

**“No Science, No Democracy”: Environmental Knowledge and Scientific Activism in
Canada**

by

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Abstract

“No Science, No Evidence, No Truth, No Democracy”: this phrase has appeared on signs and has been chanted at protests across Canada since the “Death of Evidence” protests in 2012. It marked the emergence of a number of pro-science organizations that have sought to protect the role of science in Canada’s democracy in the face of substantial changes to science governance in Canada. Arguing against funding cuts to environmental research and libraries, much of the protest has been centred on the emergence of a “wilful ignorance” or “war on science” in Canada. This thesis takes these pro-science activists seriously as part of an emerging social movement working towards changing how federal science is governed and how politics influences its governance. By tracking their modes of resistance, this thesis aims to understand how federal scientists conceive of their role and that of science in democratic governance since the sweeping changes of Bill C-38 and affiliated policies which have been accused of gutting environmental protections and blocking environmental knowledge. I argue that these changes reflect an institutional power shift and have generated a tension between different models of scientific practice within federal institutions. Differing conceptions of scientists as public servants have fuelled the protests, which have focused in particular on the Experimental Lakes Area (ELA), a freshwater institute in Kenora, Ontario, a freshwater research station previously managed by Fisheries and Oceans Canada and now by the International Institute for Sustainable Development. Using the ELA as my case study, I analyze how different conceptions of politics and governance have been articulated using discourse analysis as my primary method of study. Adding to current Science & Technology Studies (STS) discussions on the tension between expertise and democratic decision-making, I question the role of federal governance and perceptions of political interference in producing environmental knowledge.

Preface

This thesis is original, unpublished, independent work by the author, Shoshana Deutsh.

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List of Abbreviations

DFO – Fisheries and Oceans Canada*

E4D – Evidence for Democracy

ELA – Experimental Lakes Area

FRB – Fisheries Research Board

IISD – International Institute for Sustainable Development

FWI – Freshwater Institute

PIPSC -- Professional Institute of the Public Service of Canada

STS – Science and Technology Studies

*Fisheries and Oceans Canada was previously known as the Department of Fisheries and Oceans, and this acronym has stuck despite the name change in news media and literature on the federal department.

Acknowledgements

It is of the nature of idea to be communicated: written, spoken, done. The idea is like grass. It craves light, likes crowds, thrives on crossbreeding, grows better for being stepped on.

—Ursula K. Le Guin, *The Dispossessed* (1974)

No intellectual effort can exist in isolation. I may have produced this thesis, but my ideas would not have formed or grown had it not been for the vibrant and engaged communities of which I am so fortunate to be a part. Thank you's are difficult here: not because I am ungracious (I hope), but because there are so many people that have helped me think through difficult ideas and concepts, or inspired me to think laterally with a phrase or a pointed question. Late night discussions, long walks, chatting over coffee, and even social media—so much has played a part in forming this thesis that it's hard to know where to begin, but I shall endeavour to do so:

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Dedication

To remembering that there is light in the dark,

To my friends and family who continue every day to do what makes them heroes: *being*.

Chapter 1: Introduction: Evidence, not propaganda

Scientists march down the streets of Ottawa, clad in lab coats and supporting a coffin. A protestor dressed as the grim reaper escorts them, scythe in hand, leading the funeral procession. The protestors carry signs which declare “Death of Science Based Decision-Making,” “Stand Up for Science,” “Science Speaks Truth and Harper Tells Lies,” “Save the ELA,” and “Evidence Not Propaganda.” Fish, water droplets, and measuring flasks, among other scientific and environmental iconography, decorate these signs; many are depicted as polluted, damaged, or ruined. Together, the protestors chant “No science, no truth, no evidence, no democracy,” as they continue their march towards Parliament Hill and the ears of those who govern Canada. At the front steps of the parliament buildings, ecologist Diane Orihel begins her mock eulogy for evidence in Canada, calling it “the demise of science, a devastating loss that will reverberate in the daily lives of Canadians for years to come” (Coalition 2012b). Others, such as biologist Vance L. Trudeau, condemn the government, led by Prime Minister Stephen Harper, for

the tendency to use only data and evidence that you like is the misuse of information for alternative purposes. This is known as propaganda. If you think it can’t happen in Canada, then you are disregarding the very evidence the government is providing us by their own actions. (Coalition 2012a)

A “virtual vigil” accompanies the protest, which calls upon Canadian citizens around the country and internationally to express solidarity with scientists by taking a photo of themselves holding a candle. If possible, they are to “incorporate a science-related tool or symbol in your photo (calculator, test tube, graduated cylinder, periodic table, magnifying glass, compass, goggles, etc.)” (Death of Evidence 2012). The protest took on a new form: the death of not just science, but its cultural symbols and currency within the federal government.

1.1 Taking scientists seriously

Scientists, protesters, citizens: I have purposefully conflated these terms in my depiction of the “Death of Evidence” protests in July 2012. These are equivalently valid terms for these actors which not only depict and drive their actions, but also overlap considerably. Part of the purpose of this paper is to understand the entanglement of these ontological modes and categorizations in shaping and transforming federal science in Canada. If we are to take these actors seriously (and we should), then we must consider them as enacting a multitude of these categories in order to inspire productive and serious protest for what they believe to be an essential aspect of Canadian society and culture.

Part of a project of taking these scientists/protesters/citizens seriously is working towards an understanding of these actors as engaged in opposition to “undone science.” As a term used to describe research which is unfunded by elites (e.g. the government, industry), undone science is a theoretical tool that explicitly explores the power dynamics and institutional networks which set research agendas (Frickel et. al. 2010). Scientists, by holding not only a significant amount of epistemic authority but also through their own capacity to select research projects, often fall into the category of “elites.” This is not a rigid category, however, and federal scientists move freely between “elite” and “non-elite” based on their adherence to the political values of the ruling party. The mass rejection of these values by scientists for the sake of Canada’s normative democratic function (“evidence *for* democracy”) also functions as a means by which scientists become non-elites. Consequently, the protest against “undone science” has generated a tension between different ideals of the function and norms of federally managed scientific research. Scientists’ overwhelming rejection of the political as part of the norms of federal science constitutes one aspect of this tension (see section 3.2); in contrast, Canadian science policy views

scientists as public servants adherent to overarching government policies for scientific research, communication, and dissemination. Scientists are conceived of as public servants first; their duty to an external scientific ideal or community is considered negotiable.

These concerns have intersected significantly with environmentalist issues in Canada, as environmental research into areas such as the impact of natural resource production has endured the tension between differing ideals of federal science. One particular site of this tension has been the Experimental Lakes Area (ELA), a freshwater research institute in Northern Ontario, and my case study for this paper. Using the closure of the ELA as a pivotal signifier of the government's lack of interest in environmental research, the forms of protest which have emerged around the ELA and its transfer to a non-profit are particularly revelatory for the expected normative function of federal science. Several questions are raised here about the scientific community producing knowledge in government-run institutions: where are the boundaries drawn between scientist/civil servant/civilian, and by whom? How has the emerging activism changed both the government and scientists' perceptions of these boundaries? What constitutes as "political interference" for scientists in Canada? How have these issues impacted the legitimacy of environmental knowledge production, in particular?

1.2 Background

Some background on the current conflict is needed in order to understand these questions and situate them appropriately. In June 2012, the Canadian parliament passed Bill C-38, or the *Jobs, Growth, and Long-term Prosperity Act*, an omnibus budget bill with significant ramifications for

environmental research and assessment in Canada (Bill C-38 2012).¹ Protesters credit the bill with the closure of the Experimental Lakes Area, a reduction in environmental regulation and assessment, and for enacting into law a blatant disregard for scientific evidence and the environment. Environmental researchers Denis Kirchoff and Leonard J.S. Tsuji (2014) assert that this bill, alongside several others, downsized the government's public service and reduced or cut many of its environmental regulation and assessment policies. Public institutions such as the National Roundtable on the Economy and the Environment, which provided independent policy advice to the federal government, were eliminated, alongside the repeal of Canada's legislated commitment to the Kyoto Protocol (Kirchoff and Tsuji 2014). As biologists Jeffrey A. Hutchings and John R. Post (2013) have noted, Canada's *Fisheries Act* has been "gutted" as a result of C-38, alongside the *Navigable Waters Protection Act* (Hutchings and Post 2013; Winegardner et. al. 2015). Further, the length of time to conduct environmental review on new development projects was restricted, despite no concrete data indicating the length of environmental review processes (de Kerckhove et. al. 2012).

Further compounding the situation are growing restrictions on access to data and information. Federal research libraries have been closed down, including libraries belonging to Fisheries and Oceans Canada (DFO) and Environment Canada (Nikiforuk 2013; CAPAL 2014). Changes to the collection of census data from a long-form mandatory census to a "voluntary household survey" have further impeded the collection of statistically significant social information. In combination with drastic budget cuts to Statistics Canada, information about how the Canadian public is living and how the government is spending its money has become sparse

¹ Bill C-38 inspired significant comment from legal groups (Carpenter 2012; Doelle 2012; Powell 2012, 2013), newspapers (Wherry 2012), environmental organizations (David Suzuki Foundation 2012) and by environmental policy researchers (Gibson 2012). The government has addressed its impact on environmental assessment in a background paper published by the government's Industry, Infrastructure, and Resources Division of the

(Walton-Roberts et. al. 2014).² This has been accompanied by changes to the media and communications policy of the federal government, which have had significant ramifications for the communication of scientific activities to the media, the public, and the scientific community (PIPSC 2013, 2014; Environics 2013; Green 2013).

