

## Hydro Democracy: Water Power and Political Power in Ontario

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Article abstract

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## Research Note

**Hydro Democracy: Water Power and Political Power in Ontario**

Daniel Macfarlane and Andrew Watson

**Abstract:** *Drawing on Timothy Mitchell's Carbon Democracy, and using envirotechnical analysis, we probe how the materiality of energy—public hydropower—influenced democracy and governance in Ontario during the early twentieth century. Within Canada, hydro-electricity disproportionately shaped the politics of Ontario and Canada-US relations during the first half of the century. Within the province, it provided the energy-based affluence that underpinned claims for a liberal and democratic society. But residents experienced the consequences of hydropower unevenly. Urban and industrial residents enjoyed most of the benefits, while rural residents and Indigenous peoples living close to hydro developments endured the burdens of development.*

**Résumé :** *En s'appuyant sur « Carbon Democracy » de Timothy Mitchell et en utilisant un cadre d'analyse envirotechnique, nous examinons comment la matérialité de l'énergie – hydroélectricité publique – a influencé la démocratie et la gouvernance en Ontario au début du XXe siècle. Au Canada, l'hydroélectricité a influencé de façon démesurée la politique de l'Ontario et les relations canado-américaines au cours de la première moitié du siècle. Au sein de la province, elle a fourni la richesse basée sur l'énergie qui sous-tendait les revendications pour une société libérale et démocratique. Mais les résidents de l'Ontario ont subi les conséquences du développement hydroélectrique de manière inégale. Les résidents urbains et industriels ont profité de la plupart des avantages, tandis que les résidents ruraux et les peuples autochtones vivant à proximité des complexes hydroélectriques ont enduré le fardeau du développement.*

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**Keywords:** Hydro-electricity, Ontario, energy, Timothy Mitchell, hydro democracy

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DURING THE TWENTIETH CENTURY, the flow of hydro-electric power shaped the trajectory of Ontario's polity.<sup>1</sup> Our intention in this piece is, as energy and environmental historians of Ontario, to draw from Timothy Mitchell's "carbon democracy" concept in order to assess the Ontario hydro-electric context, and in particular the emergence of a public-power movement and the creation of the public-power utility, Ontario Hydro. Transformed into sources of electric-power generation, several of the Province of Ontario's largest rivers became sites of a new manifestation and scale of power: hydro democracy.<sup>2</sup>

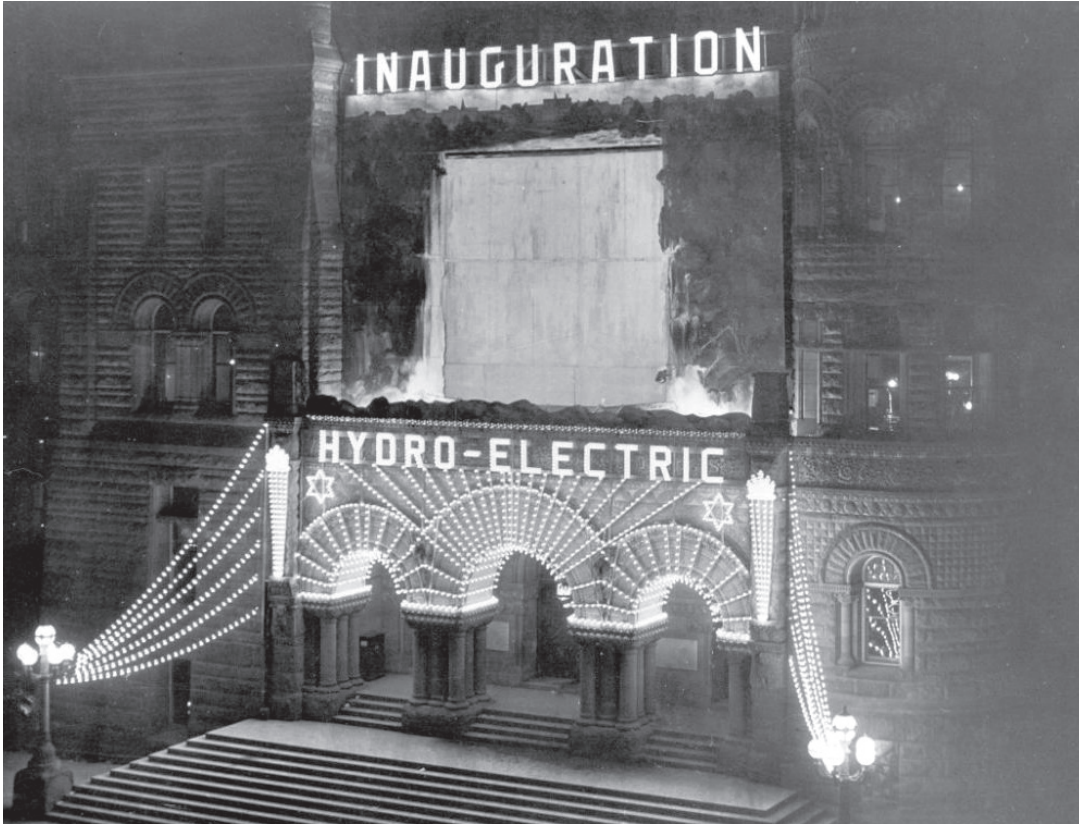
Timothy Mitchell's *Carbon Democracy*, first published in 2011, made an immediate impact, and for good reason. Without providing all the answers, the book posed important questions. Mitchell contends that the materiality of energy systems has had a profound impact on politics and governance. More specifically, Mitchell claims that his revisionist, socio-technical history of carbon

energy helps explain the history of modern democracy, where democracy “can refer to making effective claims for a more just and egalitarian world. Or ... a mode of governing populations that employs popular consent as a means of limiting claims for greater equality and justice by dividing up the common world.”<sup>3</sup>

According to Mitchell, the ways we access energy substantially shape our governing structures. During the late nineteenth and early twentieth centuries, coal was a catalyst for shifting forms of democracy. Sites of extraction and supply existed below the surface of the Earth, where unions exercised political agency to make democratic claims through their control of the mine environment. Along with oil, coal broke the ecological constraints of an organic-energy economy and allowed for the belief in unlimited economic growth. Unlike coal, however, the spatial and material aspects of oil lent themselves to less democratic and more elite control. The world’s largest oil supplies were situated great distances from consumers, and oil’s fluid properties required less labour at all stages of production, transportation, and refining. Relative to coal, oil did not require as many concessions to workers and collective social principles. Oil companies justified their control of the networks of power by convincing their home nations that carbon-energy production was an issue of “national security” and in the “public interest.”<sup>4</sup> Oil companies created scarcity by restricting production, thereby driving up prices, but only succeeded by securing overseas military protection and generous domestic subsidies. Turned into a critical energy resource during the first half of the twentieth century, the quest to secure oil demanded “imperial” actions by Western governments.<sup>5</sup> *Carbon Democracy* demonstrates that twentieth-century modes of popular governance, including the concept of “the economy” and the manufactured anxiety of the 1970s Energy Crisis, arose in response to, and were made possible by, the new political economy of carbon energy.

