

Meteorological Frontiers: Climate Knowledge, the West, and US Statecraft, 1800–50

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This article advances an analytic framework for studying climate knowledge, arguing that the dynamics of how scientists construct the category of climate articulate with practices of government by a process I theorize as “meteorological government.” Using diverse primary print sources, analysis in the present article employs this theorization to reconstruct elements of US statecraft in the period from 1800 to 1850 by tracing the governmental significance of meteorological statistics, military-medical meteorology, and what I term “racial climatology.” Historical analysis shows how these components of climate knowledge were coproduced with state efforts to evaluate, calculate, and monitor (1) the military body in a context of bureaucratization of the US Army; (2) western territories in a context of territorial acquisition and providential nationalism; and (3) a stratified population “legible” by biological understandings of racial hierarchy. The analytic framework I employ draws from and informs existing literature, which challenges assumptions that the dynamics of climate knowledge can be separated from developments in social power. I conclude by discussing the implications of the analysis for how we understand science-state coproduction, both in the case of US meteorology throughout the 1800–50 period and for climate knowledge and the state in other contexts and in recent decades.

In the summer of 1820, near the headwaters of the Verdegris River, while they were trailblazing an overland return eastward from the Rocky Mountains and lost in the vast Arkansas Plains, three men deserted their commanding officer and the Stephen Long expedition party. These soldiers stole away on horseback, their saddlebags filled with stolen goods, incidentally including the various scientific journals of Thomas Say, a naturalist dispatched by the American Philosophical Society (APS) on what was labeled a “military and scientific expedition.” The journals likely included some of the meteorological tables ordered to be kept by the expedition.¹ These important materials, “utterly useless to the wretches who now possessed them,” Major Long wrote in his journal, “were probably thrown away upon the ocean of the prairie.” He went on to lament, “the labor of months was consigned to oblivion by these uneducated vandals”—these “worthless, indolent, and pusillanimous” deserters.²

One can imagine the pages of meticulously recorded meteorological observations baking on the grassy plain, carefully inked numbers running together in the first rains

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1. The “Meteorological Register,” as compiled by Edwin James (1823), terminates in May 1820, three months prior to this desertion. However, James (1823: xliiv) also claimed the recordings from Thomas Say’s journals were “too voluminous” to compile in full.

2. As reproduced in Benson (1988: 371). See also James (1823: 486–87) for an account of this incident.

to strike them. The Long Expedition—with its perils of route finding and desertion on what they famously termed the “Great American Desert” (what we now call the Great Plains)—exposes some of the challenges through which new spaces came to enter American government, territory, and science (Goetzmann 1966). For however much meteorological knowledge was successfully recorded, much was lost. Meteorologists faced tremendous difficulty in aligning a vast network of objects and interests—the vicarious weather, often inspiring poetic description more than disciplined measurement and numerical comparisons; the delicate instruments, inclined to break or lose calibration; variable forms of accounts by Natives, settlers, and traders; and the duties of underpaid troops prone to disease, drunkenness, and, in some cases, desertion, theft, and mutiny.

Indeed, both western lands and the weather came into view within scientific surveys and the journals of military missions during the early nineteenth century to be anything but conquered or remotely governable. Long’s journal account, and the hopes of meteorologists in collecting new data from western lands, presents a picture of precarious wandering, not mastery. More than an isolated event, however, the Long Expedition desertions provide an illustrative entry point to a broader issue raised in this article: how the material and analytical challenges of knowing climate and crafting an expansive territorial state developed alongside one another within the early US context. By tracing this “coproduction” (cf. Jasanoff 2004) of climate knowledge and the state in the 1800–50 period, we can also develop broader insights into how climate knowledge operates as a practice of government in consistent ways, even though the configurations of knowledge claims, actors, and power change in different historical periods and contexts.

Historians of science (Feldman 1990; Fleming 1990, 1998) have primarily approached developments in nineteenth-century meteorology by emphasizing the mid-century as a period during which meteorology emerged as a bounded domain of scientific inquiry. Complete with standardized instruments, observational data networks, conventionalized methods, and theoretical controversies that superseded speculative dogma, the established narrative concludes, meteorology came to produce a more thoroughly *scientific* account of weather and circumscribed physical account of climate. Based on such a narrative of scientific progress, scholars have generally sought to explain how modern meteorology emerged from an “art” into a “science” (Harper 2008: 1–2, 61) and how climate-change science proceeded through a logic of discovery, only later “breaking into politics” (Le Treut et al. 2007; Weart 2008: 138). Yet such narratives remain incomplete, and we are left to wonder whether they adequately capture a possibly “impure” logic of climate knowledge, namely, a governmental one (cf. Epstein 1996).

To help explain key developments of nineteenth-century climate knowledge, the present article suggests we recover the impurity of climate as a category and reconstruct climate knowledge in terms of its governmental significance. As an analytic strategy, I conceptualize climate knowledge-state coproduction as a matter of *meteorological government*. I define meteorological government as a process by which climate knowledge develops in and through ways of constituting, categorizing, and

calculating meteorological and social orders simultaneously. With this approach, three domains of statecraft emerge as significant to the dynamics of climate knowledge throughout the 1800–50 period: military-administrative concern with disease and discipline among soldiers and state agents; national-territorial expansion; and ideologies undergirding a “racial state” (Omi and Winant 2015). In this article I link these respective domains to major developments in medical meteorology, meteorological statistics, and what I term “racial climatology.” I therefore trace how central efforts to advance climate knowledge articulated with strategies to govern, respectively, (1) soldiers’ bodies in a context of bureaucratization of the US Army; (2) western territories in a context of territorial acquisition and providential nationalism; and (3) a stratified population “legible” by biological understandings of racial difference and destiny.

The primary empirical contribution of a conceptual approach to meteorological government is to show how military discipline, expanding territoriality, and pre–Civil War racial politics were shaped by the progenitors of what is often characterized as a progressively bounded scientific field. A second contribution of the approach is to argue that climate knowledge may more broadly, in various contemporary and historical contexts, be situated relative to practices of government. The article concludes by suggesting that climate science and statecraft regarding global warming in recent decades signifies novel developments in meteorological government that preclude drawing neat boundaries between the logics of science and politics.

Science-State Coproduction and Meteorological Government

How is it possible to provide an alternative to approaches emphasizing progressive scientific autonomy, one that can problematize climate knowledge in relation to broader historical developments, especially state formation? As a conceptual point of departure, Foucault’s (1991, 2008) historical analyses of governmentality inflect concerns with power and knowledge through a specific theory of “government” vis-à-vis the state, which informs how I understand meteorological government as a process that envelops the state-science relationship. Foucault argues that modern states were “governmentalized” through diverse historical processes in which political sovereignty was reflected in constituting, disciplining, and monitoring populations. Developments in technologies of surveillance, human sciences, and disciplinary institutions, Foucault explains, gave way to a biopolitical apparatus that aimed to order the dynamics of human life, chiefly through aggregation, categorization, and minute concern with the environs that control health, productivity, and normalized behavior. Although Foucault paid scant attention to climate (see Foucault 1991: 93–95; 2004: 21–22), others (Golinski 2008; Jankovic 2000; Zilberstein 2016) have shown how achieving a productive and healthy population; “improving” climates to become more temperate and healthy; and advancing civilization as a climate-dependent process emerged as intertwined problems of government within eighteenth-century European and colonial contexts.

Yet it remains unclear how diffuse concern over climate, civilization, and improvement intersected (or “governmentalized”) US statecraft. To trace how elements of statecraft and science were coproduced through practices of meteorological government, I draw upon two major themes developed in existing scholarship—science-state coproduction and the imperial geographies of climate knowledge.