Opposition to these policy changes has generated a significant activist response. This opposition has emerged from a divisive understanding of how scientific research operates within the federal government among scientists, giving rise to not only the “Death of Evidence” protests described above, but also other forms of protest seeking to confront government science policies. Organizations such as the Coalition to Save the ELA, Evidence for Democracy, Unmuzzle Canada, and the Right to Know Project have organized protests, letter-writing campaigns, reports, and public talks aimed at promoting the role of science in Canada (Coalition to Save the ELA 2012; E4D 2014, 2015; PoE 2015). They have accused the Canadian government of holding an agenda of “wilful ignorance,” or what journalist Chris Turner has called *The War on Science: Muzzled Scientists and Wilful Blindness in Stephen Harper’s Canada* (2013). Opinion pieces in the *New York Times* have further described this as the “Closing of the Canadian Mind” and *Maclean’s* called it “Vanishing Canada” (Marche 2015; Kingston 2015). An open letter signed by scientists around the world argued against the “rapid decline in freedoms and funding extended to Canadian government scientists” and its attempt to “guarantee public ignorance” (PIPSC 2015). Support for scientific evidence has ranged further, including the emergence of working groups such as the Politics of Evidence at York University and a motion by the

² These cuts have had significant impact on all areas of Canadian life, and have additionally caused difficulties in acquiring fine grain data for my own research. The Statistics Canada reports on Federal Science Activities, in particular, have lost significant detail since 2012. The 58 pages and 48 tables depicting federal spending (which includes details on industry and university funding, among others) for 2012-2013 has diminished to 29 pages and 10 tables for 2014-2015, sacrificing much of the data as a result (Statistics Canada 2012, 2014).

Canadian Society for the History and Philosophy of Science that “endorses the principle of the federal scientists' freedom to communicate, and reaffirms the centrality of the ability of scientists to communicate for the advancement of science” (Canada Watch 2015; CSHPS n.d.). It is considered an attack not only on scientific research and its communities, but also as an affront to the Canadian public and its democracy.

The emergence of “wilful ignorance” has led federal scientists to characterize themselves as suddenly subject to ideological reasoning in the absence of scientific reasoning, produced by the Canadian government’s “governing in the dark”; their refusal to address environmental knowledge and climate change in decision making (Findlay 2014). Scientists have pitted themselves against politics and ideology, problematizing what roles a federal scientist is expected to fulfill. Emerging is a tension between different visions of federal science. The boundaries drawn reflect uncertainty in how federal scientific knowledge is produced and how it contributes/detracts from ideals of civil service and the scientific community. What is the role of expertise in government? Is a federal scientist beholden to the government first, or to the scientific community, or to the public? How are these bounded off from one another or conflated? The divergence in views displayed between the federal government and its scientists argues for different conceptions of what being a federal scientist in Canada means going forward.

The questions which I have asked are broad and far ranging, and their answers elusive. It is my intention, however, to articulate a possible interpretation of contemporary scientific activism in Canada. In doing so, I seek an understanding of how federal involvement in the production of scientific knowledge is bounded off based on the degree to which it is perceived as too political,

interfering with scientific expertise. So that these questions can be understood in a broader context, Section 1 of my paper deals with literature surrounding expertise, democracy, and governance in science and technology studies (STS), particularly with respect to climate change. My aim is to situate my discussion in the larger debates emerging in science and technology studies on the subject of expert knowledges in democracies, a growing area of study as issues surrounding climate change become more salient and contested. The latter half of this section motivates sociological theory in order to elucidate how scientific communities produce or do not produce theoretical knowledge when perceiving an outside threat, and how the specifics of the Canadian response have produced a form of “undone science.” Section 2 seeks to understand and situate the science activism in Canada. Here, I will focus on the nature of the tension between the scientists and federal government and what forms of protest have been motivated against the federal government by scientists. Of particular importance to this section is a discussion on how scientists perceive the role of politics and ideology in (not) producing environmental knowledge. Section 3 applies this and “undone science” from Section 1 in my case study of the ELA, where I outline its institutional relationship and history with the federal government. Using the ELA, I am to establish and elucidate the complexities and perceived benefits involved in federal funding. Ultimately, it is my intention to determine the how the current tension between federal scientists and the government functions or disrupts normative visions of the role science plays in federal institutions.

Chapter 2: Evidence for democracy

One of the many organizations which has emerged from the “Death of Evidence” protests is Evidence for Democracy, and it arguably has the largest presence. Founded by a group of scientists, the organization has run several campaigns seeking to both protest and reveal the issues facing federal scientists in Canada. The organization of a “network of experts” and expert panels, in addition to programs such as “Stand Up for Science” have asked scientists to actively get involved, whereas other research projects like “Can Scientists Speak?” and “True North, Smart + Free” have gathered significant information on science policy in Canada (E4D 2013a, 2013b, 2013c, 2015b; Magnuson-Ford & Gibbs 2014a; 2014b). They have promoted three main ideals for their organization’s vision: “Strong public policies, built on the best available evidence, for the health and prosperity of all Canadians”; “A thriving democracy where citizens are informed and engaged, and all levels of government are both transparent and accountable”; and, “A national culture that values science and evidence and the important role they play in our society” (E4D 2015a).³ As an organization which has based itself solely around speaking for science, they have managed to gather a significant amount of support from the scientific community. Their explicit focus on “evidence for democracy” has both mirrored and produced

³ The dynamic and changeable nature of website content means that E4D’s claims have not been static in their form or iteration. An earlier iteration of the website positioned them more explicitly in opposition to the government, describing themselves as: “A national, non-partisan, and not-for-profit organization, E4D formed out of concern over recent government cuts to important science institutions, and policies that restrict the flow of scientific information to the public. Governments can be tempted to make decisions based on ideology or political convenience unless the public loudly demands that decisions be based on evidence” (E4D 2014b). The current website makes no direct mention of this, and has instead created similar content on their 2015 project page, True North Smart + Free (2015). Other changes to the website are substantial, including changes to website content and presentation, in addition to accessibility. This includes the removal of a link to the files undergirding the *Can Scientists Speak?* study (2014a), reflecting a more concerted effort to make invisible the process by which results are achieved, emphasizing the final product over data which may be at risk for being interpreted differently; E4D’s activism is “on stage” here, to borrow from Stephen Hilgartner (2000).

much of the rhetoric surrounding scientists' arguments against the perceived corruption of federal science.

I see understanding this notion of “evidence for democracy” as helping to elucidate and analyze how scientific activism is being conducted in Canada. There is a large body of relevant literature in science and technology studies focused on how experts interact with non-experts, particularly in relation to democratic governance, which I see as pertinent to my discussion. Therefore, this section seeks to situate this notion of “evidence for democracy” within a larger theoretical discussion and debate on the subject of expertise, and in particular on the subject of expertise in climate science and science-driven climate policy. Here, I have mapped out two major strains of thought which have emerged in response to questions pertaining to the role and authority of experts in relation to climate change, focusing on the tension between the democratization of expertise and the protection of expertise. The debate on expertise reveals some of the tension in science and technology studies between practices of criticizing science and practices of protecting science from attack. I see this debate as essential to both understanding and writing about the scientist-activists in Canada; that is, to what extent should their expertise be protected and advocated for by myself, other science and technology scholars, the Canadian public, and the Canadian government? Further, does a valuation of them as experts potentially skew an understanding of them as engaging in activism for the sake of “undone science”?

2.1 The sham of modern democratic regimes

A central debate in contemporary discussions of expertise concerns the role of expertise in democracy. Not only have these discussions opened up issues about who counts as an expert and

why, but they also ask how their specific, authoritative knowledge impacts the alleged transparency and accountability of the democratic ideal (Wynne 1986; Collins and Evans 2002; Anderson 2011). This is fuelled by a recognized discomfort with the epistemic authority of scientific knowledge in some philosophical discussions which have noted that intellectual autonomy, indicating epistemic self-reliance, is a virtue that has been cultivated in North America (Zagzebski 2012). Consequently, by placing trust in experts to advise (ideally) democratically elected politicians, we are circumventing our own autonomy. Expertise is a “violation of the conditions of rough equality proposed by democratic accountability” and “‘ideology’ taken as fact,” turning “modern democratic regimes [into] shams” (Turner 2001, p. 123 and 127).

The dependence on expertise further decreases the ability of non-experts to interact with decision makers due to their lack of recognized authority. The authority of experts is sustained by the false image of “objectivity” which asserts a perspective removed from the messiness of being human (personal interests, biases, cultural and political intersections, etc.) (Daston 1992). In a society that privileges perspectives from nowhere and with governments that enact policies based on them, it is difficult to make room for other, partial perspectives, or “somewhere,” as Donna Haraway calls for in her essay on situated knowledge (Haraway 1988). Engagement only occurs through direct opposition, such as “War on Science,” which pits two constructed categories against one another: scientific experts and those who place their faith in them, and those who doubt science and purport pseudoscientific claims (Achenbach 2015; Welsh and Wynne 2013). As Mark Brown has noted, those who accept climate science are no more likely than those who reject it to critically assess assumptions they have taken on faith (Brown 2014). Instead, the legitimization of public discourse reflects an inability to acknowledge those who do

not adhere to the authority of science, as publics are alternatively considered as politicized and incipient threats, or “unruly publics,” often requiring state control (Welsh and Wynne 2013; de Saille 2015).