By foregrounding the centrality of energy to the emergence of the modern political and international system, Mitchell deftly demonstrates the ways that technology, energy, and materiality structured the historical evolution of contemporary social-democratic politics. However, Mitchell deploys “democracy” in ambiguous ways and, compared to his analysis of coal, deals rather lightly with the materialist links between oil production/consumption and democracy. It might be more accurate to summarize the book’s argument by stating that oil profoundly shaped the politics and economics of countries that happened to be democracies (i.e., western powers like the United States, Britain, France, and Germany), while inhibiting democratic development in Middle Eastern and South American oil-producing countries. Nonetheless, the notion that the materiality of energy had (and continues to have) a determinative effect on political structures makes Mitchell’s concept of carbon democracy persuasive.

Mitchell’s emphasis on the relationship between energy infrastructure and politics, however, tends to obscure the important ecological facets of fossil fuels. Energy infrastructures, including both hydropower and fossil fuels,



*Figure 1. Inauguration of Ontario Hydro at Toronto city hall, 1911. City of Toronto Archives.*

involved elaborate reorganizations of natural systems, which influenced the governance of the countries that developed and shared them. We argue that the term “envirotechnical” is a more accurate term than “socio-technical” to describe the relationship between the material realities of energy and political economies. Canada in the twenty-first century has been labeled a “petro state.”<sup>6</sup> However, since hydropower rivalled the mineral energy of fossil fuels, we argue that Canada, and central Canada in particular, was first a “hydro state.” Between the 1920s and the 1960s, hydro-electricity was arguably Canada’s, and Ontario’s, most important domestically-produced energy source, because of its disproportionate sway over democratic politics and the political imaginary.<sup>7</sup>

This essay is admittedly an impressionistic experiment, a think piece of sorts, to probe the potential impact of energy in Ontario history. We argue that hydropower enhanced democracy in the Province of Ontario in certain ways, both tangible and symbolic, while undermining or negating it in other ways. In Ontario, public hydropower provided the energy-based affluence that informed certain aspects of participation in liberal-democratic society. Hydro-electricity helped create the platform for social democratic governance, which enjoyed the consent of the population for interventionist policies that claimed to fairly, and liberally, apportion the state’s resources.<sup>8</sup> To invoke Mitchell’s definition of democracy, hydropower enhanced Ontarians’ claims to a more

just and egalitarian society. The populace often did not realize such promises and hopes of liberal and democratic benefits, or did so unequally, particularly as Ontario Hydro frequently tilted toward autocratic management. Nonetheless, a unique hydro nationalism developed in Ontario and Canada, which, when combined with the fact that most of Ontario's early hydropower came from the international border with the United States, initiated a new type of energy diplomacy that had profound implications for the Canadian-US relationship and, in turn, domestic democracy and political economy.<sup>9</sup> But the material realities of working with water and electricity, as we will show, also denied democratic opportunities. As the technological and spatial scale of hydro-electric projects increased, hydro democracy limited the rights and claims of those situated closest to hydro developments (particularly First Nations) ostensibly in the name of the wider public interest.

### Hydro-Electricity in Ontario

The magnitude of the impact of modern energy forms, including hydropower, reflect the scale of the complex envirotechnical systems that structure production, distribution, and consumption. The production of hydro-electricity is a material transformation: the energy of falling water, stored by dams and redirected through turbines, is converted into electrical power that is distributed through transmission lines. Energy scholars have separated energy regimes into “stocks” and “flows,” with the latter generally consisting of “organic” energy—e.g., wood, water, and human/animal muscle power—and the former (coal, petroleum, electricity) consisting of “mineral” energy forms.<sup>10</sup>

Unlike carbon sources of energy such as coal and petroleum, which are non-renewable stocks of fossil fuels, societies harness the renewable flows of hydropower contained in rivers and transforms them into electricity.<sup>11</sup> Owing to spatiotemporal realities, flowing water produces power that must be used on-demand and at a scale that justifies the construction and maintenance of the system designed to convert and deliver that power as electricity.<sup>12</sup> All other carbon-based fuels can be removed from their place of origin and then burned and utilized at a desired location.<sup>13</sup> But hydro-electricity is generated at the site of falling water, and the resulting electricity is transported if and where transmission lines make that possible (granted, hydropower generally is not exposed to the same supply problems as fossil fuels). During the first half of the twentieth century, water volumes and flow rates capped the amount of energy that could be produced by any particular hydro station, though the spread of massive electricity grids effectively removed these limits over large swaths of North America. Since hydropower involves both water and electricity, we contend that it is a hybrid form of energy regime: it is both flow and stock, both mineral and organic.<sup>14</sup>

Historically, Canada is a hydro pioneer and leader, with Ontario as the provincial pioneer.<sup>15</sup> In Canada, the provinces have the primary responsibility

for hydro-electric generation and regulation, with federal jurisdiction invoked under certain circumstances.<sup>16</sup> Dozens of hydro-electric generating stations appeared prior to the end of the nineteenth century. By 1886, there were 45 water-powered electric plants operating in the United States and Canada. The earliest major Ontario plants tended to be on or near border waters, such as at Niagara Falls, the cradle of large hydro-electric development and distribution. Importantly, these early plants were privately funded, although almost all were eventually taken over by the Hydro-Electric Power Commission of Ontario (HEPCO), or Ontario Hydro.