The first theme, developed among political sociologists and Science and Technology Studies scholars, regards the processes through which science and power constitute or interact through modern statecraft (Carroll 2006; Mukerji 1997; Scott 1998). These scholars challenge the relative inattention to science among state theorists. They also challenge histories of science that proceed asymmetrically, whereby scientific practices are reconstructed by emphasizing the development of reasoned truths, not the development of power. Jasanoff (2004) organizes such analyses under a framework oriented to understanding the “coproduction” of science, society, and the state. A goal, within a coproduction framework, is to refrain from imposing *a priori* analytic boundaries onto historical formations and instead to evaluate, in Shapin and Shaffer’s (1985) terms, how “problems of knowledge” may have been settled in relation to “problems of social order.” Cast into view by this theoretical focus, it becomes clear that the governability of territories, state agents, subjects, and natural environments (including climates) is not given by nature, nor by force or command, but rather by projects diverse actors carry out to make relations between social and natural worlds “legible” (cf. Scott 1998). Such legibility projects, as we might call them in the present case, entail both *practical* material relations and a specific *analytic* of government. As practical achievement, state power and meteorology both form material networks, the nodes and ties of which actors must struggle to align in the face of contingency or resistance, as the deserting soldiers, discussed in the preceding text, serve to illustrate. As an analytic of government, the category “climate” appears not as a feature of nature awaiting discovery but as a modality for governing populations, their environments, and their entwined trajectories.

A second relevant theme developed by cultural geographers and environmental historians (Golinski 2008; Grove 1995; Livingstone 1991, 2002; Mahony and Hulme 2016; Zilberstein 2016) addresses how geographically expansive and socially stratifying forms of rule, especially colonialism, related to theories of climate. Such issues have been especially important to scholars of modern environmental thought and its articulation with British and French colonization in what many called the “torrid zone” of equatorial, tropical, and arid climates (Arnold 1996; Beattie et al. 2014; Davis 2016; Duncan 2007; Harrison 1999). These studies show how those who evaluated the “otherness” of such regions not only challenged deep-seated Enlightenment theories of global climate and human life but also served to advance climate discourse to differentiate, measure, and control territories and populations. This scholarship establishes that scientists and elites understood climate to strongly determine historical, physiological, and social developments. By elaborating the climatic character of social order, colonial officials and scientists effectively constructed European whiteness and civilization as something that must be anxiously protected (e.g., through “tropical medicine”), extended through a civilizing mission of “improvement” (Conklin

1997; Drayton 2000), or advanced through practices oriented to racial stratification or violence (Bashford 2004; Livingstone 1991).

Apprehending or seeking to institute social and climatic order, what we are here labeling practices of meteorological government, is hardly reducible to colonial projects in specifically “torrid” or “tropical” spaces. Analysis of nineteenth-century US statecraft, not a focus among studies of colonialism and climate discourse in North America (Golinski 2008; Kupperman 1984; Zilberstein 2016), can contribute to the broader historical genealogy of meteorological government in two ways. The first is to show how meteorological government in the United States reflected practices developed in European and colonial contexts. Second, critical studies of climate governance in recent decades, although productively theorizing local and global scales in recent and historical contexts (Fleming et al. 2006; Jasanoff and Martello 2004), might be enhanced by investigating how climate knowledge is deployed through statecraft to govern climate-change impacts. Recent developments in climate-change “adaptation” and national securitization of climate-change impacts demonstrate Oels’s (2005: 186) point that “the production of climate change is facilitated by a specific governmentality that renders it governable,” yet in ways that her focus on climate-change mitigation at the global level may not have anticipated. If the rise of global warming mitigation regimes has inspired genealogies of “global” knowledge (Coen 2011; Mahony 2016; Miller 2004), then the rise of “adaptation” and securitization of climate-change impacts could inspire genealogies of what Baker (2017) has called the “climate state,” or what Parenti (2014) more generically identifies as the “environment-making state” (see also Mahony 2014). Through a theorization of meteorological government, then, historical studies of climate and colonialism can contribute to largely separate efforts to critically analyze climate adaptation policies (Taylor 2014), the basic category of “climate” (Hulme 2008), and resurgent forms of climatic determinism (Livingstone 2015).

War, Territory, and Race

As an empirical strategy for tracing the coproduction of climate knowledge and the state through meteorological government, I select three domains of statecraft—military-administrative order, territoriality, and racial stratification—that transformed the United States throughout the 1800–50 period and linked most significantly to climate knowledge. This strategy, if not providing a comprehensive view of US statecraft, nevertheless challenges claims, by Skowronek (1982) among others, that an American state is a product only of late-nineteenth-century industrialism.

Rather, the United States in the 1800–50 period presents an important case of state-science coproduction and of projects by various social actors to make legible populations and their environments. Particularly significant is a discourse of “civilization” that transected political and scientific efforts regarding the legibility of social progress in relation to natural order (Mazlish 2004). Norbert Elias (2000 [1939]) famously argues that early modern state-formation proceeded through a diffuse “civilizing process,” yet in the US context, civilizing was endemic to political discourse.

Indeed, many US revolutionaries and settlers believed the United States to be an originally civilized and enlightened polity, a governmental “city upon a hill” that many sought to reinforce on the axis of natural science.

Of course, US statecraft is reducible neither to a “civilizing” process nor a scientific program. Rather, as Mann (1993) and Tilly (1990) emphasize, coercive power and war are critical in shaping state territoriality, bureaucratic expansion, and the capacity for state action to penetrate society. Here too, however, we can encounter science-state coproduction. The geopolitics of the US frontiers, complete with continental expansion and imperial wars, arguably marks the initial consolidation of US state power. In other words, those seeking to protect trade, settle new land, subjugate Native people, and control settlers and government agents, by the 1810s called for a formal military and a range of bureaucratic institutions to organize coercive powers. These powers, at the same time, served to integrate western land, peoples, and nature as governmental domains and in the form of a more diffuse, “civilizing” governmentality. Although it makes sense that scientific discourse would be significant to such statecraft, including both organizing various means of coercion and integrating a wider governmental apparatus, we know little about how climate knowledge developed in relation to statecraft in these terms.

The rise of a US territorial state, and the relationship to concurrent developments in science, moreover, is complicated by racial stratification in the antebellum period. As “Manifest Destiny,” territorial expansion represented a state-facilitated providential nationalism, upheld by a cultural frame of white superiority with officially sanctioned rights for whites to claim and exploit western lands (Horsman 1981). Contested issues of citizenship and political representation, in conjunction with a volatile politics of slavery, consolidated around a newly elaborated racial category of Anglo-Saxon whiteness. The American state emerged in this way as a “racial state,” anchored with symbolic power to naturalize hierarchy, often through appeals to political philosophies of citizenship rights and scientific defenses of racial order (Goldberg 2002).

As already indicated, many scholars have pursued such elements of statecraft without any reference to meteorology or climate knowledge whatsoever, parallel to how most historical accounts of meteorology and related sciences in the United States have yet to coherently conceptualize state-making practices. A coproduction approach, however, suggests that such analyses may result in an incomplete account of important dynamics linking climate knowledge and statecraft. It is to these dynamics that we now turn.

Ordering Observations: Military Strategy and the Meteorological Register

At the turn of the nineteenth century the prospects of a national US state were unclear. Through the 1780s to the beginning of the nineteenth century, the United States

remained highly fragmented along state lines. The Continental Army, formed during the American Revolution, had been almost entirely disbanded. Executive power was severely limited in its capacity to establish rule within the original thirteen states and their borderlands. Only after a series of wars with independent and foreign-backed Indian confederacies and, finally, the War of 1812 with Britain, did the United States establish a more permanent military-administrative bureaucracy through which to regulate its territories and wage national conflicts.

