al., 2005). Certification involves compliance with formalized standards promulgated by certifying organizations. While they are subject to regular audit by the certifying body and laws control the use of certification logos, they are not legally-binding according to government regulations. The past two decades has seen a proliferation of private forest certification programs where forest products companies obtain a Sustainable Forest Management (SFM) endorsement based on a variety of sustainability criteria. The three most accepted certifications in Canada are the Canadian Standards Association (CSA Z809), the Sustainable Forestry Initiative (SFI), and the Forest Stewardship Council (FSC). Forest certification can help maintain or increase market access by appealing to consumer demands for sustainability. For example, large international publishing houses increasingly require forest certification from suppliers (Tikina et al. 2012). However, the existence of different forest certification standards and regional standards within can create confusion in the market. In addition, forest companies lack control over some SFM outcomes because they cannot restrict other activities on their land base (Weber 2007), though this challenge is not limited only to certification.

325 Voluntary agreements are longstanding and influential mechanisms for incorporating
326 ecosystems in forest management decisions. The Canadian Boreal Forest Agreement was initiated in
327 2010 (CBFA 2010) over growing concerns among environmental NGOs over increased industrial
328 development of fibre, mineral, oil and gas, and hydroelectric resources, combined with a perceived lack
329 of action in establishing protected areas. Only 8.1% of the boreal zone has protected status compared to
330 a national average of 12% (Murray et al. 2015). The CBFA is an agreement between some companies
331 represented by the Forest Products Association of Canada (FPAC) and environmental NGOs to
332 advance SFM and protected habitat for woodland caribou recovery (CBFA 2010). Specifically, the
333 agreement set forest harvest restrictions and suspensions over about 29 million hectares of sensitive
334 caribou habitat. In exchange environmental NGOs promised to halt campaigns (e.g., boycotts) against
335 industry.

336 Given its large spatial extent and the consensus between conflicting actors, the CBFA was
337 initially hailed as a model for conservation agreements (Pala 2010). However, the CBFA is
338 increasingly seen as problematic due to the exclusion of Indigenous peoples and provincial and federal
339 governments (Pala 2011; Murray et al. 2015; Smith 2015). Restrictions on forest practices outlined in
340 the CBFA are not tied to provincial tenure agreements and are therefore entirely voluntary.
341 Additionally, industry tenures often overlap Indigenous lands and excluded Indigenous groups have
342 requested amendments and removal of CBFA provisions (Murray et al. 2015; Smith 2015). Lastly,
343 while the CBFA addresses the forest sector, it does not restrict the other extractive activities like
344 mining, oil and gas. The conservation impact of the CBFA is questionable, but the agreement set an
345 important precedent regarding industry and environmental NGO collaboration, and provided valuable
346 lessons for similar future broad-scale initiatives for the conservation of endangered species (CBFA
347 2016).

348

349 3.1.4. Indigenous Lands and Governance

350 Until confederation in 1867 (and slightly after), Indigenous³ communities and governance
351 systems that placed high importance on informal agreements and oral histories were common in the
352 boreal zone (RCAP 1996). Indigenous land governance is based on both pre-colonial Indigenous
353 systems of governance and on an understanding of Aboriginal and treaty rights. This understanding
354 stems from two worldviews, the Indigenous worldview and the western view of the Canadian state.
355 From these different worldviews, different institutions, both formal and informal, have arisen in natural
356 resource development.

357 For the Indigenous worldview, rights are inherent, granted by the Creator, and tied to the land
358 (i.e., it is their responsibility to care for the land and this responsibility is tied to their right to self-
359 determination) (Starblanket 2008). This worldview assumes Indigenous rights should not be infringed
360 by any action of the Crown without the consent of Indigenous peoples. From the western worldview,
361 Aboriginal and treaty rights are outlined in s. 35 of the *Constitution Act, 1982*, (RCAP 1996).
362 Numerous decisions by the Supreme Court of Canada have defined these rights, such as per *R. v.*
363 *Sparrow* (1990) and *Daniels v. Canada* (2016), though Aboriginal Rights have yet to be defined in
364 entirety (Dufraimont 2000; Hurley 2000; Wyatt 2008). Additionally, the Supreme Court has given the
365 Crown (both federal and provincial governments) the authority to infringe those rights with
366 justification for the greater good of society (Imai 2017; INAC 2018). Justification requires that the
367 Crown must understand the nature of the rights and how any proposed plans or policies might affect
368 those rights through “consultation and accommodation” (RCAP 1996; Sterling and Landman 2011).

³ “Aboriginal peoples” is the term used in the Constitution Act, 1982, section 35, to recognize the original occupants of Canada. The Constitution recognizes three distinct Aboriginal groups--“Indian, Inuit and Métis”. The Inuit are the Indigenous people of the Arctic in northern Canada. The Métis are people of mixed blood who arose out of unions between Aboriginal women and traders in the fur trade era. Indians are all other Aboriginal people, defined as “status” (registered as such by the federal government and covered by the Indian Act, 1951), “non-status” and “treaty”. “Indians” are commonly referred to today as “First Nations”. Many of these First Nations live on “reserves”, federally owned land that has been set aside for their use (INAC 2002). “Indigenous” is becoming an increasingly popular term, formerly used mainly in the international arena, but now being adopted across Canada, including by the federal government that in 2017 renamed its ministry Indigenous and Northern Affairs Canada.