Fuelling much of the discussion concerning the role of the public and expertise in democratic governance is climate change. In particular, climate change debates have revealed a tension in conceptions of the role of STS in critiquing expertise. As Helga Nowotny has asserted, expertise is extremely vulnerable, in part due to its “transgressive” nature; expertise is not produced for the networks and practices it later inhabits. Rather, an experts’ audiences are “never solely experts” even the act of “speaking truth to power” (i.e. decision-makers) becomes complicated by concerns of transparency and accountability (2003). This vulnerability has implicated some STS research in risking reduced action on climate change and increased resistance to climate science through critique, as STS scholarship points to the breakdown of Mertonian norms of science upon which much of trust in science is placed. Concerns for the necessity of trust in science has further been fuelled by scandals such as ClimateGate (Leiserowitz et. al. 2013). Tension further arises with respect to how much input should be held by the potentially climate-change-denying public with respect to policy. It becomes a question of what Collins and Evans (2002) have described as “extending” expertise; who gets to sit at the table? Though their studies on expertise and experience privilege scientific expertise, others have taken up similar questions in dialogue with the notion of limiting expertise, asking questions of who gets to sit at the metaphorical table and the boundaries on expert deliberation and decision-making (Jasanoff 2003b; Welsh and Wynne 2013; de Saille 2015). Consequently, there is an existing tension in STS between democratizing science and protecting science (at the risk of assuming a dichotomy), epitomized by the debate on Collins and Evans’ notion of expertise in

their Third Wave of Science Studies and responses to it by Sheila Jasanoff and Brian Wynne (Collins and Evans 2002; Jasanoff 2003a; Wynne 2003; Durant 2011). Consequently, questions about the role of critique have emerged in STS, as many discussions of climate change have taken on the task of leveraging critique at pseudoscientific claims within the scientific community, bolstering “real” climate science (e.g. Oreskes and Conway 2010). In such cases, expertise remains unquestioned and the public is often conceptualized within the deficit model, requiring more scientific knowledge and education in order to trust science, or alternatively situated as radically anti-science and therefore irrational (Welsh and Wynne 2013). Concurrently, others have argued for a more concerted effort at bringing non-scientific viewpoints to weigh in on climate change decision-making, despite a concerted effort to argue that the knowledge and opinion of the “lay” public is poorly formed due to public distrust in science (Wynne 2006; Jasanoff 2003c; Lahsen 2005; Lawandowsky et. al.. 2013; McCright et. al.. 2013). Further, the global nature of climate change and how it has been conceptualized in areas such as the International Panel on Climate Change (IPCC) also have implications for the role of experts in democratic governance, implicated in part by questions of the continued existence of sovereign states (Miller 2004). Expertise is not static, however, nor is it restricted by political boundaries. It is constantly be re-negotiated in different contexts and scaling problems of expert deliberations to an international scale requires a different set of legitimation and rules for experts (Nowotny 2003).

The climate change debate has given rise to scholarship such as Robert Proctor and Londa Schiebinger’s notion of “agnotology,” or the active production of ignorance (2008). They argue that ignorance can be actively constructed rather than exist merely as an omission or gap requiring “better” science education and communication. Rather, industry has actively managed

to manipulate normative notions of scientific consensus to obscure scientific realities, or to “manufacture doubt” as Naomi Oreskes and Erik Conway describe it (Londa and Schiebinger 2008; Proctor 2008; Oreskes and Conway 2010).⁴ Their cases studies on the tobacco industry, DDT, climate change, and other scientific controversies are conducted in effort to highlight how industry has impacted the public perception of science, protecting science from criticism and attack rather than elaborate on the normative implications of doing so. For them, the difficulty with expertise in democratic decision-making is not the experts, but rather those who seek to undermine expertise by presuming to be experts. Other scholars in STS have argued against privileging ignorance as an explanatory factor for public dismissal of science, and instead argued for public resistance as a reflection of public perceptions of “dominant scientific and policy institutions” (Wynne 2001). Differing perceptions of non-experts in technoscientific decision-making have consequently generated a divide in science studies between contradictory perspectives on the role of non-experts and experts in technoscientific decision-making. These contradictory perspectives have focused on the role of the public, and specifically in their role in a democratic capacity: for example, arguments for the democratization of expertise, such as proposed by Elizabeth Anderson, call for the involvement of the public through “second-order reasoning,” or a lay assessment of expertise (Anderson 2011). This controversy has been particularly salient with respect to Harry Collins and Robert Evans “studies of expertise and

⁴ Though both Proctor and Schiebinger and Oreskes and Conway offer a useful reconceptualization of how scientific knowledge is produced, used, and undermined when corporate interests are involved, both risk upholding a normative view of science. Seeking to protect knowledge production from the active production of ignorance by corporate interests, Proctor emphasizes moving from ‘native states’ of ignorance towards scientific knowledge, a linear transition which leaves insufficient space for overlapping, alternative, and equally viable forms of knowledge (2010). Similarly, Oreskes and Conway have argued against science on the fringe, stating “there is simply accepted scientific knowledge” in effort to protect science against doubt mongering. In doing so, they actively obfuscate many of the political, economic, social, and institutional complexities of the political complexities involved in the non/production of scientific knowledge.

extension,” which has sought to provide a theory for limiting non-expert involvement in technoscientific decision-making. Their study, and the subsequent debate around limiting of expertise, is the subject of the following section. In so doing, I hope to illuminate the context in which pro-science advocacy has emerged in Canada, as how science studies has been conceptualizing expertise in the shadow of the climate change debate is central to understanding its emergence.

2.2 Crashing into the third wave

Collins and Evans’s “Third Wave of Science Studies” argues that the science studies discussion on expertise should move beyond the ‘Problem of Legitimacy’, or who counts as a legitimate expert and why, to the ‘Problem of Extension’, or how far expertise for technical decision-making should be extended (2002). This problem is predicated on the argument that the democratization of expertise has blurred the boundaries between experts and lay publics, rendering the value of (scientific) expert advice useless. Further, they assert that the descriptive nature of science studies prior to what they term the “Third Wave” and its project of deconstructing knowledge is not sufficient, claiming that “sociologists of scientific knowledge, *per se*, might also have a duty to make history as well as reflect on it” (2002). For Collins and Evans, science studies can and should take a role in the prescription of expertise and reconstruction of knowledge as part of their “Studies of Expertise and Experience” project, necessitating a normative theory of expertise compatible with normative theories of decision-making in science studies.

In responding to Collins and Evans, Jasanoff asserts that they hold an impoverished understanding of previous STS discussions on expertise, particularly with respect to Brian

Wynne's study on Cumbrian sheep farmers, which they use as a case study for their taxonomy of expertise (Collins and Evans 2002; Jasanoff 2003a; Wynne 1986). This taxonomy is one of the central theoretical tools provided by Collins and Evans, which identifies three different levels of expertise: "no expertise," "interactional expertise," and "contributory expertise." They consider "no expertise" to be a lack of ability to contribute or converse in an area of expertise, whereas at the opposite end of the spectrum is the ability to contribute to a pertinent scientific field in which an expert claims expertise is understood as "contributory expertise." Falling somewhere in between "no expertise" and "contributory expertise," "interactional expertise" is the ability to interact with experts and converse as an expertly about an area of expertise, but be unable to directly contribute to it. These delineations serve to justify Collins and Evans' argument for limiting public participation in technoscientific decision-making: those who lack contributory or interactional expertise should not be included and may be harmful to such in deliberations. For Collins and Evans, the voices of the public at the table is limited based on the degree to which they can offer valuable contributions within the existing framework, prioritizing scientific authority. As Collins and Evans have illustrated in their discussion of expertise and extension, in order for expertise to be granted to experience-based experts who lack scientific training, they must also become interactional experts in order to engage with scientists; the value of experience-based experts is restricted to their ability to speak the language of science (2002).

For Collins and Evans, limiting expertise is a preferred form of engagement between scientists and the public, as it places limits on pseudoscience and maintains the authority of science. While this solves the problem of limiting expertise in climate change debates so that the integrity of climate science is maintained, it lacks a nuanced understanding of the power

dynamics involved in expert advice and renews concerns about inequalities in technoscientific decision-making, particularly with respect to underrepresented publics.

2.3 The public as an “obstruction to public benefit”

Central to Collins and Evans’ justification of the limitation of expertise is the inherent assumption that knowledge contributed to technoscientific decision-making by non-experts is by its nature additive, rather than representing different perspectives and understandings of risk (Jasanoff 2003a). The public, in their role as non-experts, is viewed as an “obstruction to public benefit,” and public dissent of scientific authority is viewed as an anti-science sentiments originating in epistemic deficits, necessitating increased scientific education and communication science “public engagement model” (Marris 2015; Wynne 2006; Welsh and Wynne 2013). The anti-science, “unruly” public is consequently “disinvited” from engaging in technoscientific decision-making concerning risk and uncertainty, such as in cases of climate change; their responses are viewed as unwanted, unpredictable, and uninformed (de Saille 2015; Welsh and Wynne 2013). Criticism from Brian Wynne has built upon this point, arguing that Collins and Evans build their Problem of Extension on the assumption that “legitimate” experts are denied access to expert deliberation, rather than looking at “the institutional neglect of issues of public meaning, and the presumptive imposition of such meanings (and identities) on those publics and the public domain” (2003, p. 402).⁵

One attempt to remedy this approach to the public has come from the New Political Sociology of Science (NPSS). It aims elucidate social, political, institutional, and economic

⁵ I am not directly engaging in the literature surrounding “publics” here and as such have refrained from using the term. Still, that is not to say that the public exists as just one entity, but rather that the public is multiple, constituting many interests, opinions, factions, etc., many of which remain unacknowledged in political discourse.

complexities involved in the (non) production of knowledge, especially as it pertains to the imbalance of power between governments and corporations and civil organizations and social movements (Frickel and Moore 2006). It calls for a larger theoretical shift in STS towards looking at meso- and macro- sociological political institutions and organizations with respect to the distribution of inequalities and the manifestation of power in technoscience. It is particularly interested in inequalities represented in research agenda setting, which determine what expertise is used how and when. “Undone science” is a particular iteration of research agenda setting in which certain research areas have been unfunded and under researched, despite being valued by non-governmental areas of society (e.g. social movements) (Frickel et. al. 2010). In particular, “undone science” constitutes areas of research identified (and advocated for) by social movements and civil society organizations as having a “broad social benefit.” These areas are often left unfunded, incomplete, and ignored, a part of a larger politics of knowledge, with consequences for the use of expertise in democratic deliberation, especially federally funded expertise (Frickel et. al. 2010).