The administrative and military bureaucracy of the United States greatly expanded surrounding the War of 1812, to the great reluctance of many, including then president James Madison. In hastily mobilizing military and economic resources for waging the War of 1812, the Madison administration effectively reversed Democratic-Republican political commitments to a weak central state as it sought to build a national military, reestablish a Second National Bank, and expand taxation (Hickey and Clark 2016). After the war, military and administrative forces were further developed under President Monroe's Secretary of War, James C. Calhoun. These efforts largely proceeded in response to how poorly the War of 1812 had unfolded. Despite victories against Britain and allied Indian tribes, the number of casualties of war, primarily from disease, were unanticipated and totaled around 20,000 US soldiers. The security of border areas and territories in the face of Native tribes, imperial powers, and trading companies remained precarious, especially as US officials took advantage of the power vacuum left in the wake of British retreat and hastened land grabs and military advances against tribes on the southeast and northwest frontiers. These developments, by routinizing a level of military-administrative bureaucracy, extended the realm of federal government concerns.

Among these developments, the Military Reorganization Act of 1818 expanded the corps of the Army Medical Department, supervised by Army Surgeon-General James Tilton. Tilton, an army surgeon since the American Revolution, had ordered in 1814 that standardized meteorological observations be recorded at military posts. The network of observers was expanded alongside Secretary Calhoun's 1818 Reorganization and the appointment of Tilton's successor, Joseph Lovell, in the same year. Protecting the health of soldiers, especially those posted in unfamiliar and "insalubrious," or inherently unhealthy, climates, was an eminent concern at a time when diseases appeared a worse enemy than Native tribes or competing powers.

The health of soldiers was an explicitly meteorological affair because health and disease were primarily demonstrated to be a matter of behavior within particular climates. For example, [figure 1](#) presents a table based on army medical observations, in which "systems of climate," once numerically represented, could be cross-tabulated by disease types, as presented within army hospital data.

In this context for understanding and treating disease, Army Surgeon Joseph Lovell's 1817 report, "Remarks on the Sick Report of the Northern Division," amounted to a treatise on military-medical reorganization in light of the perils of hasty, undisciplined, and disease-ridden warfare. It demonstrates that developing a national military, especially in the broader nationalist context of post-1814 American politics, articulated directly with physicians' concerns over climate-based

TABLE exhibiting the relative mortality, extent of sickness, and comparative prevalence of certain diseases.

Systems of climate.	Deaths per centum per medical returns.	Deaths per centum per Adjutant General's returns.	Ratio per 1,000 of mean strength under treatment annually.	Ratio of cases per 1,000 of mean strength.									
				Intermittent fever.	Remittent fever.	Synochal fever.	Typhus fever.	Diarrhoea and dysentery.	Respiratory organs.				
									Catarrh and influenza.	Pneumonia.	Pleuritis.	Phthisis pulmonalis.	Total.
North'n lakes	9-10	1 3-10	2185	193	33	16	4	253	300	19	30	9	358
Atlantic coast	1 5-10	2	1912	36	26	43	5	170	233	22	26	9	290
Stations remote from ocean and inland seas.	8-10	1 4-10	3103	151	24	45	5 9-10	300	552	17	28	5	602
†Average -	9-10	1 5-10	2660	143	26	37	2 4-10	269	439	18	28	7	490
†Average -	1 1-10	1 6-10	2400	217	28	35	3 3-10	243	362	19	28	8	412

FIGURE 1. Excerpt from Samuel Forry's 1840 Statistical Report on the Sickness and Mortality of the US Army, page 172, cross-tabulating disease type by "systems of climate."

disease etiology and over how to organize the medical profession within the War Department.

Because Lovell organized the first central collection of US meteorological statistics, it is worth reconstructing his work in some detail. Initially, he decried the underutilized expertise of the army surgeon, a strategy that proved successful in later securing his tenure as army surgeon-general:

It is from a knowledge of *minutiae*...that the experienced officer and surgeon becomes so much superior to the undisciplined recruit. It is almost entirely in order to acquire this kind of knowledge, that a military establishment is kept up in time of peace, and it is an undoubted fact that in no department of the army is it so slowly acquired and therefore so deficient as the medical. (Lovell 1873 [1817]: 105)

Noting the failure of the military to keep soldiers healthy, alive, and disciplined during the War of 1812—a failure “too well and too publicly known to need comment”—he called for regulatory reforms and an expansion of military medicine. “It is therefore suggested,” he claimed, “whether such alterations be not required in the regulations, as are calculated to produce a system of medical police” (*ibid.*: 104–5). It is precisely this system that he later instituted to govern the training,

appointment, and monitoring of military physicians; their military hospitals and posts; and the bodies and behavior of soldiers.

A policy of “medical police,” present in European military-medical departments influenced by German physician Johann Frank’s (1976 [1799]) *A System of Complete Medical Police*, became increasingly popular among physicians’ societies in the United States around the time of Lovell’s appointment as surgeon-general. Medical policing was an appeal by physicians for government intervention into the regulation of unruly subjects and their environments, especially through hygiene laws and regulations of the medical profession. As Abbott (2005) discusses in a later period using the case of medical licensing, a discourse of medical police served as a “hinge,” linking the logics of medical professional reformers with an emerging national military bureaucracy.

What, therefore, was the aim of medical policing? As Lovell (1873 [1817]: 104) outlined, medical police were to be “best calculated to remedy the evil” of disease, considered chiefly as “the effect of climate.” Referring again to mortality during the War of 1812, he emphasized: “It must have been the climate—the weather—that produced the mischief” (103). Although espousing widely held claims linking climate and disease, Lovell was in a unique position to carry this concern into the realm of federal government policy. He thereby worked to incorporate mischievous climates into the government of military bodies and US territories. On this basis, Lovell (106) instructed,

It should be made the duty of every surgeon, together with his quarterly report to transmit an account of the local situation of his station, of the climate, the diseases most prevalent in the vicinity, and their probable causes, the state of the weather during the time reported with respect to temperature, winds, rain, etc.

Through such reports, later compiled within *Meteorological Registers*, army surgeons would “be enabled to give such an account of the diseases that had occurred, their causes and his treatment, as would be the best possible criterion not only of his medical abilities, but also of his industry and attention to duty” (ibid.). In other words, through the meteorological register, climate, soldiers, and the “industry” of officers could be centrally evaluated and, to use Lovell’s terms, policed accordingly. In this way, meteorological knowledge in the form of a stable observational network was coproduced with urgent governmental efforts to regulate relations between soldiers’ bodies, officer duties, and the potentially disruptive forces of climate, especially at frontier military posts.

Lovell’s scientific developments combined a meteorological and disciplinary gaze toward soldiers in their relations with allegedly unhealthy climates and dangerously unregulated behaviors. This approach was novel in its formality in the US context, but reminiscent of the prior history of military meteorology with which, as an army physician, Lovell was familiar. US officials concerned with military discipline and strategy in unknown or allegedly unfit climates borrowed from the lessons previously learned through British military medicine, especially the work of Sir John Pringle

(1753) and colonial medicine in the tropics.³ British Army surgeon Robert Jackson (1795), as just one example, outlined the culture and customs that comprise the proper soldier-climate relationship. He rejected the widespread belief that “European constitutions” were incapable of safely pursuing hard labor in “hot climates,” and instead argued that soldiers were susceptible to the climatic causes of diseases because of their poor *moral* situation.