In the first decade of the twentieth century, the rise of Ontario Hydro, the source of the “people’s power” as the company’s slogan claimed, was a distinct development in North American energy history. Created in 1906, after much political debate and posturing, HEPCO became operational in 1910 (though only as a distributor of electricity at first), and was dismantled in 1999. This quasi-crown corporation relied on the rhetoric of “fairness” by sending cheap electricity—“power at cost” in the rhetoric of the time—to the underdeveloped middle class and small manufacturers, rather than rich industrialists in Toronto and across the border in the United States. As *Saturday Night* magazine put it in 1902, HEPCO championed “popular rights as opposed to monopolistic privilege.”<sup>17</sup> From the beginning, the discourse about and rationale for this public power utility centred around its ability to provide cheap and accessible electricity. In the words of official HEPCO historian Merrill Denison, this energy “had to be readily available wherever it was needed, freed from the limits imposed by self-interest and caution of the capitalist concerns which controlled most of Canada’s electricity power development.”<sup>18</sup> This cheapness facilitated a growth economy that at first promised Ontarians industrial growth and networked services, including lighting and streetcars, and then increasingly after 1945 offered the modern individual comforts and conveniences made possible, and sustained by, abundant energy.

As of 1920, hydro represented 97% of the electricity produced in Canada, and 20% in the United States. By the 1940s, hydro was still responsible for about 90% of the electricity generated in Canada.<sup>19</sup> At the mid-point of the twentieth century, a major turning point in the history of Canada’s energy transition to a mineral-energy economy, hydro produced 87 billion kwh, and the United States 50 billion kwh, of electricity. By that point, Ontario had developed over 40% of its hydro-electric potential—mostly through Ontario Hydro—compared to 22% for the rest of Canada, though Quebec was rapidly expanding.<sup>20</sup> Canada has traditionally been among the top, or at the top, of global per capita users of energy in general and electricity specifically. Today, Canada is the second largest producer of hydro-electricity in the world, behind only China.<sup>21</sup>

Nonetheless we should not forget that although hydro power was the source for most of the electricity consumed in Canada and Ontario before 1939, it was still a fairly minor percentage of energy consumed in households across the

nation. Outside of urban areas, Canadians remained reliant on solid fuels (i.e., coal and wood) for much longer than residents the US and UK.<sup>22</sup> Rather, industry and manufacturing accounted for the majority of electricity consumption. Indeed, hydropower exerted an influence on Ontario's political economy and statist evolution out of proportion to its actual statistical significance in the province's energy portfolio.

Like fossil fuel networks, as well as solid fuels like biomass, the environmental transformations required to build hydro-electric systems involved significant initial capital investments to construct and maintain technological infrastructures, such as dams, generating stations, and electricity-distribution grids.<sup>23</sup> Hydropower, like coal and oil energy networks, attracted investors and financiers with the promise of large rents, and they used their economic influence to shape the development of governing structures.<sup>24</sup> In Canada, this significant investment, and the attendant risks, often necessitated state involvement in hydro-electric development as installations grew larger in size. Indeed, the state became the only entity able or willing to assume the considerable risks of development. As public utilities, hydropower networks pushed the government into an interventionist role by framing their involvement in terms of strategic interests, the wider good, and the betterment of society.<sup>25</sup> Ontario Hydro demonstrated the vitality of publicly-operated utilities, and helped condition Ontarians to an interventionist state. Other subsequent hydro utilities in Canada, such as in Quebec and British Columbia, followed Ontario's lead after the Second World War.

Until distribution technology improved, industries chose to locate in close proximity to sources of hydropower, which had important spatial ramifications for Canada's industrial and urban development.<sup>26</sup> Part of the reason Niagara Falls was so attractive as a power-generating locale was its proximity to manufacturers in Toronto and the town and cities of southwestern Ontario (a region now known as the Golden Horseshoe). Together with US coal imports, Ontario's early development of major hydro sources in the Great Lakes-St. Lawrence basin powered manufacturing growth, and contributed to southwestern Ontario's consolidation as the economic and political centre of manufacturing, finance, and urban growth in Canada.<sup>27</sup> Elsewhere in the country, the availability of hydropower also helps explain why certain regions became centres of particular types of industrial production with all the attendant long-term impacts and path dependencies.<sup>28</sup>

To fin-de-siècle Ontarians, electricity symbolically ushered in the second industrial revolution. Electricity promised to revolutionize both home and work life and even to eliminate the separation between night and day. Hydropower was, by association, imbued with the same revolutionary properties and character. It allowed for new industrial processes that bespoke a new age, one fashioned from new electro-chemical and electro-metallurgical products such as aluminum. As electricity became available across the nation, it dangled the possibility of improvements in living standards—the reduction of labour for individual households in particular—and the resulting economic and material freedom many claimed to be the basis of democracy in North America.<sup>29</sup>



*Figure 2. Control room of the Queenston hydro-electric plant. Library and Archives Canada 1971-271 NPC.*

At the end of the nineteenth century, hydropower seemed almost limitless. Falling water was treated as inexhaustible, because the technology had not yet advanced to the point where hydro stations could fully exploit the head of water at places like Niagara Falls. Moreover, this “white coal” burned clean compared to coal, oil, or biomass. Once the public adopted the attitude that hydro energy was infinite, both energy producers and governments used the material abundance of energy to lend legitimacy to a suite of policies that claimed to offer greater opportunities to its citizens, while simultaneously obscuring the inequitable division of the benefits of that abundance. Hydropower’s material bounty enabled the state to act as the benefactor, distributing electricity for use in an almost endless number of applications—even though most hydropower users in the first half of the twentieth century were a small group of industries and manufacturers.<sup>30</sup> In the process, these abundant applications led people to frame hydro-electricity as indispensable energy for a constantly growing number of Canadians and thus a feature of modern democratic society.



The benefits of hydropower translated directly into hydro democracy. The Ontario state promoted the material abundance of hydropower to legitimize claims of the province as a prosperous and egalitarian society—with “egalitarian” referring chiefly to an equality of economic opportunities made possible by electricity for the province’s enfranchised citizens who stood to benefit (i.e., white, middle-class and elite males). The mass appeal of hydropower as a vehicle of democratic politics rested on the assumption that an ever-growing share of the citizenry would come to enjoy the individual material benefits and increased wealth provided by energy abundance. Hydropower gave rise to quasi-utopian visions of society that helped provide both the conditions for greater access to energy and also the implicit rationale for the ever-expanding consumption of a seemingly limitless energy resource. For the vast majority, however, the vision initially promised more than the reality could deliver. It took several decades before hydro-electricity consumption correlated strongly enough with per capita wealth to safely say that any gains in equality resulted from abundance underwritten by hydro energy.