369 The consent of Indigenous peoples’ before resource development is not required (except where
370 Aboriginal title still exists and the extent of the rights’ infringement is significant), although there is
371 increasing discussion about the need for consent as a positive step toward reconciliation (*Haida Nation*
372 *v. British Columbia* 2004; Trosper 2008; Jollymore et al. 2016; Simms et al. 2016; McIvor 2018). The
373 Supreme Court has also declared that the duty to consult applies to both provincial and federal
374 governments. Under the Constitution, the federal government holds responsibility for “Indians, and
375 Lands reserved for the Indians” (s. 91(24), while provinces and territories have authority over non-
376 renewable natural resources, forestry and electrical energy (s. 92A). It is still unclear, however, who
377 has authority over Indigenous communities on Crown land (Simeone 2001).

378 Also important to Indigenous governance of the boreal zone is the nature of agreements
379 between the Crown and Indigenous peoples, historical and modern. In a majority (80%) of the boreal
380 zone—across northern Ontario, Manitoba, Saskatchewan, Alberta, northeastern British Columbia (BC)
381 and the Yukon and Northwest Territories—the most important agreements are the historic numbered
382 treaties, negotiated between 1850 and the 1930s (RCAP 1996). For the Crown, the interpretation is that
383 First Nations ceded their rights to land in exchange for limited use rights of hunting, fishing, trapping
384 and gathering (INAC 2018). In those treaties, the Crown also reserved the right to “take up” land for
385 mining, forestry, settlement and other purposes (INAC 2018). Indigenous peoples’ understanding of the
386 treaties is very different. The treaties are considered sacred documents that capture the spirit of sharing
387 lands and resources, and many Indigenous people oppose the notion that their ownership of their lands
388 was given up (Goldi Productions 2007).

389 In other parts of the boreal zone, agreements under the federal Comprehensive Claims Policy
390 (CCP) have been made or are being negotiated. The CCP (CCP 1973) provides a framework for treaty
391 renegotiations (modern day land claims) between First Nations and the Crown where Aboriginal title
392 has not been addressed through treaty or where there are gaps in existing treaties (INAC 2018). These

393 modern-day agreements give First Nations slightly more decision-making authority over resource
394 development on their settlement lands, unlike the historic treaties, and in total 26 have been completed,
395 such as the Innu in Labrador, the James Bay and Northern Quebec Cree, and the Umbrella Framework
396 Agreement in the Yukon. However, the CCP process is unwieldy and requires extinguishment of
397 Indigenous peoples' inherent rights, resulting in a reluctance of many communities to undergo the
398 process (McIvor 2018). For example, three Cree bands in Northern Quebec have had their land rights
399 extinguished after CCP negotiations between the Crown and other, nearby Indigenous groups (Samson
400 2016).

401 There are parts of the boreal zone where there are no agreements between the Crown and First
402 Nations. Most of Quebec outside the James Bay Cree settlement area have not negotiated claims.
403 Furthermore, the *First Nations Land Management Act* (FNLMA 1999) allows Indigenous communities
404 to become administratively independent of the Indian Act with respect to land codes on reserves, where
405 over 96 agreements have been reached across Canada (FNLMA 1999).

406 Additional relationships include co-management. Co-management is defined as “the sharing of
407 power and responsibility between the state and local resource users” (Stevenson 2006). Co-
408 management agreements after a land claim settlement can be powerful, due to a high degree of legal
409 protection, but are rare and still only place Indigenous communities as beneficiaries, not decision
410 makers (Shuter et al. 2005). For example, the Innu Nation of Labrador are entitled to shared financial
411 and resource benefits from within their territory as per their agreement-in-principle, though their
412 agreement does not specify a method for providing consent for land development (Samson 2016). Most
413 co-management agreements address a specific resource, such as the Cree of Northern Manitoba who
414 have developed a co-management method for fisheries permits (Islam and Berkes 2016), and the James
415 Bay Cree of Northern Quebec who have an open forum to discuss activities on their settlement lands
416 with the Province of Quebec through the Cree-Quebec Forestry Board (Mulrennan and Scott 2005). In

417 Ontario, Pikangikum First Nation jointly planned the management of the Whitefeather Forest with the
418 Ontario Ministry of Natural Resources and Forestry (Zurba et al. 2015; Islam and Berkes 2016).

419

420 3.2. Governance Outcomes

421 Boreal governance reflects the federal separation of powers and jurisdiction between federal
422 and provincial governments as outlined under the *Constitution Act* and evolving Treaty obligations. In
423 general, the Federal government is responsible for international agreements and trade, cross-boundary
424 issues and national environmental policies, including regulatory frameworks for environmental impact
425 assessment, establishing pollution standards and protecting wetlands, waterways and biodiversity. As
426 the Federal government is not responsible for resource development, its role in resource management is
427 limited to providing science and policy guidance as well as coordinating the provinces and territories
428 on common issues of national importance like climate change and energy (Becklumb 2013).
429 Responsibilities for implementing federal legislation and policies is usually left to the provinces, which
430 are responsible for approving most development applications and for planning on forest lands. Where
431 the Federal government has jurisdiction (e.g., *SARA* and the *Fisheries Act*), it has limited ability to halt
432 resource development, but can require compensation and mitigation of environmental impacts. In
433 theory, under *SARA*, the Federal government could issue a protection order limiting development as
434 part of an endangered species recovery plan. However, so far, *SARA* has not halted development in the
435 boreal zone even though habitat levels for several endangered caribou herds are below levels required
436 for recovery (Way 2018).

437 The interests of communities and other non-state actors are included in boreal decision-making
438 through delegated authorities and responsibilities and through public participation processes. Avenues
439 for representing public values in formal decision processes are often limited to community-based or
440 regional planning processes that reflect the concerns of local interests with less emphasis on ecosystem

services that are more important to outsiders. In Canada, the values of outside actors' influence planning and forest management decisions through international agreements and international consumer pressures.