The solution for Jackson (1795) to the problem of dying armies was to monitor soldier behavior and institute medical discipline, much like that sought by Lovell decades later and by hygiene reformers in other contexts (Arnold 1996; Bashford 2004; Livingstone 2002). “It is known to every medical person,” Jackson (1795: 260) explained, “that the fevers of hot climates are most dangerous in full and plethoric habits.” However, because “soldiers have little self-command, and seldom resist the gratification of their appetites,” Jackson (*Ibid.*) directed officers toward practices of “great vigilance and attention,” including the daily inspection of meals and of sleeping, drinking, clothing, sexual habits, and exercise regimens. Jackson (1795: 280–81) thereby rejected a policy of making “people of color do the drudgery of soldiers,” reasoning that indolence would only further degrade the moral constitutions of European soldiers. In other words, proper surveillance and discipline would mold the constitutions of European soldiers and secure a successful colonial policy in the region, the inherent unhealthiness of the climate notwithstanding.

Likewise, for the United States, on the eve of instituting military bureaucracy and imperial-continental ambitions, climate knowledge moved into the military body, onto the frontiers, and only through this process began to stabilize as a national form of knowledge. In September 1818, just months after publishing “Remarks on the Sick Report of the Northern Division” and subsequently being appointed surgeon-general, Lovell issued “Regulations of the Medical Department.” These regulations outlined bureaucratic roles and procedures aimed toward systematically examining “the diary of the weather, medical topography of the station or hospital, account of the climate, complaints prevalent in the vicinity, etc, [and] suitable inquiries concerning the clothing, subsistence, quarters, etc., of the soldiers” (Lovell 1873 [1818]: 111, 114). Although his orders were not always followed, they were more successful than calls in the decades prior for coordinated systems of meteorological observation, including parallel efforts by the General Land Office. By the standards of meteorologists and physicians at the time, Lovell’s meteorological network provided a novel basis for evaluating the nature of American climate-disease relations and their governmental apprehension.

After Tilton and Lovell’s initial struggles to order regular collection of meteorological data, army physicians continued to succeed at building the first national network of meteorological observations. Beyond pointing historically to the War of 1812, or in Tilton’s (1813 [1781]) case the debacle that was military life during the American Revolution, medical and military meteorologists expanded their range of

3. The Philadelphia physician Benjamin Rush annotated and republished Pringle’s *Observations on the Diseases of the Army* in 1808, and it was widely used among American physicians (Cassedy 1986: 15).

concerns. Meteorological knowledge, first, could solve outstanding debates about allegedly ongoing climate change and its relationship to the civilizing practices of white Europeans. Second, meteorological networks could provide the basis of a “medical geography” of western lands, which could evaluate not only the health of military posts but also the health of lands for white settlement (Cassedy 1986; Dorn 2001; Valencius 2002).

These issues clearly frame the first Army Medical *Meteorological Register* (see figure 2), based on observations submitted to the surgeon-general’s office. These registers were widely circulated and cited among US and European meteorologists and physicians and were updated periodically even as other meteorological centers were also established (Lawson 1844).⁴

The opening lines of Lovell’s (1826: 3) first *Meteorological Register* link the problem of medical meteorology directly to the active concern that American climates may be changing—a process widely held to impact the health and future habitability of certain areas:

On the question whether in a series of years there be any material change in the climate of a given district of country and if so, how far it depends upon cultivation of the soil, density of population, etc., the most contradictory opinions have been advanced.

US expansion into the uncivilized West, he continued, presented a unique “opportunity” to evaluate possible climate changes wrought by land clearing and related practices in the eastern United States. This opportunity, for Lovell, was a relatively urgent matter. Because of increasing white settlement throughout the 1820s, he claimed that the chance to establish the degree of climate change in civilized regions, “like that for recording the [customs] of the aborigines of the country, is fast passing away” (ibid.). He reasoned that “both these sons of the forest and the interminable wilderness they inhabited will, for all useful purposes, be as though they had never been.” Considering his results uncertain, however, Lovell argued that only a longer series of observations would help “ascertain what changes, if any, have taken place, either in the mean temperature, the range of the thermometer, the course of the winds, or the weather, in the Atlantic States” (4).

Lovell remained inconclusive on the point of civilization and its effects on climate, leading others to advance the controversy, as I discuss in the following text. Nevertheless, Lovell successfully reorganized the medical-meteorological bureaucracy within the War Department. Despite his reluctance to proclaim closure to controversies over climate change, and despite the fact that his programs were implemented inconsistently and his office even nearly abolished in 1830 (Gillett 1987: 27–52), those who followed him continued to pursue military meteorology

4. In figure 2, note the frontier forts from which data was collected. Other observation networks, especially in New York, and by the 1840s, through the Smithsonian Institution, reflect similar processes as those within the Army Medical Department.

MONTHLY ABSTRACTS.

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No. I.

JANUARY.

PLACES OF OBSERVATION.	THERMOMETER.							WINDS.									WEATHER.				
	Mean Temperature.			Aggregate Mean Temperature	Highest degree.	Lowest degree.	Range.	N.	N.W.	N.E.	E.	S.E.	S.	S.W.	W.	Prevailing.	Fair.	Cl'y.	Rain.	Snow.	Prevailing.
	A.M.	P.M.	P.M.																		
	VII.	II.	IX.					Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.		Days.	Days.	Days.	Days.	
Fort Mackinac	16.96	21.19	18.64	18.93	40	-17	57	6	4	2	1	2	8	-	8	S.	8	8	4	11	Cl'dy.
Fort Snelling	10.19	15.12	13.96	13.09	42	-23	65	-	3	-	2	4	4	8	10	W.	18	5	2	6	Fair.
Fort Sullivan	20.80	26.54	22.16	23.17	44	-24	68	5	5	2	2	-	3	4	10	W.	14	13	1	3	Cl'dy.
Fort Howard	18.41	21.74	17.41	19.19	47	-20	67	-	5	-	-	-	-	21	5	S.W.	15	10	2	4	"
Fort Wolcott	29.32	34.74	35.41	33.16	50	2	48	1	11	2	-	4	-	10	3	N.W.	14	10	5	2	"
Council Bluffs	15.48	31.16	19.51	22.05	60	-16	76	16	1	2	1	-	8	2	1	N.	18	13	-	-	Fair.
Fort Columbus	25.77	32.58	28.32	28.89	48	-1	49	-	13	3	1	1	2	6	5	N.W.	16	5	7	3	"
Fort Delaware	32.25	39.93	33.28	35.15	62	8	54	-	14	10	-	1	-	6	-	N.W.	24	5	1	1	"
Washington city	31.00	41.00	35.00	35.66	60	0	60	-	8	7	-	3	3	6	4	N.W.	22	4	3	2	"
Fortress Monroe	40.90	46.29	43.48	43.55	62	21	41	1	8	4	4	2	-	9	3	S.W.	17	9	4	1	"
Fort Johnston	44.16	50.61	47.64	47.47	67	30	37	5	14	1	3	-	4	1	3	N.W.	19	6	6	-	"
Augusta Arsl.	46.12	50.58	49.03	48.57	64	28	36	-	5	-	8	1	1	8	8	S.W.	13	10	7	1	Cl'dy.
Canton. Jesup	44.03	47.39	49.03	46.82	78	14	64	8	3	-	2	5	4	3	6	N.	18	2	10	1	Fair.
Canton. Clinch	47.51	55.93	50.92	51.45	68	24	44	-	10	1	2	6	5	7	-	N.W.	19	2	8	2	"
New Orleans	45.25	60.87	53.48	53.20	77	25	52	6	2	6	4	9	-	3	1	E.	19	5	7	-	"
St. Augustine	54.74	59.10	56.22	56.48	67	44	23	-	2	18	-	3	-	2	6	N.E.	17	11	3	-	"
Canton. Brooke	53.09	64.64	54.19	57.31	80	40	40	-	9	-	5	2	1	7	7	N.W.	25	3	3	-	"

METEOROLOGICAL REGISTER FOR 1826.