In Ontario, the development of hydro-electricity was intimately connected to participatory democracy that juxtaposed domestic hydropower with foreign fossil fuels, particularly coal. Because of Ontario Hydro’s public nature, hydro-electric development became a subject of party platforms, electoral debate, and democratic contestation. To illustrate, in addition to the formation of the power commission itself, the development of hydro-electricity stations, purchases of hydropower from Quebec, and Mitch Hepburn’s “Back to Niagara” campaign were all the key issues in provincial elections during the first three decades of the twentieth century. Moreover, as will be touched on below, Ontario’s hydro-electricity development also became a hot topic in intra- and inter-governmental relations, as was the case in other provinces.<sup>31</sup>

In Ontario, and even Canada as a whole, hydro-electricity has been, and continues to be, intimately intertwined with political identity.<sup>32</sup> As one engineering journal put it in 1953, Canada was “hydro-conscious,” while Canadian historian H.V. Nelles insists on a “hydro myth” in Ontario.<sup>33</sup> The link between identity and riverine environments has a long lineage in Canada, including the meta-historical and nationalist Staples and Laurentian theses.<sup>34</sup> Generating stations represented modern Canada’s ability to exploit its natural resources and control imposing environments. Many waterways amenable to hydro development became repositories of hydraulic and technological nationalist associations, gathered under the concept of “hydro nationalism.”<sup>35</sup>

Since many of the earliest large hydro-electric development sites were along Ontario border waters with the United States, negotiations over power stations involved both federal governments and the provincial governments adjoining the rivers and lakes. As a consequence, a distinct form of energy diplomacy emerged as another facet of hydro democracy in Canada during the twentieth century. For example, Canada and the US signed the Boundary Waters Treaty in 1909 and created the International Joint Commission to facilitate the



*Figure 3. Opening Ceremonies for St. Lawrence Power Project. Ontario Power Generation.*

cooperative development of border waters for power and navigation.<sup>36</sup> Decades of jurisdictional wrangling over the development of navigable waters shaped federal politics. Until the 1940s, when constitutional settlements clarified the issues, power developments often instigated federal-provincial tensions, such as the negotiations over dam sites on the Ottawa River.<sup>37</sup> The joint development of major hydro-electric installations—such as those located on the Niagara and St. Lawrence Rivers—required extensive international negotiations and diplomatic treaties and agreements. Sometimes these negotiations flared into major diplomatic disputes, though hydro-electricity ultimately did more to create long-term cooperation and integration than it did conflict.<sup>38</sup>

Hydro-electric development was so attractive in Canada not only because the country was endowed with ample viable sites, but because “white coal” offered an energy source that would not necessarily be controlled by a foreign power.<sup>39</sup> Hydro-electricity reduced Canadian reliance on American sources of energy, coal in particular, and allowed governments to weave energy security into projects focused on economic growth and democratic politics. Ontario (and Canada) exported much of its hydro-electricity to the United States since domestic production of hydro-electricity often exceeded domestic demand in the early years. Historically, a great deal of Canadian hydro-electricity has been exported to the United States, from the first American-owned Niagara developments during the early twentieth century, through the US-funded Quebec developments and the joint Canada-US St. Lawrence and Columbia River projects in the 1950s and 1960s, to the more recent Quebec projects in

James Bay.<sup>40</sup> Up to the 1960s, the majority of the power exported from Canada to the US was via Ontario, and St. Lawrence and Niagara hydropower played the leading role in shaping Ontario's and the federal government's approach to electricity exports and energy policy. These megaprojects, enhanced by the long-term firm power exports as part of the Columbia River treaty, entrenched Canadian-US energy relations and paved the way for the development of the trans-border electricity grids that proliferated beginning in the 1960s.<sup>41</sup>

### Hydro Undemocracy

Electricity exchange remains today a vital part of energy diplomacy, and the environmental impacts of the stations that produce the electricity are therefore a casualty—or the cost of doing business, depending on one's perspective—of Canadian-American relations. Few other developed nations export natural resources and energy to the same extent as Canada. Tying Canada energetically and economically to the United States contributed to Canada's slow but inexorable twentieth century shift from Britain to the United States as the primary ally and trading partner. Thus, even if a major motivation for the development of hydropower was domestically-produced energy, hydro developments arguably helped turn Canada—and Ontario, as the primary exporter of Canadian hydro-electricity for much of the twentieth century—into a partial energy and resource colony of the United States. This type of subservient relationship with the US is only one of a number of ways that hydropower in Ontario can be understood as corrosive to democracy. Neither Ontario's adoption of hydro-electricity, nor the formation and character of Ontario Hydro, was inevitable. As Mitchell, along with scholars such as Christopher Jones, Andreas Malm, and Ruth Sandwell, make clear, energy transitions are not foreordained. Rather, they depend on factors that may have little to do with technical efficiency or energy abundance.<sup>42</sup>

To transform land deemed unproductive into an electrical generator of the public interest, the state made assessments and decisions, based on the vested interests of particular groups, about what counted as a “cost” or a “benefit.” Put differently, the governmental rigged the cost-benefit analyses declaring power stations a good investment. It was also standard practice for power utilities, including Ontario Hydro, to give better deals to industrial consumers who contracted for firmly priced electricity in bulk, especially those who needed electricity outside the hours of peak demand. In this context, politics took its cue from patterns of economic growth, which privileged the wealth and social power of urbanites and industrialists who treated hydro-electricity as democratic. Thus, with Ontario Hydro publicly funded, taxpayers were effectively subsidizing the lower rates that corporate interests received for their bulk purchases, although many believed that the benefits trickled down.<sup>43</sup>

The abundance of hydropower was eventually constrained by the material limits of the volume and rate of flow of water passing a given fixed point (or series of points) in the landscape. As a system approached the



*Figure 4. Hydro-electric facilities Iroquois Falls on Abitibi River. Source: Library and Archives Canada/ Department of the Interior fonds/a043948.*

upper limit of hydropower potential, its capacity (or load) ran up against the promises of a political economy predicated on unlimited economic growth, even with the capacity of regional electric grids to interconnect and shift the load. As energy requirements grew beyond what could be provided by hydro generating stations, the state had to scale back, ignore, or alter its claims about energy abundance. One of the ways energy producers and governments grappled with these challenges was, according to Mitchell, through “produced scarcity.” During the early years of any new form of energy, a surplus exists for which suppliers must manufacture demand through the “rapid construction of lifestyles ... organised around the consumption of extraordinary quantities of energy.”<sup>44</sup> In Ontario, the business interests and monopolies that built the first private hydropower plants at Niagara followed this approach.<sup>45</sup> Ontario Hydro, which had assumed control of most of these private generating stations in the first decades of the twentieth century, did the same. In order to increase demand for electricity, the public utility sold inexpensive appliances on installment plans and even gave them away.