Despite regionalization and an array of informal institutions, the state has retained control over the forestry sector, reducing the control and capacity of regional bodies (Howlett 1999; Howlett 2000). Environmental management has been de-facto centralized by the consolidation of authority through regulatory streamlining and departments that are favourable to industry (Carter et al. 2017). For example, some provinces have combined their natural resources departments and limited their environmental departments with growth of the energy sector (Parkins et al. 2016; Carter et al. 2017; Adkin 2016). Similarly, power gaps have allowed for a bias towards industrial development (Markey et al. 2000; Sosa and Keenan 2001). Mineral exploration and tenure assignment for mining by the province is operated separately from the consultation of local communities and stakeholders over the creation of a new mine, often resulting in late consultation or failure to apply community concerns (Laforce et al. 2009). The gap between authority and management, coupled with fragmentation, is a barrier to tackling more complex issues such as climate change and water management (Bakker and Cook 2011; Rayner et al. 2013; Cargnello and Flumian 2017)

The current governance system is not suited to the complex cross-sectoral and cross-scale challenges of managing ecosystem services (Cargnello and Flumian 2017; Creed et al. 2016). Though the Federal government has some control over cross-boundary issues, it often lacks the ability to implement decisions because provinces maintain jurisdiction over resource allocation. Ecosystem functions and services cross jurisdictional and ecological boundaries and require management at multiple spatial scales. There are few mechanisms to coordinate and integrate multiple environmental impacts horizontally across sectors or between local, provincial, and national scales. Coordinating bodies and efforts like the Canadian Council of Ministers for the Environment, the National Energy

465 Strategy, and the *Pan-Canadian Framework on Clean Growth and Climate Change* (ECCC 2016) rely
466 on voluntary participation by the provinces rather than shared power.

467 Cross-jurisdictional disagreements over resource development have revealed significant
468 governance gaps related to ecosystem services, with provincial and federal governments exercising
469 various jurisdictions over resource development to overcome disputes between development and the
470 environment. The *CEAA*, which limits the number of actors that can participate in review processes, the
471 2012 changes to *CEAA*, which limited the scope of powerful tools like the *Fisheries Act*, and the *NPA*,
472 which limits the scope to ecosystem services with commercial interests, have all resulted in a failure of
473 confidence and legitimacy in the current system. Governance gaps where jurisdictions overlap and
474 conflict threaten a constitutional crisis. For example, in 2014 the Northern Gateway pipeline to ship
475 bitumen from Alberta's oil sands through BC to China was approved by the federal government but
476 was opposed by First Nations and environmental groups over lack of consultation, risks to marine and
477 terrestrial ecosystems, and potential greenhouse gas emissions from oil sands expansion. In addition, in
478 2016, BC's Premier Christy Clark argued that BC did not receive a fair share of the economic benefits
479 of the pipeline while bearing a disproportionate share of risk and sought a benefits-sharing arrangement
480 with Alberta outside of existing authorities and legislation, causing BC's Premier to announce in July
481 2012 that BC would pull out of the National Energy Strategy until its concerns over Northern Gateway
482 were addressed. The dispute became moot after the pipeline approval was overturned by the Federal
483 Court of Appeal based on inadequate Indigenous consultation. Similarly, in 2013, the *NEB* approved
484 the proposed Kinder Morgan Trans Mountain Pipeline expansion which would again take oil from
485 Alberta to Asian markets via the BC Coast. As in the Northern Gateway decision, the pipeline approval
486 was overturned by the Federal Court of Appeal based on inadequate Indigenous consultation, and that it
487 erred in the scope of the environmental assessment by not considering the impacts of increased marine

tanker traffic on marine species at risk causing Alberta's Premier Rachel Notley to pull out of the Pan-Canadian Framework for Clean Growth and Climate Change.

The transboundary jurisdictional disputes between the provinces and the federal government over pipeline development reflect a crisis of legitimacy in environmental governance. First, the environmental review process under *NEB*, with its limited criteria for standing and failure to duly consult Indigenous communities, was viewed by environmental groups as biased towards industry. Second, as shown in the Trans Mountain case, the narrow scope of the environmental review process affected the *NEB*'s decision. In 2017, to improve legitimacy and increase the certainty of the review process, the federal government introduced Bills C-68 and C-69 to amend the *Fisheries Act*, the *NPA*, and the *CEAA*. Bill C-68, which is currently in reading at the Senate, would restore protections for fish habitat and all fish populations that were removed in 2012 and require the Minister to consider impacts on Indigenous peoples and traditional knowledge (Levine 2018; Doelle 2018). To streamline the regulation, certain classes of activities would be exempt, though at this time the list of exempted activities is not known. Bill C-69, which is currently under public consultation, would restore protection of navigation rights to all waterways by providing opportunities for the public to comment and initiate a review for waters not currently designated under the *NPA*.