FIGURE 2. Excerpt from Joseph Lovell's 1826 Meteorological Register, as reprinted in Lawson (1840: 32).

in terms of climate dynamics, disease causation, and medical policing. Lovell established that meteorological data was a critical aspect of policing unruly subjects and securing the habitability of areas, especially along the frontiers. Although previous generations had attempted to construct stable meteorological observation networks, Lovell succeeded within the Army Medical Department by linking issues of meteorological observation to state-making strategies.

Territorial Exploration and Mapping Climatic Futures

Beyond issues of military medicine and administration, climate knowledge was also coproduced with the practices and analytics of government undergirding US territorial exploration and expansion. We begin such an inquiry on June 20, 1803, around the time Joseph Lovell was just beginning his education at Harvard College and when the Louisiana Purchase was being negotiated in France. On this date President Thomas Jefferson sent detailed instructions to Captain Meriwether Lewis as he and the Army Corps of Discovery prepared for their surveying campaign in the soon-to-be-purchased territory. Jefferson's instructions to Lewis make clear that projects to extend governmental order and "the Empire of liberty," to use Jefferson's (1780) earlier terms, were to include not only topographical information but also "civilizing" interventions:

Considering the interest which every nation has in extending and strengthening the authority of reason and justice among the people around them, it will be useful to acquire what knowledge you can of the state of morality, religion, and information among [Indians], as it may better enable those who may endeavor to civilize and instruct them, to adapt their measures to the existing notions and practices of those on whom they are to operate. (Jefferson 1803)

Civilizing in these terms meant to "instruct" and "operate" through "acquiring knowledge."⁵ However, for Jefferson and scientists broadly speaking, the prospects of civilization, like the health and discipline of soldiers, was partly a climatological issue. Jefferson and his contemporaries widely agreed that civilizational trajectories were climate dependent (Golinski 2008). In *Notes on the State of Virginia*, Jefferson (1794 [1785]) argued that climates in eastern lands were changing because of cultivation, at the same time rejecting critics who argued American climates were degenerating, not improving, the relationship between climate and civilization. Jefferson pursued

5. Civilizing Natives as a government policy was weakly structured at this time. Most Native policy consisted of war making and treaty making to regulate trade and land use. Yet the War Department introduced a Civilization Fund in 1818, with appropriations for civilians to introduce agricultural and educational reforms within western borderlands. Later controversies surrounding removal of Natives west of the Mississippi River also hinged on a discourse of how to measure "civilization" among tribes. The mission, as James Madison declared in his 1809 Inaugural Address, was clear: "carry on the benevolent plans," meaning "the conversion of our aboriginal neighbors from the degradation and wretchedness of savage life to a participation of the improvements of which the human mind and manners are susceptible in a civilized state" (Hunt 1908: 49).

related concerns within the APS and, during the time of Lewis and Clark's expedition, with the visiting naturalist Alexander von Humboldt.⁶

Concerned with the historical and possible future relations between atmospheric and civilizational orders, the expedition sought to institute a meteorological gaze over vast unknown areas of the continent. Jefferson (1803) therefore instructed Lewis to record all encounters with "climate, as characterized by the thermometer, by the proportion of rainy, cloudy, & clear days, by lightening, hail, snow, ice, by the access & recess of frost, by the winds prevailing at different seasons" and other factors. Historians (Kovarsky 2014) have emphasized Jefferson's position as a philosopher-statesman with a background in geographic surveying to help explain the meticulously planned scientific mission of the expedition and his concern over American climate change. However, expanding the frontiers through military, geographic, and meteorological intelligence was less about individual ambition and more about the broader science-state coproduction of frontier legibility. Jefferson's instructions and his scientific interests remained consonant with justifications before Congress that the expedition served to protect American economic interests against British and French traders encroaching on western territories. Measuring western lands, through boundary surveying, military documentation of possible threats, and meteorological and ethnological intelligence, provided a metric of the prospective trajectories of a civilized order in America.

Frontier cartographies, as a major component of frontier representation and capture, only deepened the promise that mapping climates would help to explain and evaluate the distribution and prospects of "civilization" more generally. Techniques for mapping political-territorial order through apprehending trends in climate, population, and civilization, therefore, linked meteorological knowledge to territorial statecraft. Efforts to map prospective futures—onto western lands in particular—brought together cartographic innovations within state surveying with parallel developments in meteorological mapping (see Anderson 2005: 171–233; Schulten 2012).⁷

The scientific missions declared by expeditions to the US West, often jointly organized between the federal government and professional societies (chiefly the APS), articulated with military strategies to survey, evaluate, protect, or usurp territory otherwise used or claimed by foreign governments, trading companies, and Native tribes. Of course, securing frontier legibility did not always succeed as planned. Yet practical failure, as much as successes, indicate the coproduction of climate knowledge and state territorial expansion. The fate of Zebulon Pike's 1805–7 expeditions and of his

6. Jefferson served as president of the APS from 1791 to 1793, and was a member from 1780 until 1826. Through Jefferson, the APS was central to Captain Lewis's training (Bedini 1990). Benjamin Rush was responsible for providing medical-scientific training. Because Rush was a central figure in advancing climate-change theory among physicians, the issues of climate-change and disease were likely a common understanding among expedition members.

7. Humboldt's approach to geography especially influenced frontier cartographies. On the import of Humboldtian cartography to medical meteorology, see Rupke and Wonders (2000), and to expeditions, see Ponko (1997). Meteorological records from the Fremont Expedition, addressed in the following text, show how Fremont implemented his prior meteorological training with the Humboldtian cartographer, Joseph Nicollet (Fremont 1845: 673; Nicollet 1839).

meteorological tables represent an important case of such mutual failures of meteorology and statecraft. Departing from Saint Louis and commissioned by General James Wilkinson to survey boundaries of the Louisiana Territory, the expedition party lost its course and ended in Mexican territory, where they were captured by Spanish authorities and brought to Santa Fe. The expedition was embroiled in political controversy. Amidst possibly imminent war with Spain and during federal investigation of Aaron Burr's conspiracy (implicating Pike's commanding officer, General Wilkinson) to secede and annex Spanish lands in the Southwest, Pike and his meteorological records were precarious.⁸

Pike worried that his charts and tables (such as [figure 3](#)), kept in a single trunk upon capture, would be found by the Spanish and expose his party as spies. So, as Pike recalled, he strategically "caused [my] men to secrete my papers about their bodies, conceiving this to be safer than leaving them in the baggage." However, "in the evening, finding the ladies of Santa Fe were treating them to wine, &c., I was apprehensive their intemperance might discover the secret"⁹ (in Maguire 1889: 390). After collecting the papers, they were promptly discovered and confiscated by Spanish officials. After Pike's release, in an 1807 letter to Spanish Governor Salcedo (in Maguire 1889: 386), Pike appealed: "Your Excellency may be induced to conceive that the measure of seizing my notes, plans, meteorological and astronomical observations... may not be justifiable." He argued to Salcedo that his papers "would enable the executive of the United States to take some steps to ameliorate the barbarous state of the various savage tribes whom I visited" and "would have added in some small degree to the acquirements of science, which are for the general benefit of mankind." Salcedo, claiming Pike's papers violated international agreement, promptly refused. Pike's appeal to science, combined with efforts to have superior officials intercede on his behalf, failed to integrate his records into incipient efforts to construct a national view of climate. His meteorological observations were lost to such purposes. His instruments, "most of them...ruined in the mountains by the falling of the horses from precipices, &c.," were also sold during captivity to avoid having to carriage them back to Louisiana.¹⁰

If the materiality of meteorological observations were intimately tied to successes of state action, military-scientific expeditions through frontier areas also proceeded through a complementary Baconian analytic approach to scientific and governmental legibility. As Secretary of War John Calhoun instructed Major Stephen Long as he prepared to set off on a later expedition up the Missouri River in 1819:

The object of the Expedition, is to acquire as thorough and accurate knowledge as may be practicable, of a portion of our country, which his daily becoming more interesting, but which is as yet imperfectly known. With this view, you will permit *nothing* worthy of notice, to escape your view. (James 1823: 37)

8. Analysis of Pike's expedition is drawn from Pike's 1811 account, reproduced in Maguire's (1896) edition and appended with letters between Pike, Wilkinson, and Spanish officials, and Pike's papers, first recovered by Bolton (1908).