Of course, another way that a state could deal with unfulfilled expectations of limitless energy and growth was to develop additional energy sources—as Ontario did with nuclear power and coal-fired electrical-generation plants. However, these energy sources lent themselves to different political evaluations



*Figure 5: Sir Adam Beck Generating Stations at Niagara Falls. Photo by Daniel Macfarlane*

than did hydro-electricity. When controlled by a public utility, coal and nuclear power also became matters of political and democratic debate. But even as governments used abundant hydropower to claim to represent the interests of a widening segment of Ontario society, the physical infrastructure that embodied hydro's socio-political potential transformed a wide variety of distant communities and environments. In the places where envirotechnical systems converted falling water into hydro-electric energy, abundance could work against democracy. In many Canadian provinces, public utilities came to exercise a monopoly, or near-monopoly, on large-scale hydro-electric development. Unlike coal, but quite similar to oil, hydropower deployed and distributed expertise to take autonomy out of the hands of labour.<sup>46</sup> Planning and executing hydro developments required specially educated and elite hydraulic engineers, and once completed, such developments required only a handful of people to operate. Such a small coterie of operators, owners, investors, technocrats, and government officials formed "hydraulic bureaucracies" that functioned as special interest groups, even as they professed to be representing the public will and interest.<sup>47</sup>

Like fossil-fuel energy, hydro-electric networks formed grids with multiple delivery pathways.<sup>48</sup> Ontario Hydro was more willing than private utilities to supply small urban centres in southwest Ontario, and more remote industrial users in rural parts of Ontario.<sup>49</sup> But over time, the necessity to build transmission lines to connect with consumers produced a systemic urban-industrial imbalance of material benefits. Electric grids exhibited rigid rights-of-way and path dependencies akin to older rail-dependent coal pathways, rather than inter-modal routes followed by oil. Thus, at the same time as the government used mass-produced and mass-consumed energy to justify claims of greater equality within society, the realities of hydropower rationalized only a small share of abundant energy for rural communities. The mandate to extend service to regions with low-population density and little or no industry, as well as the flexibility offered by the interconnected North American electrical grid, really only emerged after the Second World War (when the proportion of people living in such communities was dropping sharply) and took many decades to develop.

The scale of hydro-electric development entailed social, health, and environmental consequences comparable to, though often different from, coal mining and oil drilling operations. But energy abundance became something that many citizens took for granted, while those in the know were more than satisfied with the tradeoff in which discrete locations became sacrifice zones for power development.<sup>50</sup> Generating electricity removes some of the river's energy from the ecosystem, where it would otherwise perform valuable natural functions (scouring and erosion, transport of sediment, supporting fish and aquatic life, etc.) or other functions for human society (navigation, logging, recreation, etc.). Furthermore, dams and reservoirs alter water temperature and present migration hazards for fish and other species. Thus, depending on settlement patterns along the shore and other uses, creating a reservoir changes the types of ecosystem services the river can provide. In some cases, the government and hydro developers consulted riparian landowners and users, but more often environmental changes took place through manufactured consent, or no consent at all. Thus building a hydro installation was to privilege the industrial and capital uses of a water body while foreclosing other uses and users.

Put differently, hydro democracy involved sacrificing hinterland watershed environments for metropolitan benefits. Acquired violently from Indigenous peoples, abundant natural resources facilitated Canada's rise as a nation of high-living standards.<sup>51</sup> Hydro installations typically occupy riverine locations featuring waterfalls or rapids, which historically served as important sites of fishing, trade, and cultural exchange for Indigenous peoples. As a result, hydro developments often inundated land of significant value to Canada's First Nations, who as a result of this "hydraulic imperialism" bore a disproportionate brunt of the costs for projects that represented progress, that ineluctable talisman of modern capitalist society.<sup>52</sup> For non-Indigenous Canadians, the need to move and/or relocate people and communities highlights the limits to government claims that large-scale energy systems received popular consent and produced democratic politics.

Spatial arrangements and locations of hydro sites created long-range path dependencies and technological momentum. As was the case with fossil fuels, the environmental consequences of hydro development usually unfolded at great distances from sites of consumption, and on a scale that most never considered. Combined with its abundance, envirotechnical infrastructures de-natured networked energy. And since the country's political structures took so much of its logic from the principles of unlimited economic growth made possible by energy abundance, as Mitchell asserts, democratic politics was also de-natured politics.<sup>53</sup> Apart from those who lived in close proximity to dams and directly confronted the environmental consequences of hydro-electric development, citizens judged the outcomes mainly by its benefits. And since public utilities and Crown corporations so often initiated, financed, and operated hydro facilities, their authority to claim that hydropower served the public good framed environmental change as democratic politics.

## Conclusion

In conclusion, we argue that the public development of large-scale hydropower exerted a discernable influence on the nature of the Ontario state, and had tremendous long-term repercussions, positive and negative. Returning to Mitchell's definition of democracy, it appears that hydro-electricity did, at least in the public imagination, allow for more effective claims for a just and egalitarian world than oil: at the same time, hydro democracy became a mode of governing populations that employed popular consent as a means of limiting claims for greater equality and justice by dividing up common resources.

Because hydropower in Ontario, and elsewhere in Canada, was mostly produced by state-sponsored agencies, it was able to longer resist certain facets of neoliberalism associated with oil, such as privatization and deregulation.<sup>54</sup> Canadian historians may wish to explore whether efforts to develop hydro-electric power helped lay the foundations for a Canadian interventionist state, which by the postwar period was largely committed to social-welfare programs across the country (e.g., national adoption of single payer health care, mortgage insurance, social support networks, etc.). Public power also meant that hydro-electricity often became a key electoral and political issue. Underpinning the development of electricity from falling water is the particular cultural resonance that Ontarians (and many other Canadians) attached to hydropower, which made the province (and the country) an exporter of energy, with an attendant range of implications.