2.3.1 Situating undone science

As the major theoretical tool employed in this paper, this section necessarily situates Undone Science in the broader literature of the non-production of knowledge, or cases in which knowledge isn’t produced. Where the production of scientific knowledge was once considered impervious and isolated from the actions of policymakers outside of the lab, laboratories have since been proven to be permeable, with political decision-making impacting the production of knowledge. Studies seeking to understand the impact of social and political factors on the production of knowledge have also resulted in research on how and why knowledge isn’t

produced. The study of the non-production of knowledge loosely groups studies of ignorance, forbidden knowledge, non-knowledge, nescience, and all other studies which seek to understand what may be cordoned off by the production of knowledge and how and why such boundaries occur. It is a multifaceted discussion that has emerged especially in studies of risk and uncertainty in technoscientific decision-making, in addition to social movement studies and the intersection of politics and science. In the Canadian context, I argue that some form of the non-production of knowledge is occurring and consequently generating a growing science advocacy movement; this section seeks to situate “undone science” among other studies of the non-production of knowledge and assert its relevance for understanding how environmental knowledge is not being produced in Canada.

Scholarship on the ways in which knowledge is not produced are varied and multiple, offering different taxonomies for understanding the non-production of knowledge. Recent literature on the subject has sought to overturn static perceptions of knowledge production and actively works against the obscuration of the non-production of knowledge by normative conceptions of knowledge production (Gross 2007; Kempner et. al. 2011). By arguing that knowledge production is dynamic, rather than linear, the argument is made that understandings of the non-production of knowledge are essential to understanding the production of knowledge, and furthermore reveal complex institutional and organizational frameworks which impact knowledge production.

The non-production of knowledge as a topic of scholarly interest originates largely in studies of ‘ignorance,’ a topic which must necessarily co-exist alongside the production of knowledge. Discussions of ignorance have typically focused on the positive and productive nature of ignorance. Robert K. Merton, for instance, has argued for a “specified ignorance,” a

productive ignorance, rather than dysfunctional (1987). He described it as the identification of what is not yet known but what needs to be known in order to produce more knowledge, and which increases as new knowledge is produced (Merton 1987). Sociologist Matthias Gross has argued that ‘specified ignorance’ or ‘ignorance’ has at least two different meanings: ‘non-knowledge’, which takes into account what is not known for future planning and decision-making; and negative knowledge, or knowledge about what is not known but also considered unimportant, unnecessary, or dangerous, and not worthy of inquiry (2007). The latter terminology stems from Karin Knorr-Cetina’s ‘negative knowledge,’ which she conceptualizes as knowledge at the limits of knowing, actively considered as unimportant for further inquiry (1999). Building from Knorr-Cetina’s ‘negative knowledge’, sociologists Joanna Kempner, Jon F. Merz, and Charles L. Bosk (2011) have sought to understand the role of ‘forbidden knowledge’ in the production of knowledge. Unlike Knorr-Cetina’s ‘negative knowledge’, which is an area in which there is a concerted lack of interest, Kempner et. al.’s ‘forbidden knowledge’ highlights an avoidance and aversion to the production of certain types of knowledge which are considered “too sensitive, dangerous, or taboo to produce”; it designates explicitly normative limitations placed upon knowledge inquiry (2011). It is subversive, undermining the ‘sacral’, or normative structures of science and the idea that limits need to be minimal for the pursuit of knowledge; it also subverts the ‘practical,’ when inquiry “threatens powerful interests” (2011). Kempner et. al.’s concludes that scientists’ uphold the principle of the open pursuit of knowledge, even when faced with contradiction in practice through the necessary limitations of knowledge production by taboos which stem from various societal, political, institutional, and economic factors (2011). Normative ideals such as the open pursuit of knowledge have been upheld and subverted by the external and political restrictions placed upon federal research.

Though the normative ideals laid out by Kempner et. al. persist, there is clear evidence of a heightened awareness of how political power transforms how scientific research is conducted, rather than the continued implicit acceptance of it as normal; how environmental research “threatens powerful interests.” This has been recognized by the science advocacy movement in Canada, which, by acknowledging the politics and power in the governance of science in Canada, transforms the movement from being passively subject to forbidden knowledge to objecting to and protesting “undone science.”

“Undone science” is, in many ways, a foil of Kempner et. al.’s “forbidden knowledge.” Where “undone science” diverges from other forms of unfunded or incomplete knowledge is who and what holds the power and decision-making; for Frickel et. al., those with decision-making power includes elites, or those in the “institutional matrix of government, industries, and social movements” (2010). They argue that research agenda setting, for both private and public funding, has a tendency to be set by elites, produced with respect to their interests and cultural assumptions (Frickel et. al. 2010). As undone science seeks to prioritize how social movements and civil society organizations view the production of technoscientific knowledge in specific areas, often in contrast to how elites view the production of the same knowledge, undone science is conceptualized differently depending on the actors involved; undone science can be both negative knowledge and non-knowledge, depending on the perspective (Gross 2007).

By emphasizing institutional networks and power dynamics at play, “undone science” is a tool uniquely situated because it reflects many of the assertions made by science advocates with respect to federal environmental research in Canada as underfunded, causing risk to democratic institutions in addition to the environment and human health. By insisting upon the impartiality of expert knowledge and by placing limitations on non-expert participation, undone science has

the potential to generate significant democratic inequalities, stemming from a refusal to engage with the public in most parts of the deliberative process involving techoscientific decision-making. In particular, it is a refusal to consider the public as possessing second-order reasoning through which to hold government research agendas accountable (Anderson 2011). Consequently, in cases in which “undone science” occurs it risks exacerbating concerns already latent in the coproduction of expertise and democracy, particularly with respect to non-scientists and those who are typically maligned by governments. In the Canadian case, “undone science” is less a concern for research that has not yet been funded than research whose funding has been cut. Rather, Canada is in the process of *undoing* science, a constant and fluctuating series of decisions and events that have removed key resources for environmental research, and in doing so reduced the capacity of scientists to produce knowledge and affect change with respect to the environment. The ensuing pushback by various movements and organizations has revealed that environment science, like other aspects of society, is at risk of being ignored and so also requires advocacy.

2.4 Standing up for science

The above debate has highlighted a significant tension running through not just science and technology studies literature, but also environmental and climate science on the role of experts in relation to the public. Situating Evidence for Democracy and other science advocacy groups here positions them as part of the larger context of the climate change debate and contestations or denials of climate science in North America. In particular, classic perceptions of the public as risky science deniers are flipped, as the government begins to enact policies reflecting a reluctance to engage in environmental science and its implications for climate change policy.

Moreover, science advocates are protecting spaces of science, seeking to restore Canadian science to “science-as-we-knew-it,” arguing for increased funding and freedom for science (Rip 2009). This builds upon social science research which has shown that when scientists feel under threat, they emphasize the ideals that justify protecting these spaces regardless of the emergence of contradictory evidence, such as in the case of the open pursuit of knowledge, or an idealized “science as we knew it” (Kempner et. al. 2011).

The effort to protect science from outside, undue influence is the primary goal of groups such as Evidence for Democracy, resulting in the promotion of normative ideals. Given that an attack on science feels like an attack on the values of Canadian society, I interpret these groups as protecting values being destroyed by those in power who set the research agenda (Copeland 2015; Marche 2015). Despite their adherence to normative values of science, they cannot be discounted from being considered an active social movement or actively disadvantaged as a consequence of “undoing science”; as I noted earlier, there is a considerable cause to take scientists seriously as fulfilling a number of overlapping roles, including activists and citizens. The following section addresses how the pro-science organizations feel under attack, disempowered, and silenced, and motivate means of protest to draw attention to and change the status of science in Canada. In doing so, I argue that these activists are resisting “undone science” on a large scale; the divergent agendas and institutional powers between the government and federal scientists have set the stage for the movement.

Chapter 3: Federal scientists: A disconnect

Science advocacy groups, non-profit environmental and civil organizations, unions, and public advocacy groups have been primarily focused on what they perceive as a degeneration and politically-charged destruction of scientific integrity in Canada. Typified by an emergence of pro-science protests and advocacy movements, the growing science advocacy movement is geared towards changing how federal scientific research, particularly environmental research, is governed and used. Particularly concerned with changes enacted under the majority Conservative government and Prime Minister Stephen Harper since 2011, in addition to policy changes made as far back as 2006 when the government was first elected, the movement largely understands the changes to federal science policy as a consequence of political ideology infiltrating scientific research at the cost of good democratic decision-making (E4D 2014b). The government has reduced its own ability to produce knowledge and regulate the environment (Tupper de Kerchove 2013; Hutchings and Post 2013; Gibson 2012; Kirchoff and Tsuji 2014), despite insisting that science has been funded more under Prime Minister Stephen Harper than any previous government (Semeniuk 2015). Consequently, a marked tension between the perception of federal scientific research held by Canadian federal scientists advocates and that of the government has emerged; the former holding that federal science is a venture in basic research, free of politics and ideology, whereas the government perceives federal science and scientists as part of a larger apparatus of public servants who must adhere to the government's (political) messages and goals. Here I am depicting this tension as a slight oversimplification of the complex parties involved, forcing a dichotomy which holds the interests of a diverse collection of organizations and groups in opposition to government policy, which is not static in practice. Though there is certainly room for further research in this respect, for the purposes of my paper I

adhere to this dichotomy in order to emphasize the displacement felt by federal scientists who are accustomed to trusting the government to maintain a certain standard of practice for science.