9. Pike to Wilkinson, July 5, 1807 (in Maguire 1889: 390).

10. *Ibid.*: 393.

Meteorological Table for June 1806 & July Aug.

Days	Thermometer			Sky	Wind		Latitude	Longitude	Baria ²	Barometer	Remarks ¹
	M ³	N ⁴	E ⁵		Course	Force					
26		30	25	Clear	E	Gentle	38. 35	21.	7°		
27	24	31	28	Do							
28	26	31	27	Do							
29	28	32	28	Do							
30	25	31	27	Do	W	Gentle					
1	24	28	21	Cloudy Rain	N	A breeze					Heavy Trees blown down
2	23	25	21	Cloudy rain	SE						
3	27	27	23	Cloudy							
4	19	24	20	Rain							
5	19	21	11	Rain							
15		25		Clear	W	Hard	38 35	21 W			
16	24	27	20	Clear	NE						
17	23	30	20	Rain	NW	A Gail					L Charles
18	16	26	20	Clear	S. E.	Gentle					
19	15	18	19	Cloudy	S. W.	Hard					Temperature of the water 5 3/4 of a degree colder than the therm in 14° degrees above 0°
20	15	25	20	Cloudy Rain General clear	N. E.	Gentle					A and thunder & lightning
21	15	20	18	Rain	N. E.	Hard					
22	15	25	16	Clear		Gentle					
23	11	22	18	Clear	N. W.	Gentle					
24	15	24	18	Clear	S. W.	Gentle					Gasconade
25	15	26	24	Do	S. W.	Gentle					
26	15	28	25	Do	S. W.	Gentle					
27	14	25		Cloudy Rain	N. W.	Gentle					Great River Flowing
28	15	24	20	Rain	S. W.						

FIGURE 3. Zebulon Pike's "Meteorological Table for June 1806," among those seized by Spanish officials.

Source: Zebulon Pike's 1805-7 "Notebook of Maps, Traverse Tables, and Meteorological Observations."

The Long Expedition, introduced at the beginning of this article, collected detailed meteorological instrument readings throughout the West. Among hosts of “interesting” facts, meteorological records could be considered a curious appendage to territorial expansion or else a failure of science based on false premises about disease or climate. Over time, however, efforts to stitch climate knowledge into larger tapestries of western settlement and progress helped to construct West territories as sites of agricultural productivity, “salubrious” landscapes, and the possible progress of civilization. From a military or natural-philosophical standpoint, such progress was hardly inevitable. Yet explorations and the matters of fact that they circulated to state officials and possible settlers helped construct western spaces as knowable, habitable, and governable.

How did meteorological facts become integrated into prospective accounts of western territories as habitable and governable spaces? The influential maps produced by the Army Corps of Topographical Engineers of the Frémont Expeditions (1842–45) help answer this question. The expedition was mostly oriented to facilitating westward migration. The maps and associated reports contained not only topographical data but also novel cartographic representations of future settlement. Frémont’s cartographer, Charles Preuss, presented minute notes, often reproduced from Frémont’s journals, on the exact number of Indian “warriors” in various villages; notes on water, fuel, soil, grazing land, and “Indian” problems; and meteorological data collected during the expedition (see [figure 4](#)).

The inclusion of meteorological data on surveying expeditions did not intend to formally represent the stable climate of a region nor aid in specific predictions. Yet it signified that western climates were, in principle, knowable in ways that may align with national expansion.

Those who crafted a system of meteorological recordkeeping helped to make cartographic interventions alongside surveyors, military strategists, and settler-colonists. Such maps, and climate knowledge generally, yielded not only two-dimensional snapshots of areas but also narratives of spatial expansion and future progress.

One might imagine topographical surveyors as a corps of men, instruments, and logbooks, but their work comprised assembling chains of what Short (2009) calls “cartographic encounters.” Maps and tables often began as a patchwork of Native, settler, trader, and explorer testimony and measurements. State actors translated and consolidated diverse information and then distributed it widely to government agents and through print media to settlers, often accompanied by adventure narratives, western boosterism, and medical advice. Popular “emigrants’ guides,” as they were often called, synthesized expedition reports and other information on western climates as exploration proceeded.¹¹ Such guides relied on federal expeditions for legitimacy and data, and they translated climate knowledge into medical and geographical terms that projected civilized futures in western territories. Timothy Flint (1826: 188–89),

11. As examples, Darby (1818), Flint (1826), and Disturnell (1849) rely on expedition reports and maps to guide emigrants, often commenting extensively on climate. Fremont’s reports and maps were uniquely printed by legislative order for direct distribution.

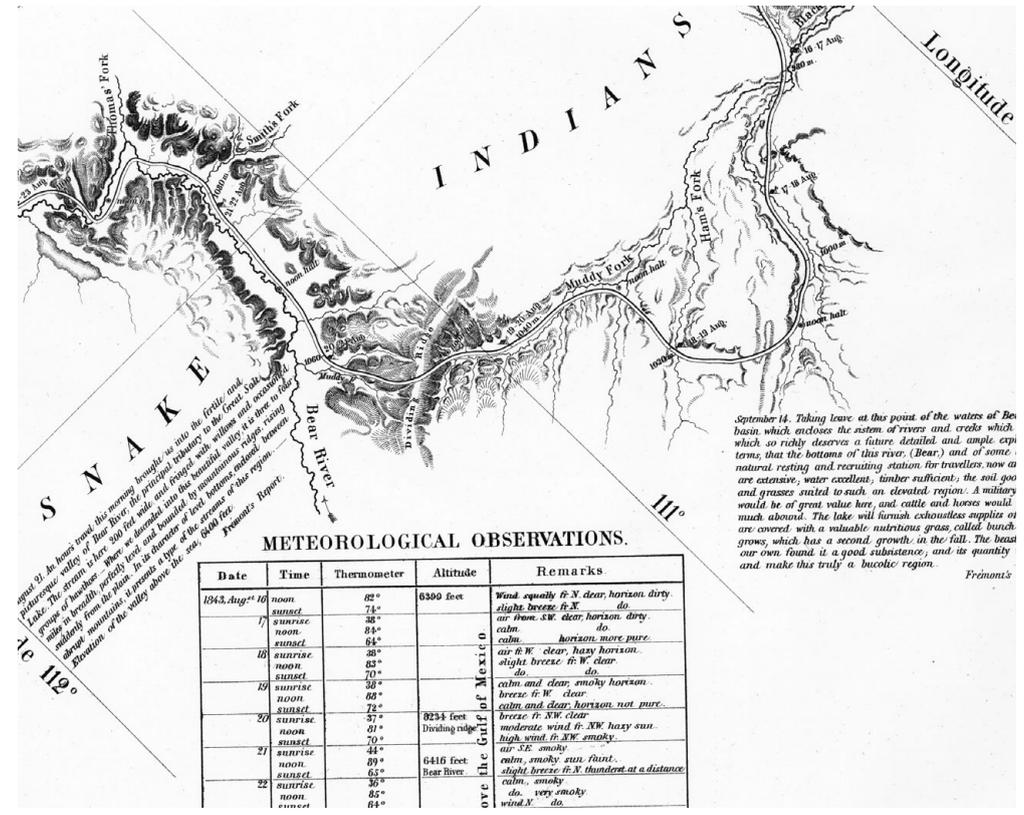


FIGURE 4. Excerpt from John Charles Frémont and Charles Preuss's 1846 "Topographical Map of the Road from Missouri to Oregon, Section V."

for example, combined his own travel narrative with official reports to portray the “exhaustless fertility” of the Missouri plains, on which he envisioned, “the climate will grow salubrious with its population and improvement,” and hence “will arise the actual *Ne plus ultra*.” Through such cartographic and narrative translations, territorial expansion was not only coproduced with the *physical* meteorological network, but also with an *analytic* view toward prosperous and governable climate futures.