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## Endnotes

- 1 The authors would like to thank R.W. Sandwell, Christopher F. Jones, Joshua MacFadyen, and William Knight for reading and commenting on early drafts, as well as Tina Loo for comments on some of the early ideas put forward here. We thank them for sharing some of their own work and statistical evidence.
- 2 When discussing coal in Britain, Mitchell has the advantage of addressing a relatively compact geographic area; Canada's spatial size and the resulting diversity of energy and political economy regimes, however, mitigated against our initial goal of addressing hydro-electricity across the entire nation. As a result, we decided to focus solely on the Province of Ontario—a territory that alone is still about four times larger than the whole of the UK.
- 3 Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (New York: Verso, 2011), 9.
- 4 Mitchell, *Carbon Democracy*, 41 & 71.

- 5 For Mitchell, oil deposits in the Middle East explain the imperialist actions of colonial powers like Britain and France towards countries like Iraq. Indeed, the history of colonialism in that region would have been far different without oil. The outcomes of the First World War, particularly the promotion of the principle of self-determination, take on a whole new meaning when viewed through the lens of carbon imperialism. Mitchell, *Carbon Democracy*, 65; Daniel Yergin, *The Quest: Energy Security, and the Remaking of the Modern World* (New York: Penguin, 2011).
- 6 Since Canada's share of GDP from oil revenue has never exceeded 10 percent, some critics insist that only Alberta—which has exceeded the 20 percent threshold—qualifies as a petrostate. Meenal Shrivastava, "Liberal Democracy in Oil-Exporting Countries: A View from the Perspective of Staples Theory," in Meenal Shrivastava and Lorna Stefanick, eds., *Alberta Oil and the Decline of Democracy in Canada* (Edmonton: AU Press, 2015): 31-67; Andrew Nikiforuk, *The Energy of Slaves: Oil and the New Servitude* (Vancouver: Greystone, 2012): chapter 10.
- 7 Richard W. Unger and John Thistle, *Energy Consumption in Canada in the 19th and 20th Centuries: A Statistical Outline* (Consiglio Nazionale delle Ricerche (CNR)), Istituto di Studi sulle Società del Mediterraneo (ISSM), 2013), appendix 1; Sam H. Schurr and Bruce C. Netchert, *Energy in the American Economy, 1850-1922* (Baltimore: John Hopkins Press, 1960), 22.
- 8 In this sense, our adoption of Mitchell's concept of carbon democracy contributes to a wider historiographical debate on the nature and influence of liberalism in Canada, a debate to which few environmental or energy historians have devoted much attention. Ian McKay, "The Liberal Order Framework: A Prospectus for a Reconnaissance of Canadian History," *Canadian Historical Review* 81 (2000): 617-645; Stéphane Castonguay and Darin Kinsey, "The Nature of the Liberal Order: State Formation, Conservation, and the Government of Non-Humans in Canada," in Jean-Francois Constant and Michel Ducharme, eds. *Liberalism and Hegemony: Debating the Canadian Liberal Revolution* (Toronto: University of Toronto Press, 2009): 221-245; James Murton, *Creating a Modern Countryside: Liberalism and Land Resettlement in British Columbia* (Vancouver: UBC Press, 2007); Shannon Stunden Bower, *Wet Prairie: People, Land, and Water in Agricultural Manitoba* (Vancouver: UBC Press, 2011); Daniel Macfarlane, *Negotiating a River: Canada, the US, and the Creation of the St. Lawrence Seaway* (Vancouver: UBC Press, 2014).
- 9 Daniel Macfarlane and Lynne Heasley, *Border Flows: A Century of the Canadian-American Water Relationship* (Calgary: University of Calgary Press-NiCHE Environmental History Series, 2016); Karl Froschauer, *White Gold: Hydroelectric Power in Canada* (Vancouver: UBC Press, 1999); Richard White, *The Organic Machine: The Remaking of the Columbia River* (New York: Hill and Wang, 1995).
- 10 On these issues, see also E.A. Wrigley, *Energy and the English Industrial Revolution*; E.A. Wrigley, *The Path to Sustained Growth. England's Transition from an Organic Economy to an Industrial Revolution* (Cambridge: Cambridge University Press, 2016). Stefanie Barca argues for the need to look at energy transitions as social processes that include the environmental costs: Stefanie Barca, "Energy Property and the Industrial Revolution Narrative," *Ecological Economics* 70 (2011): 1309-1315. On water power as a vital energy transition predecessor to coal in the industrial revolution, see Ted Steinberg, *Nature Incorporated: Industrialization and the Waters of New England* (Cambridge: Cambridge University Press, 1991).
- 11 We should acknowledge that, like Mitchell, our use of "carbon energy" refers to mineral forms of energy. Although various forms of biomass, particularly wood, represented a sizeable portion of Canada's and Ontario's energy budget at the turn of the twentieth century, we consider only fossil fuels when referring to carbon energy.
- 12 Granted, reservoirs and reverse-pumped storage can partially alter the temporal availability of hydro-electricity.
- 13 As Bob Johnson points out, once people burned fossil fuels, the transmission of that power was spatially limited unless it was converted into electricity. Regardless of its original source, harnessing energy presents transmission challenges, which electricity is uniquely suited to overcome. From the standpoint of evaluating the systems that convert energy into useful human applications, up until the point energy is harnessed, one of the main differences between carbon power and hydropower is that it took much less effort to move the former to sites of power production. Bob Johnson, *Carbon Nation: Fossil Fuels in the Making of American Culture* (Lawrence, KS: University Press of Kansas, 2014), chapter 4.