3.1 Can scientists speak?

Media policy for federal scientists in various federal departments (including the DFO, Environment Canada, National Resources Canada, and National Research Council) has been central in shaping this rift, as discussed in a report on open government by the non-profit Democracy Watch in collaboration with the University of Victoria's Environmental Law Clinic. Using data released through a Freedom of Information request under the Access to Information Act, Democracy Watch argued that the federal government is "closing off access to government information by tightly controlling and monitoring the release of government information to the public" (Democracy Watch 2013, p. 22). In the case of Environment Canada, they noted that the department's first formal media relations policy, established in 2007 amongst a series of media policy changes in the federal government, held the stated rationale that "just as we have 'one department, one website' we should have 'one department, one voice'." There is a concerted effort to hide differences in perspective held by not only scientists, but other government employees, behind a stage curtain, with the end product a monolith "voice from nowhere" (Hilgartner 2000; Haraway 1988). Changes in other departments employing scientific expertise made similar changes. Fisheries and Oceans Canada (DFO), changed their revised policy to reflect a process in which communications staff are the first point of contact for media requests, especially with respect to "high profile" or "controversial" issues such as the oil and gas industry, aboriginal issues, and the seal and cod fisheries. Democracy Watch points to the censorship of Kristi Miller's salmon sockeye study for a period of several months as a

consequence of the DFO's policy, which extended to not allowing her to speak to a judicial inquiry ordered to study the decline of salmon in the Fraser River, the Cohen Commission (see also: Davison 2012). Instances such as this are indicative of both "indirect" and "direct" censorship, or muzzling, of federal scientists, where communications and media relations departments "now play a gatekeeping function and have the power to dictate whether or not federal servants will be permitted to respond to federal inquiries" (Democracy Watch 2013, p. 22). Ecologist David Schindler, a prominent environmental scientist, has said of this censorship that "They're feeding the public hogwash. And I think most people would accept that you can't run a democracy and make it function on a public informed with BS" (CBC 2014a).

Broken media policies aimed at reducing public understanding and interaction with scientists, especially environmental scientists, have also been analyzed by Evidence for Democracy in their study "Can Scientists Speak?" (Magnuson-Ford and Gibbs 2014a; 2014b). Using a metric for evaluating the communication of federal science designed by the Union for Concerned Scientists in the United States, Evidence for Democracy graded federal departments on openness, rights to free speech, "protection against political interference," and protection for whistleblowers in their scientific activities (Magnuson-Ford & Gibbs 2014a; 2014b). They determined the departments which conducted federal scientific research scored low on all the measures they were grading for, concluding that "government media policies do not support open and timely communication between scientists and journalists, nor do they protect scientists' right to free speech...[and] do not protect against political interference in science communication" (Magnuson-Ford and Gibbs 2014a, p. 3). "Political interference" implies any third party, especially one affiliated with the government, coming between a federal scientist and

the media.⁶ A concern for political interference prompted marine scientist Jeffrey Hutchings to declare that “we have somehow deemed it OK or permissible for an Iron Curtain to be drawn across the communication of science in this country” (Davison 2012). The analogy of Canada as undemocratic that has emerged in response to the reduction in environmental research and increase censorship. In a talk given for Evidence for Democracy, biologist C. Scott Findlay argued that “to repudiate evidence informed decision making is to govern in the dark. In fact, there are two darkneses—those who are governed, and the governors” (2014). Ragnar Elmgren, a limnologist, has further stated “This is the kind of act one expects from the Taliban in Afghanistan, not from the government of a civilized and educated nation” (Smith 2013).

The responses of various scientists and non-profit organizations to what they deem as “muzzling” reveals the tension inherent in how scientists are perceived in government contexts. It has led to the emergence of a growing science activism, as the implementation of federal science policy clashes with how federal scientists perceive their roles in the public sector. Arguing that the federal government seeks to reduce or eliminate the role of environmental science in federal policy making due to economic considerations, scientists have taken umbrage with communications and funding policies in Canada (Gibbs et. al. 2012; Frozen Out 2012; Death of Evidence 2012). Responses have ranged from protests to opinion articles in various news and academic journals, to science outreach campaigns and studies on science in Canada (e.g. E4D 2014b; Carpenter 2012). The number of activities and actors has grown in recent years, increasing criticisms of the government’s science policy and its negative impact on

⁶ The study evaluated this metric based on the following sub-criteria: “Does not require pre-approval for contact with the media; does not re-direct media requests to approved department spokesperson; No required clearance for interview questions; Does not require public affairs officials to sit in on interviews with scientists; Specifies that only scientists, or those with the necessary technical expertise, may edit the scientific content of agency communications” (Magnuson-Ford and Gibbs 2014a, p. 4).

democracy in Canada. The passage of the omnibus budget bill, Bill C-38, has had the most significant impact on the movement. Its cited closure of the Experimental Lakes Area, the focus of my case study, and budget cuts to basic research and research libraries, in addition to the elimination of the long-form census, were depicted as the “death of evidence” signalling that the Canadian government was “governing in the dark” (Walton-Roberts et. al., 2014; Dudley 2014; Findlay 2014). Chants for “no science, no truth, no evidence, no democracy” the “Death of Evidence” march and rally in Ottawa, have revealed an intrinsic association among science advocates and scientists for the role of “true” evidence in making democratic decision making (Death of Evidence 2012; Coalition 2012a, 2012b). Alongside an expressed discomfort at the necessity for scientists to become political, the intrusion of government policies into the “normal” practice of science was perceived as evident. Consequently, science advocates arguments for “ideology-free” scientific evidence as necessary to a well-functioning democracy is central to the tension held between the government and science advocates.

3.2 Science advocacy

The growing science advocacy movement in Canada is unique in its goals and ambitions for both the Canadian context and for scientists operating within social movements in North America overall. Though the movement rests on a long history of environmental activism in Canada, activism specifically oriented towards boosting the use of evidence in federal decision-making is a unique phenomenon. Advocacy for science in government typically expresses itself in the larger North American context through topical issues coordinated by organizations which do not refer more broadly to the use of science (e.g. environmental activism, nuclear-free advocacy, etc.). The emergence of a science advocacy and activism movement in Canada is consequently

atypical and difficult to categorize due to its unique position. Evidence for Democracy, for instance, organizes protests, campaigns, and position papers on federal policies in order to support the role of evidence in democratic decision-making complicates their designation as a “social movement.” Contrary to many social movements, their organizing principles are located around an appeal to existing (hegemonic) authorities: scientific knowledge and understanding. Concurrently, they also argue for the increased role of evidence in democratic decision-making, with little critical reflection on *how* scientific evidence contributes to decision-making in government, especially with respect to the social, political, and economic values latent in scientific knowledge. Instead, they predominately affect a top-down view of scientific knowledge, in which knowledge is disseminated to the public without consideration of how the knowledge is disseminated, such as in the “Can Scientists Speak?” study which prioritizes communications to journalists despite its stated goal of ensuring public understanding of federal research. Though reactionary against poor and obfuscating media policies, the study also reflects the “public understanding of science” model of communication which has endured significant criticism for its assumptions about the public as *tabula rasa* (Leach et. al. 2009; Irwin 2009; Irwin 2014).

As I have discussed above, Evidence for Democracy is composed of scientists who perceive themselves and their research as maligned, ignored, and misappropriated by the government, and in doing so they are acting citizens advocating for a special-interest for the benefit of society; for the purposes of my paper, they are a social movement. The difficulty emerges in the nature of their special-interest, which argues that for democratically, and though unsaid, morally, just decision-making, a reliance of evidence is necessary. As in my discussion earlier on the nature of epistemic authority, this is a convoluted issue, and the uncritical

acceptance of scientific knowledge carries its own set of issues. In particular, it is difficult to ignore that a significant amount of STS literature has been dedicated to focusing on the efforts of social movements (sometimes involving experts) to legitimize lay expertise and experience in response to the oppressive role of scientific authority in silencing lay publics (e.g. McCormick 2007; Epstein 1995; Wynne 1986). Recent work on social movements and science has focused on democratizing science movements and citizen science (McCormick 2009a, 2009b). Sabrina McCormick (2009b) has illustrated the complex nature of science movements in her comparative discussion between the Committee for Nuclear Information and the Campaign for Safe Cosmetics, tracking how over time lay people have become central to the production of scientific knowledge, with experts becoming less central to the purposes of the movement. Conversely, Kelly Moore has shown how science activism “unbounds” scientific authority from scientists, as shown in her analysis of social movements involving scientists in the United States in the postwar period. She argues that many other groups were then able to make successful claims in the name of science, a consequence of the declining authority of *scientists* themselves, though not a decline in the authority of *science* (Moore 2008, p. 190).

To what extent can these organizations be conceptualized as composed of “citizens,” “scientists,” or “citizen-scientists,” or in other ways which eliminate the dichotomy between citizen and scientist? Part of the work I am attempting to do with this paper is complicate this notions, but there is very little language emerging from groups such as E4D indicating their position as citizens. Rather, they place an emphasis on their roles as scientists and the impact of their scientific research upon citizens. Yet, it is hard to conceptualize E4D and other organizations as a social movement engaging in advocacy without conceptualizing them as citizens. STS has tracked how scientists often exist in a bounded-off space in which they are

removed from citizenship due to normative values which insist on bias-free production of knowledge (Gieryn 1999). Scientists involved in advocacy actively seek to distance themselves from what they perceive to be more politically orientated organizations (Kinchy and Kleinman 2003). As Scott Frickel has pointed out (2006), much of the work on social movements related to science has focused on “boundary making,” attempting to create a clear separation between politics and science, though boundary making and science activism are not mutually exclusive for him. Movements such as the 1970s radical science group *Science for the People*, however, have “disrupted” the boundary between science and politics (Moore 2008). As an organization, *Science for the People* provides a salient example of a radical science group which sought to actively engage with political issues, “politicizing” science. Though Moore (2008) asserts that its organizational structure and goals have never been widely replicated, their discussion of *Science for the People* provides a useful framework for thinking about how Evidence for Democracy is organized, and the implications for its willingness to politicize science. The politicization of science comes alongside a large number of essays exist which are directed at guiding scientists in advocacy and simultaneously engaging in boundary work that ensures that scientists don’t overstep their boundaries (e.g. Foote et. al. 2009; Karr 2006; Piekle 2002; Rice 2011).

For Canadian scientists, there is a stated reluctance to engage in political issues and explicitly “disrupt” the boundary between science and politics, as made evident in the emergence of a science movement that contravenes scientific norms of explicitly avoiding engagement in political issues. Kady O’Malley, a live blogger for the Canadian Broadcasting Corporation (CBC), noted of the Death of Evidence rally on twitter that “One gets the feeling that, for many of those in attendance, this is the first #rally they've ever felt the need to join” (O’Malley 2012). CBC’s The Fifth Estate documentary *Silence of the Labs* described the emergence of science

activism in Canada in similar terms, depicting it as “a wave of outrage arising in unlikely places, in the labs and classrooms of the country,” composed of “unlikely radicals protesting an unlikely cause; the sacrifice of scientific knowledge on the altar of political expediency” (2014a).