Bill C-69 would also replace the *NEB Act* and the *CEAA* with a new *Impact Assessment Act*. Proposed changes in environmental assessment include: (1) establishing a new Impact Assessment Agency that would be responsible for all environmental assessments for designated activities; (2) adding in-situ oil sands projects to the list of designated projects to address greenhouse gas emissions; (3) establishing an early engagement process before formal review to identify and engage the public on significant challenges prior to formal review; (4) removing the standing test for participation in the review process; and (5) removing decision making from the Independent Assessment Agency and

511 giving final approval to the Minister or Cabinet (Doelle 2018). These changes have raised concerns
512 about increasing the overall time, cost and politicization of the approval process (Ignasiak et al. 2018).
513

514 **4. Looking Back**

515 Five themes (Fig. 2) have influenced boreal governance over the last 50 years. The first three
516 relate to empirical trends in international governance outlined by Krott et al. (2014): (1) shift in the role
517 of government from regulation to marketisation; (2) cross-sectoral integration; and (3) decentralization
518 or shift in authority or responsibility from centralized national and provincial jurisdiction to lower
519 levels of jurisdiction. The fourth theme is Indigenous empowerment and reflects the evolving
520 recognition of Indigenous rights and attendant prescriptions on Canadian laws and institutions (Fortier
521 et al. 2012; Beaudoin et al. 2015; Zurba et al. 2016). Finally, the fifth theme is geopolitics that refers to
522 the influence of international pressures on Canada’s natural resources policies (Howlett 2001a).
523

524 *4.1. Role of Government*

525 The role of government refers to the degree to which private actors and markets influence
526 management decisions. On one end of the spectrum is a privatized model of governance with an
527 emphasis on strengthened property rights giving industry full responsibility and authority over
528 management decisions in response to market forces. This end captures marketization through market
529 incentives, certification, and payments for ecosystem services (Krott et al. 2014). On the other end is a
530 pure public model with resource management decisions made by government using command and
531 control approaches. In between are co-management and community-based arrangements which involve
532 a broader arrange of actors in decisions (Arts 2014).

533 Over the past 50 years, the role of government has shifted from managing forests for timber and
534 other economic commodities to managing forests for multiple uses and ecosystem values. Forest

535 governance has followed the general trend in environmental governance away from command and
536 control regulation, which is viewed as inefficient and ineffective, towards outcome-based regulation
537 and the use of market-based instruments such as carbon offsets and tradable rights (Weber and
538 Adamowicz 2002). Further trends towards self-regulation and payment for ecosystem service
539 approaches to monetize the benefits of ecosystem services reflect the rise of neoliberalism over the last
540 two decades (Krott et al. 2014).

541 While provincial forestry legislation and regulations were sufficient for managing harvest
542 activities to maintain a productive forest land base, they could not address the full suite of multiple uses
543 and public demands for non-provisioning ecosystem services. Cross-sectoral conflicts in resource
544 development (e.g., forestry and oil and gas), landscape-level cumulative effects, and stricter
545 environmental policies in the natural resource sectors threatened effective governance of the boreal
546 zone (Canter and Ross 2010). Governments responded with new regulatory instruments, such as
547 performance-based regulations (Hoberg et al. 2016) and carbon pricing (Voß 2007). Where there were
548 governance gaps, voluntary arrangements like forest certification and the CBFA emerged with new
549 actors involved in both formal and informal institutions (Howlett and Rayner 2006). As public
550 demands to participate in forest decision-making increased, community-based and regional planning
551 processes increased the role for non-state actors in forest planning processes. However, the
552 incorporation of public values in plan implementation varied across jurisdictions and was often limited
553 because decision-making authority remained centralized.

554 The rise of non-state arrangements received mixed reviews. On the one hand they addressed
555 important gaps in managing ecosystems; on the other they are viewed as non-democratic, with industry
556 having the power to greenwash and pre-empt more stringent environmental policies that would be in
557 the public interest. Although the original FSC stance on the development of regional SFM standards
558 was to reduce government involvement (Tollefson et al. 2008), provincial governments remained

559 influential actors around forest certification, by providing preferential treatment to Crown license
560 holders and informing certification standard development (Hackett 2013).

561

562 4.2. *Jurisdictional Scale*

563 Scale of government refers to the administrative scale of management institutions, which ranges
564 from community-based governance on the one end to centralized provincial and federal decision-
565 making on the other (Cargnello and Flumian 2017; Secco et al. 2014). In the past 50 years, there has
566 been a trend towards decentralization (or regionalization) with responsibility for forest planning,
567 administration and implementation devolved from provincial governments to regional decision-making
568 bodies (Haley and Nelson 2007; Faguet 2014).

569 Decentralization is associated with limited capacity, fragmented or uncoordinated jurisdiction and
570 governance gaps related to the various ecosystem services provided by forests (Rayner et al. 2013).
571 Jurisdictional bodies may have differing objectives that can negatively impact resource management
572 (Dietz et al. 2008; Rayner et al. 2013). Where cross-jurisdiction governance gaps exist, such as in the
573 regulation of greenhouse gas emissions, projects can be fought through a suite of conflicting legislative
574 authorities challenging the existing federalist structure as demonstrated in recent pipeline decisions. For
575 ecosystem services that do not cross regional boundaries, regionalized and community-based decision
576 processes are more successful. In Ontario, water resources are governed at the watershed scale by local
577 conservation authorities comprised of municipal representatives which have been praised as effective
578 (Teitelbaum et al. 2006; Chilima et al. 2013).

579 Community-based collaborative governance (Sunderlin et al. 2008; Porter et al. 2013) includes
580 community forestry, which refers to a partnership of mixed stakeholders who are granted the rights to
581 manage forests on public land (Teitelbaum 2016). The focus of community forests is on multiple use
582 management (e.g., managing for ecosystem services like recreation and clean water), as well as local

control over decision-making (Egunyu et al. 2016). While formal institutions remain central (e.g., license agreements with a provincial government), informal intuitions are vital for effective community forestry. For instance, social networks and societal norms and sanctions are vital in community-based governance (Dietz et al. 2003). While there is increasing evidence of a societal demand for these bottom-up, collaborative models of governance, community forest agreements currently comprise less than 2% of public forests in Canada (Teitelbaum 2014).