- 14 Christopher Jones treats hydro-electricity as a stock and part of the mineral energy regime, whereas R.W. Sandwell emphasizes its renewable and flowing features, and places it within the organic energy regime. Christopher Jones, *Routes of Power: Energy and Modern America* (Cambridge, MA: Harvard University Press, 2014); Ruth Sandwell, ed., *Powering Up Canada: The History of Power, Fuel, and Energy from 1600* (Montreal: McGill-Queen's University Press, 2016); E.A. Wrigley, *Energy and the English Industrial Revolution* (Cambridge: Cambridge University Press, 2010); Vaclav Smil, *Energy in World History* (Boulder, CO: Westview Press, 2008).
- 15 See Matthew Evenden and Jonathan Peyton, "Hydroelectricity," in Sandwell, e.d., *Powering Up Canada*.
- 16 For an overview of hydropower in Canada see Evenden and Peyton, "Hydroelectricity."
- 17 Denison, 41. In addition see Nelles, *The Politics of Development*; Neil B. Freeman, *The Politics of Power*.
- 18 Denison, 28.
- 19 Daniel Macfarlane, "A Completely Man-Made and Artificial Cataract: The Transnational Manipulation of Niagara Falls," *Environmental History* 18 (4) (October 2013): 759-784; Daniel Macfarlane, "Current Concerns: Canadian-American Energy Relations and the St. Lawrence and Niagara Megaprojects," in Amelie Kiddle, ed., *Energy in the Americas: Critical Reflections on Energy and History* (Calgary: University of Calgary Press, forthcoming).
- 20 H.R. Rice, "More Canadian Kilowatts at Niagara," *Compressed Air Magazine* Volume 58, Number 8 (August 1953): 210-217. In the 1940s Quebec took its first step toward nationalizing its hydro utilities and then passed Ontario as the country's major hydro-electric producer, while provinces outside of central Canada began to develop their own hydropower resources.
- 21 <http://worldknowing.com/top-10-largest-hydroelectricity-producer-country-in-the-world/>
- 22 In 1941, oil represented 17%, coal 53%, and electricity 6% of total energy consumed, Unger and Thistle, *Energy Consumption in Canada in the 19th and 20th Centuries*. In terms of household rather than total national consumption, data from the Dominion Bureau of Stats figures shows that (unlike the US) Canadians were consuming very little electricity in their homes before World War II. On wood and biomass use for energy, see Josh MacFadyen chapter in *Powering Up Canada*. As Ruth Sandwell argues, Canada was an outlier compared to other industrialized countries because of the extent to which Canadians had 'free' and widespread access to the organic energy regime, generous homesteading system, cheap and often marginal agricultural lands at great distances from state surveillance, and the persistence of a dominant rural population more interested in 'getting by' than in 'getting rich'. Sandwell, *Canada's Rural Majority*; Sandwell, "Introduction," *Powering up Canada*; Ruth Sandwell, "Mapping Fuel Use in Canada: Exploring the Social History of Canadians' Great Fuel Transformation," in Jennifer Bonnell and Marcel Fortin, eds., *Historical GIS in Canada* (Calgary: NiCHE-University of Calgary Press Environmental History Series, 2014).
- 23 Thomas Parke Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (JHU Press, 1993); David E. Nye, *Electrifying America: Social Meanings of a New Technology, 1880-1940*, New edition (The MIT Press, 1992); David E. Nye, *American Technological Sublime* (The MIT Press, 1996); Harold L. Platt, *The Electric City: Energy and the Growth of the Chicago Area, 1880-1930* (University of Chicago Press, 1991); Paul Hirt, *The Wired Northwest: The History of Electric Power, 1870s-1970s* (University Press of Kansas, 2012); Gretchen Bakke, *The Grid: The Fraying Wires Between Americans and Our Energy Future* (Bloomsbury Publishing USA, 2016); Julie A. Cohn, *The Grid: Biography of an American Technology* (MIT Press, 2017).
- 24 Once the up-front capital costs were paid off, hydropower tended to be even cheaper per unit of production than coal and oil.
- 25 H.V. Nelles, *The Politics of Development: Forests, Mines and Hydro-Electric Power in Ontario, 1849-1941*, 2nd Edition (Montreal: McGill-Queen's University Press, 2005); Christopher Armstrong and H.V. Nelles, *Monopoly's Moment: The Organization and Regulation of Canadian Utilities, 1830-1930* (Philadelphia: Temple University Press, 1986); Andrew Dilley, "Politics, Power, and the First Age of Globalization: Ontario's Hydroelectric Policy, Canada, and the City of London, 1905-10," in