Atmospheric scientist Tom Duck declared in the same documentary that “

this is uncomfortable territory for any scientist to be in...we’re not used to making political arguments; we’re not even interested in [them]. But I think these circumstances require that we speak out—they require that we tell the public what’s going on. (2014a)

CBC’s depiction of marine mammal toxicologist Peter Ross holds similarities to Tom Duck’s approach to science and politics, asserting that Ross worked under the assumption that “science has no politics, no point of view. The facts owe loyalty to no one” (2014a). The rejection of both science and scientists as political marks a discomfort and dissonance held by Canadian scientists between the perception of science as a value-free, neutral activity, and the reality of scientific activities as laden with political and ideological intentions. More importantly, the movement has consequently been typified by a rejection of politics and a concerted attempt to hold science separate and distinct from it; it is science vs. politics.

In particular, science is conceived of as special and unique, subject to its own rules and codes, and simply operating within the federal context out of convenience; scientists are scientists first, and public sector employees second. Consequently, federal scientific research is thought of as above and apart from other federal activities by the nature of the expert knowledge conveyed by federal scientists (Mulkay 1976). The inability of some scientists to perceive themselves as working for the public in the same capacity as other public servants is complicated by the pre-existing tension between expertise and democracy. By holding themselves above and separate, scientists perpetuate what David Guston has called an “asymmetry of information

between those who would conduct research and those who would govern it” (Guston 2000, p. 17). Decision-makers are reliant on trust rather than their own epistemic autonomy as a means to access and value expert knowledge (Hardwig 1985; 1993). Alongside an expectation for an aperspectival, apolitical, “view from nowhere” and the realities of scientific practices, a dissonance is generated in how scientists, government, and the public expect federal research to be conducted.

3.3 Ideology at the lakes’ shore

The conflict between differing expectations of federal science is not limited to prohibitive media politics, but also extends to the federal funding for scientific, and especially environmental, research, where the process of undoing science has impacted research institutes such as the Experimental Lakes Area (ELA). It became the leading example of the destruction of fundamental environmental science for the science advocacy “Death of Evidence” protest in July 2012. Contending that ideology forced the closure of a world-class freshwater institute, protesters argued that the government’s insistence on its closure was an effort to silence the research conducted there, particularly as it pertained to the environmental and health effects of the oil sands in Alberta (Coalition 2012a, 2012b). Since then, various scientists have claimed that only federal research could conduct the long term research necessary to determine the effects of pollutants and other wastes on freshwater ecosystems; university, industry, and non-profit research were too tenuous, ideological, or focused on short term results to conduct the appropriate studies and maintain the institute (Galloway 2012). The reliance on federally run scientific institutions is premised on the assertion and maintenance of an apolitical ideal in the production of scientific knowledge in these laboratories and field stations. As with media

policies, the adherence to the apolitical ideal reveals distorted views in the operation of federal science between scientists and federal policymakers. Further, as Kempner et. al. (2011) have shown in their discussion of “forbidden knowledge,” scientific researchers tend to maintain the normative notion of science as truth-seeking in spite of internal political or socioeconomic goals which may restrict, limit, or reduce scientific research in a particular area. When the threat is external, though, these normative values are perceived to be under attack, and the ideals of an open science which is apolitical and seeks truth at all costs are threatened (Kempner et. al. 2011). In the Canadian context, federal policies conflicting with how scientists perceived the pursuit of knowledge is considered a threat to this normative ideal. Consequently, the emergence of federal science policy targeted at reducing or removing funding from these have been described as “ideological,” as opposed to reasoned or science-based, maintain Rip’s “protected spaces” for science (E4D 2014; Rip 2011). At play is a disconnect between what scientists perceive to be a contravention of scientific ideals and standards, and what the government perceives those to be.

I’d like to explore the disconnect between federal scientists and their governance as contributing to what Frickel et. al. (2010) have termed “undone science.” As a theoretical tool used to understand the social, economic, organizational, and political structures surrounding research agenda setting and funding, with particular emphasis on the (im)balances of power involved, it is a useful tool with respect to understanding the ELA. “Undone science” focuses particularly on research advocated for by civil and social organizations, but for various reasons, primarily related to power imbalances, remains unfunded. Though scientists obviously carry epistemic authority and power in Canada culturally and socially, the accusation of reduced funding for environmental research under the auspices of ideology has generated a funding climate which can potentially be understood more clearly through the employment of “undone

science” as a theoretical tool. Specifically, I will be focusing on the accusation that the Experimental Lakes Area lost its federal funding as an effort to eliminate data which would significantly slow or deter natural resource extraction due to risks to human health and the environment and with inherent consequences for democratic governance.

Chapter 4: Experimental lakes

The “Death of Evidence” rally and subsequent campaigning and protests against contemporary federal science policy featured a wide array of issues centred around the reduction or muzzling of environmental science in Canada. Consistently mentioned in this context, a figurehead for reduced environmental research funding, was the Experimental Lakes Area, hailed as a world-renowned freshwater institute at risk of closing for ideological reasons (Coalition 2012a, 2012b). Newspaper articles and opinion pieces leading up to and following the DoE rally argued for the ELA as a key site of climate research whose continuing success was central to the long-term funding and so-called “pure” science only available through federal funding (Galloway 2012). Couching the collapse of the ELA in terms of “pure” and “unpure” science, political and ideological vs. “unbiased” has revealed the normative lens through which the ELA is perceived. As discussed previously, the reactions by scientists to the threat of ELA closure reveal that scientific communities resort to the portrayal of scientific norms in the face of an external threat (Kempner et. al. 2011). This can further be seen by the rejection of the role of federal politics in the ELA despite an acknowledged history of the ELA in which it is a policy instrument as much as a research institute, operating under various bureaucratic norms as have been described by its initial director, David Schindler (2009).

In 2012, Bill C-38 set a budget which included the cutting the operational budget of the ELA in its entirety. Widely considered an attack upon science and evidence-based decision-making in Canada, science advocates emphasized the ELA as a site of ecological research essential to understanding the impacts of natural resource extraction and climate change on freshwater bodies, and consequently the environment and human health. Shortly before Bill C-38 was passed, the federal government indicated that it was considering a private or university

operator to take over the ELA, shutting it down if one could not be found (Hansard 2012). In the course of two years, the federal government initiated negotiations with a non-profit UN group, the International Institute for Sustainable Development (IISD), which took over the ELA in 2014. The transfer of the ELA prompted a series of protests from scientists who believed that non-profit research is susceptible to political influences, preventing proper apolitical research from being conducted. Opponents have argued that the ability of the ELA to conduct long-term studies was compromised, and that researchers would no longer have access to funds from the Research Council of Canada and affiliated bodies, as they would if they were at a federally run research centre or university, further reducing the ELA's resources. Assumptions have followed which argue that while non-profit research is politically biased, federal research can typically govern science well without politics; the current situation is aberrant (Galloway 2012; Orihel and Schindler 2012; Coalition n.d.). Initial opposition to the IISD has been contrasted with a wave of support and relief at the prospect of the continuation of the ELA and its research (CBC 2014b). It is evident that the federal government as a site of apolitical, unbiased, environmental research is essential for the image of science held by many science advocates, but that the production of scientific knowledge has also taken precedence among others. Questioning the legitimacy of a non-profit to conduct the research at the ELA has implications with respect to understanding the ecological research conducted at the ELA as "unfunded" or "undone," particularly as activists still perceive the federal government as potential source of good governance for science, providing that the politics is omitted.

The pro-science movement and its insistence on pitting science against politics has served to obscure the ELA's long history of policy recommendations for freshwater management in Canada and internationally, in addition to the political and institutional relationships influencing

and funding the research conducted. My purpose in illustrating the history of the ELA relative to the DFO here is not only to contextualize the ELA's proposed closure, but also to emphasize how normative processes in the production of knowledge have functioned to obscure this history from the current debate; as Kempner et. al. (2011) have shown, there are regular political occurrences preventing knowledge production which scientists more readily accept or filter through normative lenses. When, in 2012, the ELA was not the sole research and environmental program in a precarious position, the passivity of "forbidden knowledge" was no longer possible, as the ELA was caught up in the fight against the Death of Evidence. Consequently, what would have previously been understood as a normal process in science becomes a process of undoing environmental knowledge.

4.1 A brief history of the ELA

The Experimental Lakes Area was founded in 1968 at the Freshwater Institute (FWI) at the University of Manitoba. Its initial mandate was to study eutrophication in the Great Lakes, as requested in 1965 by a joint US and Canadian commission which sought to understand transboundary pollution in the area. At the time, it was run by the Fisheries Research Board (FRB), an institution with a long history of marine research composed of university scientists who both advised the scientific work at the ELA, among other research stations, as well as oversaw its operations. The FRB was organized as what policy historian Frances Anderson described as "an autonomous scientific institution" which was run by a board composed of representatives from universities, industry, and government, reporting directly to the minister in charge of fisheries (Anderson 1984). It described itself in terms of its ability to develop the whole field of fisheries research, and in doing so, doing what industry and university research

could not. A report released by the FRB in 1968, coinciding with the emergence of the ELA, describes the justification for the FRB as a federal organization at some length:

The sea is a common property resource whose non-proprietary users have no commercial incentive to invest in the husbandry of its wealth and potential. For this reason, and because of the fragmented nature of the industry, there is no real alternative to government sponsorship of fisheries research. Industry participation is limited to some product and equipment work by the larger companies. Universities do some basic research which varies according to staff interests. Provinces and International Commissions deal with stocks of certain species...However, the Fisheries Research Board of Canada is uniquely the agent in Canada which has both the responsibility and technical background to develop the whole field. (FRB 1968, p. 1)

Demonstrated here is an early commitment to the idea, later expressed during the closure of the ELA, that the federal government is the only institution capable of conducting fisheries research in a comprehensive manner. At the time, the FRB emphasized the development of the field of fisheries, rather than rather than a specific goal or project as outlined by a federal ministry.⁷ This emphasis changed in 1973, when the FRB's research institutes and its projects were placed under the Ministry of Fisheries, reducing the FRB to a solely advisory capacity. The stated rationale for the change was a refocusing of fisheries research priorities to reflect the mandates of the ministry. In the terms of the senior deputy minister at the time, the change was instigated "In order to be effective...the research programs could not be permitted to have separate objectives since...research (was) only an activity and not...an end in itself" (Anderson 1984, p. 152). This change marked the prioritization of explicit government objectives towards applied science, preceding a drastic funding shift towards applied research across federal science departments in the 1980s (Atkinson-Grosjean 2006).