4.3. Scope and Coordination

Scope refers to the extent of authority across a range of forest issues. Scope is related to the degree of fragmentation or integration of overlapping jurisdictional and cross-sectoral issues including both vertical integration between local, provincial and national jurisdictions that influence the same issues, as well as horizontal integration across cross-sectoral and cross-cutting environmental issues. Over the last 50 years, conflicts between industry, government, ENGOs, and Indigenous peoples over environmental degradation associated with timber harvesting and resource extraction led to new and more stringent policies and regulations for forest management, counteracting the trend towards deregulation and decentralization (Haley and Nelson 2007; Prudham 2007). The management of environmental externalities through forestry regulation and tenure reflects a shift in scope and outcomes for boreal governance. At the same time a push for integrated resource management at the provincial level has expanded the scope of governance to include a broad array of provisioning and non-provisioning ecosystem services beyond wood fibre in forest management decisions (Mitchell 1986).

As demonstrated in the Trans Mountain Pipeline decision, government is increasingly challenged with authority and accountability as non-government actors are increasingly involved as intermediaries in decision making and core government functions are distributed to Crown corporations

607 and boards, such as the NEB outside the responsibility of ministers (Cargnello and Flumian 2017).
608 Bills C-68 and C-69, if they pass, are intended to increase coordination in the environmental review
609 process as well as expand the scope of issues to be considered. The scope of the *Fisheries Act*, the
610 *Navigation Protection Act*, and of environmental review in general would be expanded, including
611 additional clauses to deal with complex issues like climate change and including opportunities for input
612 from a broader public, not just individuals directly affected by decisions (Ignasiak et al. 2018).

613

614 *4.4. Indigenous Empowerment*

615 Many reports suggest that Indigenous peoples’ role in decision-making in resource development
616 is inadequate (FNFC 2010). Most relationships between Indigenous communities and the Crown in
617 Canada are criticized for a lack of involvement by Indigenous peoples in the land planning processes
618 and the lack of need for consent before industrial activities take place (Alcantara 2008; Beaudoin 2015;
619 Smith 2015). Both the Comprehensive Claims Policy (CCP) and the *First Nations Land Management*
620 *Act* (1999) fall into this category (Alcantara 2008; Beaudoin 2015; Smith 2015).

621 Consultation is the most common relationship and has improved Indigenous people’s
622 participation in planning and protection of their rights, however the process of consultation can still
623 have negative outcomes (*Haida Nation v. British Columbia* 2004; Trosper 2008; Jollymore et al. 2016;
624 Simms et al. 2016). In the Grassy Narrows case in 2014, Grassy Narrows First Nation, a signatory to
625 historic Treaty #3 of 1873, questioned the authority of Ontario to issue forest licences when the
626 resultant logging would impact their Aboriginal and treaty rights. The Supreme Court clarified that the
627 Province of Ontario has the right to “take up” land for forestry purposes. However, the decision
628 emphasized that the province had a duty to consult to minimize infringement of Aboriginal and treaty
629 rights. Given the different interpretations by First Nations and the Crown, including the Supreme

630 Court, about the meaning of the treaties, there will be ongoing conflict over resource development
631 (Thibodeau 2014).

632 Co-management (where Indigenous communities share authority and responsibility with the
633 Crown or private sector) and self-government (where communities are responsible for governing their
634 lands with a high degree of decision-making about land use) agreements are argued to be more
635 progressive forms of relationship between Indigenous peoples and the Crown (Campbell 1996; Curran
636 and M’Gonigle 1999; Rynard 2000; Armitage et al. 2007). Co-management agreements are more
637 inclusive and based on negotiation rather than litigation, however the authority to assign decision-
638 making power is still typically retained by the provincial and federal governments (Campbell 1996;
639 Penikett 2012; Wyatt 2016). For example, the Essipit Nation of northern Quebec have an agreement
640 with a forestry corporation, and mutually benefit from the agreement, but are still “at arms length”
641 (Beaudoin et al. 2015, p. 292) in decision-making, as they participate only through meetings, public
642 hearings and conversations (Beaudoin et al. 2015). Furthermore, co-management agreements are not
643 always beneficial for ecosystem services, as agreements made with the private sector can be unfair,
644 leading to unsustainable practices, and ecosystem management ideals may conflict with indigenous
645 values, where some communities believe they are part of the landscape and do not possess the power to
646 manage it (Campbell 1996; Stevenson 1998; Parsons and Prest 2003; Stevenson 2006; INAC 2006;
647 Wyatt 2016).

648 At the international level, the United Nations Declaration on the Rights of Indigenous Peoples
649 (UNDRIP) was endorsed in 2007 by a majority of countries, with Canada adopting the Declaration in
650 principle in 2010. A key concept in the Declaration is Article 32 where nation states must seek the free,
651 prior and informed consent of Indigenous peoples before any resource development occurs in their
652 territories. Although the Supreme Court of Canada has acknowledged the need for consent in
653 consultation processes in Canada, this consent is required only when an Indigenous people has a very

654 strong claim of Aboriginal title and when the infringement of their rights is expected to be extensive.
655 This principle was affirmed in the *Tsilhqot'in* decision in 2015 (McNeil 2015). The Government of
656 Canada has committed to fully implementing UNDRIP, including free, prior and informed consent,
657 based on a recommendation by the Truth and Reconciliation Commission (2015) to adopt the
658 Declaration as a reconciliation framework. Whether this will change how consultation is done in
659 Canada remains to be seen (Boutilier 2017).