Thus far we have traced how developments in meteorology first articulated with issues of forming a healthy and disciplined army, and then with concerns about the nature and trajectory of western territories. Clearly, central scientific issues concerning disease etiology and the relationship between civilization and climatic changes played out in and through military and territorial expansion in the West. Yet what of racial statecraft throughout this period? If the state and meteorological knowledge are indeed coproductive, issues of racial stratification in the decades leading to the American Civil War should provide a test case. It is to this issue that I now turn.

Racial Climatology

By the mid-nineteenth century, meteorology developed into what its leading participants and, later, historians have called an empirical and modernized science. Yet what was the character of this science? To consider this question, I here trace the work of a leading figure in this emergent scientific view of climate, Samuel Forry, and contextualize his work and climate knowledge more broadly with respect to racial ideologies in the pre–Civil War decades. As a “true science,” Forry’s story suggests, climate knowledge coproduced elements of an American racial state.¹²

Forry, a meteorologist and army surgeon, worked under the direction of Thomas Lawson, who was appointed surgeon-general after Joseph Lovell’s death in 1836. Let us first observe how Samuel Forry summarized the field in his famous 1842 text entitled *The Climate of the United States and Its Endemic Influences*:

Numerical analysis applied to governmental objects soon bestowed the character of a science upon political economy [and] the doctrine of averages has been not unaptly styled the mathematics of medical science.... So [in] meteorology, nature has found faithful interpreters content to observe facts and to trace their relations and sequences, thus bestowing upon it the characters of a *true science*. (Forry 1842a: 26, emphasis added)

12. Forry’s work on American climate was internationally well regarded (see Forry 1843c: 116). His work was later hailed the “first general work on the climate of the United States, and thereby also our most important climatological incunabula” (Leighly 1954: 335). Recent historians have mostly viewed Forry’s work as a culmination of developments in the Army Medical Department, yet Fleming (1990: 68–70) situates Forry’s statistical work only within the context of storm-related studies, especially those by James Espy, commissioned by Thomas Lawson in 1842, after Forry resigned from the army (Espy 1843; Forry 1843a).

In other words, “numerical analysis” of atmospheric patterns, disciplined by “facts,” “relations,” and “sequences,” meant meteorology was achieving scientific status. On this basis, Forry rendered the United States within one statistical view of climatological space (see [figure 5](#)).

To what end did meteorology construct such a view? Forry echoed Lovell’s framework for meteorological observation:

A mass of facts thus accumulated will prove of immediate practical use to the philosopher, the physician, and the agriculturist; and to future generations, it will serve to determine what changes, if any, time may effect upon the climate of a particular region. (Forry [1842a](#): 20)

Forry argued that Constantine Volney, Thomas Jefferson, Benjamin Rush, and others, who had promulgated a theory that civilization was actively changing American climates, had in fact made “premature deductions” reliant on the “testimonies of travelers” as opposed to the “thermometrical data” he provided (Forry [1842a](#): 103). Based on decades of data collected through the Army Medical Meteorological Registers, Forry (*ibid.*: 108) granted that “climates are susceptible of melioration” by “the labors of man.” However, “[T]hese effects are extremely subordinate, compared with the modification induced by the striking features of physical geography.” In other words, Forry concluded that the activities broadly constitutive of civilization—especially clearing, reclaiming, and “improving” land—expressed minimal effects on the trajectories of American climates.

Considering Forry’s ambivalence about having effectively settled a long-standing controversy helps to clarify the general terms by which concerns over climate, civilization, and government unfolded up to the mid-nineteenth century. Despite following Lovell’s inconclusive results with ones that appeared to refute a clear progressive climatic trajectory over US territory, Forry nevertheless upheld a radical civilization-climate perspective especially adapted to issues of racial stratification. He ([1842a](#): 95) reasoned: “As climate not only affects the health but modifies the whole physical organization of man, and consequently influences the progress of civilization,” it followed that comparing “systems of climate” would “reveal to the medical philosopher much that is now unknown, and to the political economist many of the circumstances that control the destinies of a people.”

As we saw with the issues of military-medical discipline and territorial expansion, the “whole physical organization” of bodies, lands, and civilization was entwined with categories endogenous to statecraft. By the 1840s, for Forry and for the state, race became just such a category. Numerous public discourses—including a civilizing mission expressed in formal policies like “Manifest Destiny” and the racial politics that undergirded slavery and Indian Removal—were steeped in scientific problems. The contested category of race linked the interests of state officials; partisan interests vehemently for or against national expansion and slavery; and medical and meteorological professionals. In particular, developments in static, biohereditary, and anatomical concepts of race had significant import into how scientists considered the



FIGURE 5. Frontispiece to Samuel Fory's *The Climate of the United States*, showing isothermal lines.

relationship between “climate” and “civilization.” In this way, as I will show, race altered the terms by which climate knowledge proceeded to evaluate the dynamic relationship between populations and climates.

In addition to helping to solidify a national climatological field of vision, like his contemporaries in European colonial settings, Forry’s foundational texts in American climatology presented comparative statistics to evaluate the natural-historical and probable futures of racial order. He concluded that “the superiority of the warlike nations of Southern Europe over the effeminate inhabitants of Asia” had resulted from “this all-pervading agency of atmospheric constitution” (1842a: 22). Climate, in this view, endowed “nations” with properties that explain their character and trajectory. Turning to Native people and “the political horizon of North America,” Forry (1842a: 22) further concluded:

If we look upon history as philosophy teaching by example, it requires not the gift of divination to foresee the destiny of Mexico and the States south of it, whose inhabitants, enervated by climate, conjointly with other causes, will yield, by that necessity which controls all moral laws, to the energetic arm of the Anglo-Saxon race.

Elements of Forry’s conclusions, of course, were hardly new. African slaves had been consistently portrayed by slaveholders and scientists as having bodily “constitutions” suited for laboring in Southern heat, without succumbing to the diseases proper to the white constitution in such climates (Johnson 1827 [1813]). Arguments about differentiated constitutions rationalized a long-standing fear that whites were unfit for “intemperate” climates while also building a scientific basis for enslavement of Africans in the US South (Kupperman 1984; McCandless 2011; Puckrein 1973). Yet Forry’s view of the “energetic” Anglo-Saxons was not one of an *unfit* race, but of one endowed with relatively stable racial features that exhibited exceptional biological qualities that transcend climatic influence.

Written only several years before the imperial Mexican-American War and amidst political tensions regarding slavery and territorial expansion, Forry’s arguments concerning western climate and racial fitness indicate the broader conceptual import of racialized climate knowledge. We can call this knowledge a “racial climatology.” Advancing a complex climatic theory of racial domination, Forry’s arguments helped to build the contours of racial theory in this period, and his authority as a meteorologist and his control over climate statistics were important to such developments. Forry’s view of climate enacted what Omi and Winant term *racialization*, defined as “the extension of racial meaning to a previously racially unclassified relationship” (Omi and Winant 2015: 13). In this case, the alleged relationship between a historicized racial type (the “energetic” Anglo-Saxon) and particular climates provided a novel construction of racial hierarchy and order.