- Andrew Smith and Dimitry Anstakis, eds., *Smart Globalization: The Canadian Business and Economic History Experience* (Toronto: University of Toronto Press, 2014); Stéphane Savard, *Hydro-Québec et l'État québécois, 1944-2005* (Montreal: Septentrion, 2013); Desbiens, *Power from the North*; Evenden, *Allied Power*.
- 26 Keith Fleming, *Power at Cost: Ontario Hydro and Rural Electrification, 1911-1958* (Montreal: McGill-Queen's University Press, 1991).
- 27 Ian M. Drummond, *Progress Without Planning: The Economic History of Ontario from Confederation to the Second World War*. (Toronto: University of Toronto Press, 1987), chapter 8.
- 28 Mark Kuhlberg outlines the ways that hydroelectricity facilitated the pulp and paper industry in Northern Ontario. *In the Power of the Government: The Rise and Fall of Newsprint in Ontario, 1894-1932*. (Toronto: University of Toronto Press, 2015). On northern Ontario hydro developments see also Jean Manore, *Cross Currents: Hydroelectricity and the Engineering of Northern Ontario* (Waterloo, ON: Wilfrid Laurier University Press, 1999).
- 29 On this point see Matthew Huber, *Lifeblood: Oil, Freedom and the Forces of Capital* (Mineapolis: University of Minnesota Press, 2013); Ruth Sandwell, *Canada's Rural Majority*; Joy Parr, *Domestic Goods*; Dorotea Gucciardo, *Powered Generation: Canadians, Electricity, and Everyday Life* (PhD Dissertation, Western University, 2011); David Nye, *Electrifying America*; Ronald Tobey, *Technology as Freedom: The New Deal and the Electrical Modernization of the American Home* (University of California Press, 1997).
- 30 R.W. Sandwell, "Pedagogies of the Unimpressed: Re-Educating Ontario Women for the Modern Energy Regime, 1900-1940," *Ontario History*, 107,1 (Spring 2015): 36-59.
- 31 Neil B. Freeman, *The Politics of Power: Ontario Hydro and its Government, 1906-1995* (Toronto: University of Toronto Press, 1996); Jerry Bannister, "A River Runs Through It: Churchill Falls and the end of Newfoundland History," *Acadiensis*, Vol. XLI, No. 1, Winter/Spring-Hiver/Printemps (2012): 211-225; Philip Smith, *Brinco: The Story of Churchill Falls* (Toronto: McClelland and Stewart, 1975); James Feehan, "Smallwood, Churchill Falls, and the Power Corridor Through Quebec," *Acadiensis* XL, no. 2 (Summer/Autumn 2011): 112-27.
- 32 This is of course true of Quebec as well, for that province's heavy reliance on hydro-electricity allowed it to consume home-grown energy and become *maîtres chez nous* Caroline Desbiens, *Power from the North*; David Massell, *Quebec Hydropolitics: The Peribonka Concessions of the Second World War* (Montreal: McGill-Queen's University Press, 2011); Savard, *Hydro-Québec et l'État québécois, 1944-2005*.
- 33 H.R. Rice, "More Canadian Kilowatts at Niagara," *Compressed Air Magazine* Volume 58, Number 8 (August 1953): 210-217; Nelles, "Hydro as Myth," *The Politics of Development*.
- 34 Harold Innis, *The Fur Trade in Canada: An Introduction to Canadian Economic History* (New Haven: Yale University Press, 1930); Donald Creighton, *The Empire of the St. Lawrence: A Study of Commerce and Politics* (Toronto: Macmillan, 1956); Christopher Armstrong, Matthew Evenden, and H.V. Nelles, *The River Returns: An Environmental History of the Bow* (Montreal: McGill-Queen's University Press, 2009).
- 35 Macfarlane, *Negotiating a River*; Daniel Macfarlane, "Dam the Consequences: Hydropolitics, Nationalism, and the Niagara-St. Lawrence Projects," in Lynne Heasley and Daniel Macfarlane, eds., *Border Flows: A Century of the Canadian-American Water Relationship* (Calgary, AB: University of Calgary Press, 2016).
- 36 See Daniel Macfarlane, "Fluid Relations: Hydro Developments, the International Joint Commission, and Canada-US Border Waters," in Peter Stoett and Owen Temby, eds., *Towards Continental Environmental Policy? North American Transnational Environmental Networks and Governance* (Albany, NY: SUNY Press, 2017).
- 37 Christopher Armstrong, *The Politics of Federalism: Ontario's Relations with the Federal Government*.
- 38 Heasley and Macfarlane, *Border Flows*.
- 39 Andrew Watson, "Coal in Canada," in Sandwell, ed., *Powering Up Canada*.

- 40 The Canadian federal government initially adopted a laissez-faire approach to electricity exports, and by 1910 Canada exported about one-third of its electricity. Since the Second World War, non-firm (interruptible) power sales have dominated the Canada-US electricity trade. Janet Martin-Nielsen, "South over the Wires: Hydro-electricity Exports from Canada, 1900-1925." *Water History* 1 (2009): 109-29.
- 41 By 1975, at a time when new Canadian hydro-electric developments moved spatially away from the border (e.g., northern Quebec), Canada's hydro-infrastructure featured 65 cross-border interconnections, with a total transfer capability of over 6,000 megawatts.
- 42 Jones, *Routes of Power*; Malm, *Fossil Capital*, Ruth Sandwell, "Pedagogies of the Unimpressed" and Ruth Sandwell, "People, Place and Power: Rural Electrification in Canada, 1890-1950," in Paul Brassley, Jeremy Burchardt and Karen Sayer, eds. *Transforming the Countryside: the Electrification of Rural Britain* (London and New York: Routledge, 2017): 178-204.
- 43 Nelles, *The Politics of Development*.
- 44 Mitchell, *Carbon Democracy*, 41; Jones, *Routes of Power*.
- 45 See H.V. Nelles, *The Politics of Development*.
- 46 Mitchell, 192. On labour and the transition from hydraulic power to steam power in Britain, see Malm, *Fossil Capital*. In the case of Canada's move to hydro-electricity, however, controlling the labour force was only one reason among a number of motivating factors. See Gerald Bloomfield and Elizabeth Bloomfield, "Waterwheels and Steam Engines in Ontario: Industrial Power Reported in the 1871 Manuscript Census," *Scientia Canadensis*, Vol. 13, No. 1 (Spring-Summer 1989): 2-38.
- 47 Ontario Hydro's first chairman, Adam Beck, is a prime example. On "hydraulic bureaucracies" see F. Molle, P.P. Mollinga, and P. Wester, "Hydraulic Bureaucracies and the Hydraulic Mission," *Water Alternatives* 2 (2009): 328-349; on the application of "hydraulic bureaucracies" to the Ontario context see Macfarlane, *Negotiating a River*.
- 48 Mitchell, 38.
- 49 On Ontario Hydro and rural electrification see Fleming, *Power at Cost*.
- 50 The relationship between abundant energy and the failure to appreciate it is a central axiom of the Jevons paradox, in which increased demand results from greater availability. Bob Johnson, *Carbon Nation*.
- 51 A number of historians in Canada have explored the relationship between the consequences of hydropower development on rural and Indigenous communities and environments and the benefits enjoyed by urban residents and economies. Brittany Luby, "From Milk-Medicine to Public (Re)Education Programs: An Examination of Anishinabek Mother's Responses to Hydro-electric Flooding in the Treaty #3 District, 1900-1975," *Canadian Bulletin of Medical History*, 32, 2 (2015): 363-89; Daniel Macfarlane and Peter Kitay, "Hydraulic Imperialism: Hydro-electric Development and Treaty 9 in the Abitibi Region," *American Review of Canadian Studies*, 47, 3 (Fall 206): 380-397; Caroline Desbiens, *Power from the North: Territory, Identity, and the Culture of Hydro-electricity in Quebec* (Vancouver: UBC Press, 2014); Matthew Evenden, *Fish Versus Power: An Environmental History of the Fraser River* (Cambridge: Cambridge University Press, 2004); Matthew Evenden, *Allied Power: Mobilizing Hydro-electricity During Canada's Second World War* (Toronto: University of Toronto Press, 2015); Tina Loo and Meg Stanley, "An Environmental History of Progress: Damming the Peace and Columbia Rivers," *Canadian Historical Review* 92, no. 3 (September 2011): 399-427.
- 52 Macfarlane and Kitay, "Hydraulic Imperialism: Hydro-electric Development and Treaty 9 in the Abitibi Region," Luby, "From Milk-Medicine to Public (Re)Education Programs."
- 53 Mitchell, 251.