660

661 **5. Driver Interactions**

662 Feedbacks between governance and other drivers can amplify or mediate changes in social,
663 economic and environmental conditions. The following description of driver interactions provides a
664 narrative for how changes in boreal governance might interact with other drivers when developing
665 future scenarios. These drivers (described and analyzed in other papers that are part of the Boreal 2050
666 Project (Creed et al. 2019)) include: (1) atmospheric change (Yeung et al. 2019); (2) the demand for
667 provisioning ecosystem services (PrES) (Lamothe et al. 2019) and non-provisioning ecosystem services
668 (NPrES) (Erdozain et al. 2019); (3) industry and innovation (Musetta-Lambert et al. 2019); and (4)
669 demographics and social values (Nitoslawski et al. 2019).

670

671 *5.1 Atmospheric Change*

672 Governance can will have impact on atmospheric change mitigation and adaptation, provided
673 policies change in the near future (Lempriere et al. 2013). Atmospheric change is a large aspect of
674 policy inaction and governance “hollowing out” (Parkins 2006; Lemos and Rood 2010). A high level of
675 atmospheric change may shift Canadian and global demand from PrES towards NPrES. However,
676 atmospheric change in the boreal may also reduce ecosystem service availability, triggering policy
677 responses around ecosystem protection, such an increased monitoring as recommended by Gauthier et

al. (2014). Additionally, atmospheric change may have dramatic impacts on the Indigenous communities living in the boreal zone, who are already noticing climate change impacts (Wesche and Armitage 2010). Indigenous communities may become mobilized if atmospheric changes affect areas that are sacred or plentiful.

5.2 Provisioning and Non-Provisioning Ecosystem Services

Governance is highly influential over PrES and NPrES as it dictates the formal and informal institutions that guide the decision-making of the various managers and beneficiaries of boreal ecosystem services. Increased demand for PrES or NPrES are reflected in governance structures in the boreal zone. An increase in the demand for PrES may increase deregulation and increasing reliance on market-based tools to guide decision-making (Howlett 2000; Cashore 2002). Consistent demand may also increase extraction, such as for the mining and oil and gas industry, which may negatively impact northern communities (particularly Indigenous communities) due to the resource curse (where reliance on extraction resources slows economic growth and makes town livelihoods tied to market value), calling for changes to economic and social policy in these areas (Sachs and Warner 2001). Alternatively, an increase in the demand for NPrES and increase environmental regulation (stricter policies and better enforcement), may cause the social license for extraction to be removed (Prno and Slocombe 2012). The increase in the demand for NPrES may also increase the capacity and involvement of Indigenous communities, as Indigenous culture places high value around NPrES in traditional knowledge and land uses, which is argued to be essential to sustainable forestry (Huntington 2000; Beaudoin et al. 2015; Uprety et al; 2017). Increases in the demand for both PrES and NPrES have the potential to lead to more sustainable policies because of overlapping needs (Davies and Mazumder 2003), but more often than the focus is on developing PrES over NPrES (Raudsepp-Hearne et al. 2010; Zheng et al. 2016).

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5.3 Industrial Innovation and Infrastructure

Industry and innovation play unique roles in the governance of the boreal zone. Industry increases demands for PrES and NPrES with legislation and regulations guiding their decision-making processes and management activities. Innovation can lead to stricter environmental policy. Governance can reinforce innovation by improving funding for science and entrepreneurs and by fostering effective ecosystem management (Dasgupta et al. 1997). Similar principles can apply for Indigenous communities but these may have unexpected consequences. Innovations that increase the economy of northern communities and open up the Boreal may be supported by Indigenous communities; however, if expensive, it may mean that Indigenous communities are unable to access these innovations, or it may create inequity within communities (Wesche and Armitage 2010). Alternatively, innovations that make the boreal forest easier to access may increase the amount of demand on ecosystem services in the boreal zone, which in turn may either further infringe on Indigenous rights or provide easier access and therefore opportunities for Indigenous empowerment (Salee and Levesque 2010).

5.4 Demographics and Social Values

Changes in social values in response to declines in ecosystem services can influence governance systems through calls for change that create political pressures to act (Methot et al. 2015). For example, Canadians who place priorities in social, economic and environmental issues are open to new policies that touch on one or more of these issues (Cameron and Potvin 2006). Furthermore, Canadians who place priorities on science support an increase in evidenced-based policies, though this can backfire, where scientific uncertainty can be used by decision-makers to stall or pick which science is appropriate to apply (Lemos and Rood 2010). Social values may change based on demographics. Increases in Indigenous populations in northern areas, or an increase in Indigenous peoples continuing

to gain capacity, may spur increased calls for the recognition and protection of Indigenous rights and further rejection of industrial development on Indigenous traditional territories (Salee and Levesque 2010). Alternatively, with a globalizing society, an increase in the valuation of ecosystem services marginalizes other ways of knowing, potentially reducing Indigenous capacity (Ernstson and Sorlin 2012). Social values can also conflict, and often do. There are increasing demands for ecosystem protection and conservation, but these demands conflict with calls for economic growth that is in part fueled by resource extraction (Lemos and Rood 2010). Policy can reflect this indecision, with strong policies that lack authority and enforcement (Howlett 2000; Parkins 2006). In these cases, social values can be leveraged by third parties to force government's hand, such as examples given by Adger (2003).

6. Looking Forward to 2050

6.1. Scenario One – Staying the Course

This future scenario describes a possible outcome of our current trajectory. Boreal zone governance is increasingly decentralized and fragmented, being largely reactive at the local level. The Canadian population is aging, and with slowed population growth due to more stringent immigration policies, government services are stretched. Income inequality worsens and marginalization increases in rural and Indigenous communities that lack the stronger tax base of large urban populations. The increasing urbanization of the Canadian population both inside and outside the boreal zone leads to considerable declines in economic welfare and employment in the primary industries and thus declines in rural boreal populations (Nitoslawski et al., 2019). The slowing of employment in traditional areas does lead to innovation and entrepreneurship among younger generations in large cities but is increasingly disruptive for employment in the primary industries.