⁷ The impact of the FRB on developing fisheries research is a topic to be explored at greater length elsewhere; however, it can certainly be said that the FRB oversaw research projects which had a significant impact on North American freshwater and pollution policies (e.g. the acid rain and eutrophication research conducted at the ELA).

Scientists were uneasy with the FRB's new direction at the Ministry of Fisheries. News media reporting on the subject depicted a concern emerging of the impact of government organizational structures on scientific work, incurring a potential loss of freedom. While counter-arguments proposed that the split of the FRB would remove "a conflict of interest that existed when the advisory board operated the research stations," others perceived the opposite effect (Balfour 1973). As Dr. J.M. Anderson, who oversaw various research stations for the FRB, notes: "...there was a buffer between scientific enterprise and the Government," arguing that the FRB's excellence was due to its protection from "the buffeting winds of politics by the 19-member board" (Balfour 1973). These structural changes had further consequences for the FRB, violating the terms of the *Fisheries Research Board Act* which had created the FRB. The act was subsequently repealed in 1979, shutting down the FRB. Former ELA director David Schindler described this as "what was unquestionably one of the biggest blunders in the history of Canadian environmental science...instead of answering to a panel of the country's most eminent scientists, we now reported to politicians and bureaucrats" (2009, p. 1841). As a consequence of the FRB closure, the ELA was sunsetted, slated to be closed and its financial resources allocated elsewhere. Schindler described the challenges faced by the ELA as a result of the incompatibility between the new management and fisheries scientists at the time, noting an inability to recognize the importance of eutrophication research by the government. Schindler's autobiographical history of the DFO is filled with the tension between the ELA and the DFO, elucidated by the anecdote that a "DFO middle manager accused [him] of inventing the acid rain problem to keep the ELA from being closed" (Schindler 2009, p. 1841).

One thing that is evident in the history of the ELA is both its long-term instability and its involvement with both government and industry. The years following the cessation of the FRB

saw the ELA on the brink of closure on several occasions, its funding frequently threatened. Projects from outside sources, such as the Alberta Oil Sands Environmental Research Project, sustained the ELA in the 1970s and past its proposed closure (Schindler 2009). Long term research projects throughout the 1970s and 1980s ensured its continuation, though a tension between government priorities and those of scientists continued. In 1996, the ELA was slated to close once more due to a lack of funding, resulting in the resignation of some scientists in protest (Stokstad 2008). Journalists argued in its defense, stating that the ELA was “the only agency of the [DFO] that hasn't been involved in fish losses and other ecological nightmares. In contrast to its disgraced oceanic peers, the Freshwater Institute has actually set North American standards and policy on acid rain, phosphates and global warming,” and in so doing “defend[ed] national interests” (Nikiforuk Dec 1995; July 1995). Funding for the ELA was eventually found, and an article in *Nature* from 2008 quoted the DFO’s regional director in charge of the Freshwater Institute as stating that the ELA was “not in the crosshairs” and has a secure position in the DFO (Stokstad 2008). Despite this, scientists have remarked on the depletion of funds available to support research at the ELA and a lack of replacement of its scientific and technical staff, many of whom had been working at the ELA since it was founded (Schindler 2009; Stokstad 2008).

The ELA’s history reveals that the tensions between the ELA’s governance and its research pre-date the current situation, marked by accusations such as David Schindler’s assertion in 1996 that the DFO was composed of “moronic bureaucratic MBA-types and junior scientists who wouldn’t know a good piece of science if it hit them in the head” (Nikiforuk July 1995). The perceived inability of policymakers and DFO management to understand the significance of scientific research being conducted at the DFO is understood as on par for the course, resulting

in a risk to scientific research and national interests. This discourse has been subsequently reflected in current debates about the ELA, its role in the research community, and its funding.

4.2 The DFO and the ELA

As described above, the DFO's initial relationship with the ELA occurred in a less-than-ideal climate, with some resistance from ELA scientists on the government's style of operational management. The DFO has since been the agency through which the ELA is funded, and has faced its own share of setbacks and difficulties with fisheries management and research. Several dramatic shifts in the organization's structure since 2011 have generated an increasing number of questions about the purpose of the department and its role in environmental research, assessment, and regulation. This is not assisted, as Schindler points out, by the fracturing of fisheries research between Environment Canada and the DFO, who both have different mandates, though there has been some attempt at collaboration since 2007 (Schindler 2009; Rosenberg and Paterson 2008). The status of environmental research as a necessary aspect for the function of the DFO in fulfilling its mandate has since been in question.

The uncertain role of environmental research at the DFO has had ramifications for the ELA, though its position in the DFO is nebulous and not clearly defined; this is not in the least due to its existence as a site of multiple interests. In particular, its ability to house researchers and projects with funding external to the department means that determining its yearly funding has been a difficult task. Further confounded by architecture changes in 2011, it is difficult to say for sure where the ELA is located at the DFO, though its closure was described as under the Habitat Management Program (DFO 2012c). For the most part, the DFO referred to the ELA as one of its main research stations, rather than as a program in and of itself requiring any funding

but that to cover operational costs. Consequently, an understanding of the structural changes undertaken by the DFO is essential to understanding the role of environmental science for the department, and the impact of other interests on its continuance. In particular, the degradation of government support for environmental research both monetarily and in terms of its expressed values is the subject of this section.

4.2.1 Missions, mandates, and visions of fisheries

The DFO's mandate has shifted recently, changing its focus away including scientific research and sustainable development in order emphasize the economic role that the DFO plays, in addition to its role in national security through its management of the Canadian Coast Guard. The pivotal point for these changes is 2011, as evidenced in the DFO's annual *Report on Plan and Priorities 2011-2012*. 2011 was the beginning of a shift in how the DFO was not only organized, but also how it perceived its organizational purpose and mandate. For instance, the DFO ceased referring to their goals as part of a "mandate" and instead substituted "mission." Concurrently, the stated "vision" of the department has changed. Though the changes are subtle, they mark a significant shift in outlook on the role of the DFO and science in environmental research, as seen in changes made to the *Reports on Plans and Priorities* from 2006-2015:

2006-2011:

Mandate: "...DFO is responsible for developing and implementing policies and programs in support of Canada's scientific, ecological, social, and economic interests in oceans and fresh waters."

"Our Vision": "Excellence in service to Canadians to ensure the sustainable development and safe use of Canadian waters."

2011-2016:

“Our Vision”: “To advance sustainable aquatic ecosystems and support safe and secure Canadian waters while fostering economic prosperity across maritime sectors and fisheries.

“Our Mission”: Through sound science, forward-looking policy, and operational and service excellence, DFO [Fisheries and Oceans Canada] employees work collaboratively toward the following strategic outcomes: Economically Prosperous Maritime Sectors and Fisheries; Sustainable Aquatic Ecosystems; and Safe and Secure Waters.

(DFO 2006, 2007, 2008, 2009, 2010a, 2011a, 2012a, 2013a, 2014a, 2015)

As can be seen above, the “vision” of the DFO has shifted significant from highlighting serving Canadians by promoting “sustainable development,” to refocusing on economic prosperity. Similarly, the stated mandate of the DFO is replaced by the more loosely conceptualized “mission” which, though it employs the terminology “sound science” misses on the mandate’s previous insistence on ecological, social, scientific, and economic interests for the sake of Canadians. Marking a neoliberal shift, these changes eschew the department’s previous reference to itself as “decentralized” in favour of emphasizing its organizational structure. Further, references to Aboriginal and Inuit peoples and their stated interests in Canada’s waters diminishes and then disappears, alongside an increase in references of and reports on risk.

The change in mandate has been reflected in a shift in project organization and funding allocation for the DFO. Amidst massive budget cuts to many federal departments, the budget cuts to the DFO have not been significant relative to other departments (Statistics Canada 2012, 2014). Despite this, many of the DFO programs focused on environmental research and operations have either shifted focus or been closed due to insufficient funds. The program’s architecture and Strategic Outcomes (SO), which outline the purpose of various projects and sub-projects, have also undergone a significant restructuring since 2011:

Strategic Outcomes (SO):

Pre-2011:

- Sustainable Fisheries and Aquaculture (SFA)
- Healthy and Productive Aquatic Ecosystems (HPAE)
- Safe and Accessible Waterways (SAW)

2011-present:

- Economically Prosperous Maritime Sectors and Fisheries (EPMSF)
- Sustainable Aquatic Ecosystems (SAE)
- Safe and Secure Waters (SSW)

(DFO 2006, 2007, 2008, 2009, 2010a, 2011a, 2012a, 2013a, 2014a, 2015)

The two of the three preceding SO's, "Sustainable Fisheries and Aquaculture" (SFA) and "Healthy and Productive Aquatic Ecosystems" (HPAE), changed significantly, with "Economically Prosperous Maritime Sectors and Fisheries" (EPMSF) added "Sustainable Aquatic Ecosystems" (SAE), substituting for "Sustainable Fisheries and Aquaculture" (DFO 2011a). The third SO, "Safe and Accessible Waterways" also underwent a slight rhetorical shift, moving to "Safe and Secure Waters" and reflecting a new emphasis on national security. The third, though less important for the purposes of my discussion, absorbed some of the programs previously under HPAE (ocean forecasting), while some of its programs were redistributed under predominately under EPMSF. Significantly, the program "Science for Safe and Accessible Waterways" was transformed into two disparate programs: "Hydroponic Products and Services" and "Territorial Delineation," displaying the tendency towards applied science and a growing preference for the ideals of security and economy in favour of other values. Though the changes made to the operation of the SO Safe and Secure Waters were significant, the greatest changes were to the programs previous under HPAE and SFA. The changes were quite lengthy,

and resulted in the “sunsetting” or outright closure of several programs targeted towards habitat management: for instance, the Aboriginal Inland Habitat Program. The impact of the new SOs and their funding structures were also felt, as programs such as the Salmonid Enhancement Program moved from the SAE to the EPMSF in 2012, resulting in a shift in its focus (see Appendix 1 for a summary of changes to programs).