The rise of nationalistic trade protectionism persists globally, most notably with our chief trading partner the US. The Trans Pacific Partnership and The Canada-European Union (EU)

750 Comprehensive Economic and Trade Agreement remain intact but globalization is slowing drastically
751 in response to domestic pressures worldwide. Canada's forest product exports from the boreal zone
752 decline with the loss of market share to tropical wood fibre sources from plantations in developing
753 nations. The resurgence of the softwood lumber dispute with the U.S. and restructuring of the North
754 American Free Trade Agreement lead to an increase in duties on resource exports, which exacerbates
755 the decline. Other resource exports, most notably oil and gas, increase marginally with the new trade
756 agreements in place. However, oil prices remain low due to the proliferation of renewables that are
757 incentivized by carbon pricing regimes, and both production and exports show a downward trend.
758 Geopolitical instability surrounding immigration, refugees and idealism exacerbates these latter
759 economic impacts.

760 Overall, a declining economy and curbing of globalization lead to increasing industry pressure,
761 suggesting that strict environmental policies and regulations are stifling trade. In response, provincial
762 governments layer new but ineffective regulations on top of existing policy instrument mixes with little
763 success. Moreover, with the decline of primary industries in Canada, voluntary and market-based
764 environmental policy instruments are no longer effective. Resource management practices become
765 more destructive on boreal ecosystem structure and function, as they favour efficient and rapid rates of
766 extraction to mitigate economic losses. There are increasing conflicts between industry and Indigenous
767 communities over land claims and the adverse cumulative effects from industry affecting traditional
768 Indigenous land uses. The fragmentation of environmental policy coupled with more destructive
769 practices equates to the degradation of boreal ecosystems despite the decline in exports and overall
770 rates of extraction. Moreover, with little provincial and national coordination on climate change
771 adaptation, wealthier, larger cities are able to adapt with a primary focus on infrastructure while many
772 rural and Indigenous communities face severe climate change impacts.

773

774 6.2. *Scenario Two – Regional Coordination and Adaptive Governance*

775 This future scenario describes an increasing emphasis on coordination between boreal zone
776 actors at the local and regional scale. Similar to the previous scenario, there is considerable
777 decentralization and diffusion of responsibility and authority. However, both governance and
778 sustainability outcomes for the boreal zone are not nearly as bleak. First, rather than a complete retreat
779 of provincial governments in resource governance, there is a renegotiation of their role. Provincial
780 government departments act as facilitators, coordinators, funders and data sharers instead of regulators.
781 Regional watershed-scale authorities facilitate collaborative partnerships between Indigenous peoples,
782 environmental NGOs, and industry.

783 Community-based governance is a central feature in the boreal zone. Benefits associated with
784 provisioning and non-provisioning ecosystem services flow directly to communities living in the boreal
785 zone, while Indigenous communities see improved sovereignty and self-governance over their lands
786 and resources in traditional territories. Carbon pricing has restricted larger, high-emitting industries in
787 the boreal zone and the by-product is local-level community forestry, agriculture and small-scale
788 renewable energy development. This community-based governance – including implementation,
789 experimentation, re-assessment and re-adjustment – are enshrined in the new adaptive decision-making
790 and management processes. However, while benefits from boreal ecosystem services have been
791 redistributed more equitably across the boreal zone at the community level, their overall contribution to
792 the Canadian economy has declined substantially due to reduced extraction rates and exports.

793 Socio-ecological resilience and the supply of ecosystem services are enshrined in planning and
794 decision-making processes, but a lack of boreal-wide coordination is evident. Climate change is not as
795 severe as the most extreme predictions due to regional, national and global mitigation measures such as
796 renewables and carbon pricing. However, broad-scale climate change impacts, like forest fires, drought

797 and invasive pests span local nodes of governance and challenge the capacity of this seemingly ideal
798 scenario, pushing governments towards future vertical and horizontal multi-scale coordination.
799

800 *6.3. Scenario Three – Low Carbon Innovations*

801 One Canadian and one international catalyst have shaped the future of boreal zone governance
802 in this industry-led and innovation-fueled scenario. First, in response to the federal government’s plan
803 to implement a carbon tax, provinces and regions take charge, favouring emissions trading programs
804 with regional cap-and-trade markets. With the desired effect of carbon disincentives in place, a flurry
805 of industry-led innovation in renewable energy technology takes place. Second, with carbon pricing in
806 place around the world and commitments to the Paris Agreement, China and India have subsequently
807 generated massive markets for renewable energy technology. Canada, among some others, is an
808 innovation leader and commands a considerable market share.

809 Canadian governments favour rapid deregulation and market-based tools—notably sustainability
810 reporting and social corporate responsibility—in response to this economic growth. With this major
811 restructuring of the demand for ecosystem services, ecosystem conditions and sustainability outcomes
812 are generally favourable. Industry commitments to sustainability are largely ensured by multilateral
813 agreements and powerful international environmental NGOs and their advocacy. A perceived loss of
814 social license and market share keeps private-sector environmental practices in check. However, with
815 the current institutional arrangement, politicians and their governments have little power and few
816 incentives to enact new, stricter environmental regulations for fear of the economic impacts. This fact
817 is made evident when minority but vulnerable populations in the boreal zone, including northern
818 Indigenous populations, feel little is being done to curb climate change impacts in their communities.

819 The continued retreat around environmental governance and basic service delivery alike by
820 national and provincial governments allows the private sector to fill this gap. With basic services being

delivered through a competitive market and inequalities building rapidly, Canadians begin to feel disempowered. Despite a positive environmental future and a low carbon economy, the public demands policy change from governments that are no longer able to provide it. Moreover, highly competitive global markets and a lack of environmental regulation, coupled with increasing economic disparities and a climate refugee crisis, mean the risk of geopolitical tension and inter-state conflict is high.

7. Synergies and Trade-offs

Previously, we considered interactions among drivers of change; here we consider the interactions within the driver of governance and geopolitics. Decentralization, market-based instruments, and Indigenous empowerment are key considerations for the future of governance and geopolitics in the boreal zone. Synergies include positive interactions that create more effective outcomes than the initial interactions, while trade-offs are the opposite, where the outcome is less than if the elements were isolated. A brief summary of the possible synergies and trade-offs of the different aspects of governance and geopolitics are provided below.

Canadian governance has undergone a significant “hollowing out” in recent years (Howlett 2000; Lemos and Rood 2010; Carter et al. 2017). Decentralization (or regionalization) has resulted in “tradeoffs” – local control has increased, but there has been a “hollowing out” of governance as there has not been a concomitant increase in the capacity to enforce regulations within local jurisdictions (Howlett 2000; Sosa and Keenan 2001; Carter et al. 2017). Decentralization emphasizes local control, which is considered paramount in ecosystem management by identifying polluters and engaging in region-specific decision making (Teitelbaum et al. 2006; Kern and Bukleley 2009; Chilima et al. 2013). However, without cooperation among regions, local control can be fragmented (Rayner et al. 2013). Therefore, a mix of local control and power, combined with higher-level coordinated ecosystem

844 management, similar to Ostrom's classic nested enterprise, would enable communities across the boreal
845 to be able to tackle the environmental challenges the boreal faces (Ostrom 1990, Cox et al. 2010).

846 Decentralization has also resulted in "synergies"—especially with Indigenous communities.
847 Decentralization of power to regional authorities could empower Indigenous communities, e.g.,
848 through co-management agreements. Indigenous communities could then have influence over agenda
849 setting, allow for more effective implementation of treaties, and contribute to the resolution of
850 outstanding treaties. With empowerment of Indigenous communities, the use of traditional knowledge
851 may also increase, calling for policies and management guidelines that allow for the preservation and
852 use of Indigenous knowledge (Stevenson 2005). However, co-management agreements will need to be
853 carefully negotiated. Indigenous peoples consider themselves a nation, and so may prefer nation-to-
854 nation agreements. Often agreements between natural resource corporations result in unfair
855 relationships with Indigenous communities, due to the economic position of many Indigenous
856 communities, placing ecosystem services further at risk, and leaving communities open to further
857 economic decline (Wyatt 2016). These same relationships also pose the risk of degradation of
858 Indigenous cultures (Campbell 1996; Ernston and Sorlin 2012; Passelac-Ross and Smith 2013).

859 Market-based instruments have a place in this as well. Decentralization may promote the use of
860 market-based instruments. In the current state of decentralization, where there are power gaps, many
861 third-party certifications have flourished (Cashore 2002; Parkins 2006), answering public and
862 international calls for increased sustainability (Tikina et al. 2012). However, the increase of market-
863 based instruments could easily become a trade-off, if other extraction opportunities open nearby
864 (Weber 2007), or if international markets or public attitudes shift (Cashore 2002; Gulbrandsen 2004).

865

8. Conclusions

Canada's boreal zone is rich in ecosystem services and cultural heritage. Effective governance and management of the boreal zone is important for continuing its vitality, particularly in the face of climate change and associated uncertainty. The federal governance system is not equipped to address emerging cross-sectoral and cross-scale challenges in managing for non-provisioning ecosystem services. The past 50 years has shown a trend towards decentralization, marketization and increased role of non-state actors in boreal governance. Decentralized governance can be suitable for managing ecosystem services that manifest at local scales, involving communities that are impacted by environmental degradation. For example, Indigenous empowerment is increasing, with greater consultation with Indigenous communities and a move towards co-management of resources. While these arrangements are not yet reflected in legislation and practice, it is expected that formal Indigenous control over resource decisions will increase as court challenges move through the system. However, decentralized decision-making does not adequately coordinate among sectors or across scales (i.e., impacts downstream or downwind or impacts that are intergenerational). These governance gaps provided greater room for non-state actors to negotiate arrangements that allow development projects to move forward while addressing only some of the public demands for environmental protection. The shift of government control over decision making to non-state actors may erode democratic processes, particularly given Canada's dependence on international trade which leaves society and ecosystems vulnerable to global market and governance trends.

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Draft

1319 **Figure Captions**

1320

1321 **Fig. 1:** Analytical framework of boreal zone governance, expanded from Ostrom’s (1999) institutional
1322 analysis and development and 2007 (and 2009) multi-tier framework (in black and grey) for analysing
1323 social-ecological systems which distinguishes: 1) governance elements; 2) governance outcomes; 3)
1324 international pressures and geopolitics; and 4) governance discourses.

1325

1326 **Fig. 2.** Five governance themes in the boreal zone. Each is laid out along axes representing the
1327 variation of the theme.

Draft

Figure 1: Analytical framework of boreal zone governance, expanded from Ostrom's (1999) institutional analysis and development and 2007 (and 2009) multi-tier framework (in black and grey) for analysing social-ecological systems which distinguishes: 1) governance elements; 2) governance outcomes; 3) international pressures and geopolitics; and 4) governance discourses.

304x219mm (300 x 300 DPI)

Figure 2: Fig. 2. Five governance themes in the boreal zone. Each is laid out along axes representing the variation of the theme.

254x254mm (300 x 300 DPI)