4.2.2 Closure of the ELA and the IISD

DFO funding has also changed in the past few years to reflect an emphasis on economics. Many programs have changed their stated goals, whereas others have borne the brunt of the funding cuts. Though it has been difficult to track the exact position of the ELA in relation to the department’s organizational architecture, its closure was marked on a budgetary line in 2012 under the Habitat Management Program (DFO 2012c). When asked to justify the closure in parliament, Randy Kamp, a Conservative Minister of Parliament stated:

Mr. Speaker, I want to assure the member that the Department of Fisheries and Oceans will continue to support freshwater research across Canada. That is why, for example, we invested in the Lake Simcoe cleanup fund of \$30 million in 2008. We are making very good progress using that money.

While we think that this facility would be better run by an academic private facility, we are going to continue to invest in clean water in our lakes. We are looking forward to facilitating a transfer from this particular facility to a private organization. (Hansard 2012).

Stated here is contradiction in the value of the ELA to the federal government relative to its commitment to continue funding it. Implied is the suggestion that by seeking the continuance of the ELA under a private organization, the ELA should be able to provide the same value to the federal government as it did previously. However, the process of closing the ELA began in June 2012 with the passage of Bill C-38, without the confirmation, let alone the public

announcement, of the government's desire to seek out a private buyer, indicating that the value of the research conducted at the ELA was negligible to the government. This led to the allegation that the federal government was conducting "secret negotiations" on the future of the facility (Peesker 2012).

The ELA was eventually provided interim funding by the provincial governments of Ontario and Manitoba throughout 2013, before it was taken over entirely in 2014 by the International Institute for Sustainable Development. Late in 2014, the ELA gained charitable status. Its new website under the IISD includes a brochure advertising the research conducted at the ELA, arguing for it as a center of "high-impact science," an "unparalleled resource for critical evaluations of the ongoing changes to our planet" (IISD 2014). Though many scientists and activists celebrated the renewed funding of the ELA, alongside came the criticism that funding and operations drawn from non-government resources weakened the scientific credibility of the ELA (CBC 2014a; Galloway 2012). Asserting that environmental research is particularly susceptible to being skewed, ecologist Carol Kelly argued that the IISD's emphasis on policy is "not the same as doing unbiased science where the results are just the results." A former chief scientist of the ELA, John Rudd, stated that though the science would be pure if the people at the ELA remained the same, one had to "appear to be clean." He further asserted that the prevention of findings from being made public would be "abhorrent" (Galloway 2012). Further concerns have been expressed that the funding would be insufficient, especially as researchers could no longer rely on federal funding and are unable to acquire many research grants due to their lack of university position (Orihel and Schindler 2014). In particular, there is a concern that it would necessitate private deals with oil companies which would prevent the release of the results to the public (Galloway 2012). Others have argued that the IISD will have

difficulty running the longitudinal studies that are essential to freshwater research at the ELA due to potential funding instability (Coalition n.d.).

These concerns for “pure” science and the susceptibility of the ELA to undue influence from industry reflect the same promotion of the ideals of science promoted by the pro-science activists previously. For them, the federal government and its perceived historical tendencies towards transparency and accountability to the public has been circumscribed in favour of potentially “closed” science. Further questions emerge: who is now setting the research agenda? Non-profit institutions have been shown to subscribe to the authority of scientists in environmental debates and discussions: that is, the authority and legitimacy of scientists has not been reduced, though the contexts of this authority have been renegotiated (Eden et. al. 2006). It is unclear, however, how the shift from federal to non-profit governance will impact how research is conducted and which research projects are selected.

Chapter 5: Conclusion: Undoing environmental knowledge

At first glance, it seems unusual to use a theoretical tool such as “undone science” to describe the contemporary pro-science movement in Canada. As mentioned previously, both science and scientists carry significant weight and authority in non-scientific contexts: they are often those who hold the ability to direct research, either through a direct selection of research topics or through scientific advice to government. By taking this situation as one which is representative of tensions particularly to *environmental* science, however, the discussion changes. Environmental scientists in North America have been undermined for decades by divergent interests (Oreskes and Conway 2010). In the past decade in Canada, their work has been undercut at every turn, whether through changes in funding and research priorities or through changes in media policies preventing the communication of environmental science (Democracy Watch 2013; PIPSC 2013, 2014). This has given rise to protest in the name of science’s place in a democratic government, arguing for science for the sake of the public. Though these protests are certainly a case of Rip’s (2011) protecting scientific spaces in their request for more money and freedom, they are also a protest against what scientists perceive to be the Canadian government’s wilful inattention to environmental science, with repercussions for the health and environment of all Canadians. It is understood as not only destabilizing the place of scientists, but that of knowledge within Canada (Marche 2015; Buranyi 2015; Kingston 2015). It is a site of on-going protest, in which not only scientists are at risk.

The ELA has been a focus of much of the discussion surrounding Canadian science. It was one of the key institutions mentioned and protested for during the Death of Evidence protests in 2012, spearheaded by organizations like the Coalition to Save the ELA. Its trajectory, from funded by the federal government to funded by a non-profit institution with no accountability or

transparency owed to the Canadian public marks the increased obfuscation of scientific knowledge in Canada. Accompanying these changes has been a concern for the future of research conducted at the ELA: who gets to set its agenda? And what consequence does that have for the quality of scientific knowledge produced and its ability to remain unquestioned in climate policy debates?

There has been a growing sense in which scientists feel as though they do their work for the sake of the public, representing them in the laboratory as federal scientists. With the place of knowledge in the federal government depicted as having been fundamentally changed under the Conservative government and its Prime Minister, Stephen Harper since 2006, there is a stated understanding that scientific knowledge's new place, closed off and serving solely the economy, does not serve the Canadian public.

It is clear that something is being “undone” here: science is not functioning as it once did in Canada, nor as it has been advocated for by pro-science activists. Federal research agendas and decision-making processes have circumscribed the ability of environmental scientists to contribute to both federal knowledge and decisions, but instead of opening up the process to diverse and multiple perspectives, as has been advocated for in some areas of science and technology studies, it has been further closed to those who do not adhere to party lines. It is in this sense that Canadian environmental knowledge can perhaps be understood as “undone.” Though I do not seek to protect scientific knowledge from scrutiny, the use of government power to eliminate environmental knowledge from federal planning alongside an attempt to unify government positions, erasing diverse perspectives, is a step in a direction very far from the democratization of science and inclusion of “unruly publics” (PIPSC 2013, 2014).

I have endeavoured in this paper to understand how scientific communities are responding to substantial changes in how environmental knowledge is governed in Canada. In doing so, I have argued that scientists are protecting scientific spaces alongside arguing for accountability and transparency to the public. In particular, I have looked at the DFO and the ELA where the argument for federal scientific research as the best for the public has played out. In doing so, I have given rise to a number of questions and potential avenues for future research on environmental knowledge. For instance: to what extent does environmental knowledge differ from other forms of scientific knowledge in its stated ideals, especially as it pertains to the public? How can we reconcile the desire to protect environmental knowledge from destabilizing scrutiny and yet still be critical, allowing for non-scientific and non-expert voices to be heard? What impact do social movements have on research agendas? How does the appeal to evidence-based democratic decision-making function on an international level? How does it transform itself in non-profit and industry environments?

Some of these questions have been answered in part by my paper, and largely by other scholarship in the fields of science and technology studies and environmental studies. As environmental knowledge continues to grow in relevance to governing institutions, non-profits, social movements, and the everyday lives of individuals, these are essential questions to continue asking.

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Appendices

Appendix A

Significant Changes made to projects, sub-projects, and programs at the Department of Fisheries and Oceans/Fisheries and Oceans Canada from 2011-2014:

Eliminated projects

Between 2011-2012 and 2012-2013:

- Funding for the “Aboriginal Inland Habitat Program” ceased after 2011-12 as consequence of a project review.
- Under “Aboriginal Strategies and Governance” Project
 - Atlantic Integrated Commercial Fisheries Initiative
 - Pacific Integrated Commercial Fisheries Initiative
 - Aboriginal Funds for Species at Risk

Between 2012-2013 and 2013-2014:

- Habitat Management (including the ELA)
- Under the “Sustainable Aquaculture Program”
 - Aquaculture Regulatory Reform
 - Aquaculture Innovation and Market Access Program
 - Aquaculture Certification and Sustainability Reporting
 - Aquaculture Regulatory Science Program

Added projects

Between 2012-2013 and 2013-2014:

- Aquaculture Management
- Climate Change Adaptation Program
- Intelligence Services
- Fisheries Protection

Projects moved to a different Strategic Outcome:

Between 2011-2012 and 2012-2013:

- The “Salmonid Enhancement Program” and its sub-projects “Salmonid Enhancement Operations” and “Salmonid Enhancement Contributions” were moved from the “Sustainable Aquatic Ecosystems” strategic outcome to “Economically Prosperous Maritime Sectors and Fisheries”