In a series of articles (Forry 1842b, 1843b, 1856) concerning racial polygenesis, or the theory that races lack common ancestry, Forry most explicitly developed the political (and theological) significance of his racial climatology. Although he rejected

the polygenesis theory by affording a degree of flexibility and “adaptation” to racial types, his work nevertheless reified a superior Anglo-Saxon race. Having traced the Anglo-Saxon racial type to premodern population and climate dynamics in northern Europe, Forry then posited that degrees of intelligence, civilization, and morality were products of three major factors: climate, social organization, and, drawing positively from phrenologists, what he termed “cranial organization.” Forry (1842b: 130) concluded,

Can it be supposed that [the] noble developments of the present races contrasted with the low forehead, diminutive stature, and deformed figure, of some of the northern hordes who overran Southern Europe, are not owing mainly to the influence of civilization and a more genial climate?

Answering affirmatively, Forry nevertheless emphasized that prior accounts of civilization and climate were mistaken insofar as they proceeded “without any knowledge of the functions of different parts of the brain” (ibid.: 131). Regarding “Caucasians,” he concluded, “it is among these nations that the progress of civilization and the development of the anterior portion of the brain, each exercising on the other a mutual influence, have gone hand in hand” (1843b: 38). Unlike prior climatic theories of human difference dating back to Montesquieu’s *De L’esprit des Lois* and Buffon’s *Histoire Naturelle*, Forry synthesized the influential phrenological and anatomical-racist theories of his day, many of which challenged the entire paradigm linking climatic causes to racial formation.¹³

To summarize, Forry provided an account of racial types as outcomes of interaction between, on the one hand, the physical and social effects of climate on degree of civilization, and on the other hand, the moral and “cranial” effects of the civilizing process. Recall that an initial governmental rationale for pursuing climate knowledge concerned the degrading or unhealthy effects of unknown or changing climates on “European constitutions.” By linking intelligence and morality to relatively stable categories of “cranial organization,” however, Forry’s analysis did not problematize white “constitutions” as such. Rather, Forry’s racial climatology was oriented to evaluating what he saw as inevitable racial domination. In other words, Forry was working out the political implications of how historical climates had inscribed *brains*—not only bodies, civilized minds, and moral behaviors—with qualities that were more stable than the bodily “constitutions” as considered by previous generations of medical meteorologists. If racially stable by biological fact, then the danger of unhealthy climates notwithstanding, Anglo-Saxons were by nature fit for continental expansion.

13. Forry situated his account of race, climate, and civilization with reference to anthropologist James Pritchard, whom he defended, and Samuel Morton, a leading polygenist. He upheld the cranial and physical superiority of Caucasians, as established by Morton’s (1839) craniometric studies and Francis Peron’s dynamometric studies of “savages”’ inferior strength. Yet he rejected polygenism with climatological arguments, especially concerning the aboriginal “American” racial type. Analysis of climate helped Forry provide a materialist ground for racial difference: “It thus appears that mind dwells in a material tabernacle, and is acted upon by material causes” (1842b: 130), a position from which he justified the civilizing obligation of Anglo-Saxons.

Racial climatology, in effect, helped constitute broader discourse concerning Native, immigrant, and black races that transcended political debates over slavery, expulsion of Native people, and other forms of state-sanctioned racial violence and subjugation. Alongside coercive racism, civilizational discourse as developed through racial climatology helped form a diffused biopolitics aimed toward a “productive” engagement with climate and racial difference (cf. Foucault 1980: 119).

Advanced by Forry (1840; 1842a: 28; 1848)¹⁴ and increasingly popular among urban reformers and western physicians, “medical geography,” and what Forry called “hygeiology” and “state medicine,” helped to work out a governmental and medical synthesis of climatological and racial difference. Contemporary studies in medical geography were highly racialized, demonstrably so by the famous Ohio physician, Daniel Drake. In his *magnum opus*, Drake (1850) provided a broad medical program based on comparative climate statistics and racially stratified biomedical indices and therapeutic techniques. He intricately mapped geographical and climatological areas, framing his analyses according to the “Caucasian,” “African,” “Indian,” and “Esquimaux” races (Drake 1850: vi) races. Although primarily surveying the medical geographies of the Caucasian race (stratified by European ethnicities), he situated this racial type as a special subject of medical geography. By evaluating the “physiological etiology” of Caucasian diseases, Drake (*ibid.*: 637) analyzed westward migration as a modifying force on racial constitution and its medical consequences. Drake viewed westward movement of whites as a natural trajectory, suggesting racial destinies would culminate in “amalgamation”: “The homogeneous millions, with which time will people the great region between the Appalachian and Rocky Mountains [are] thus destined to present the last and greatest development of society” (647). Yet Drake nevertheless reified racial difference and focused on Caucasian diseases, stating that “I shall dismiss [the others], until the history of the diseases of the Caucasian races is finished” (638).

In effect, racial climatologies deepened claims that races were observable and treatable in biologically distinct ways, even if medical geographers diverged on political lines regarding slavery and reform movements. Valencius (2002: 246) finds that Daniel Drake supported slavery and reserved his ambivalence toward racial “amalgamation” only for European nationalities. Polygenists who supported slavery, for example Josiah Nott (1851), rejected arguments of monogenists like Forry by denying the relevance of climate knowledge to scientific racism altogether. For his part, Forry rejected slavery as immoral, reasoning that “Negroes in the lowest stage of civilization are the ugliest, having depressed, fore heads, flat noses, projecting jaws, and crook’d legs.” Yet he concluded, these “most ferocious savages—stupid, indolent, and sensual,” could be “elevated in the scale of social condition,” leading to

14. Forry (1842a: 128) claimed *The Climate of the United States* provided “some general laws towards the basis of a system of medical geography.” It was reviewed favorably as such (Caldwell 1843; see also Forry 1848: 299–301). Forry’s posthumously published text, *Vital Statistics*, extended the governmental implications of medicine: “The object of the science of medicine,” Forry (1848: 290) reasoned, “is not alone the cure of diseases: but it has, as will be seen, the most intimate relations with the social organization.... [Medicine] spreads the wings of its solicitude over all society.”

possible “improvement in their physical feature” (Forry 1842b: 118). How might such improvement proceed? Forry wagered that “political institutions and social organization often struggle successfully against climatic agency,” the Anglo-Saxon race forming his primary historical case in point. In other terms, “the superior endowments of a more fortunate race should be exercised in extending the blessings of civilization” (ibid.: 132).

Racial superiority as a basis for allegedly necessary, beneficial, or inevitable social domination, of course, had long-standing consequences. Perhaps the most important were Democratic political movements to justify slavery and naturalize racial exclusion through such landmark policies as those reached through the 1857 *Dred Scott* decision. With perhaps more providential zeal than colonial discourse of climate in other contexts marked by racial anxiety (see Anderson 2006; Parsons 2014), a diffuse, “civilizing” racism emboldened Anglo-Saxon superiority as political and climatic destiny. The role of science in constituting “whiteness” and its racial others as socio-biological categories is widely recognized. Here we find that meteorologists helped evaluate a climatological basis for racial hierarchy in an expanding United States. In whatever degree less violent than biological justifications for slavery or state-sanctioned violence, racial climatology nonetheless advanced an ideology of providential nationalism that placed territorial and racial expansion on a scientific foundation. In this way racial climatology formed a component of the broader coproduction of statecraft and climate knowledge that emerged over the antebellum period.

Conclusion

The present analysis demonstrates how, during the period from 1800 to 1850, the development of meteorology was coproduced with three emerging domains of US statecraft: military medicine, discipline, and administration; territorial exploration and frontier expansion; and foundational ideologies of a racial state. Thus, making climate a category of scientific knowledge was simultaneously a matter of making legible the relations between mobile, often racially coded, bodies and their environs, thereby helping to secure a governable social order. My historical narrative of science-state coproduction holds two major implications. The first is empirical and concerns how to interpret matters of meteorological government in the 1800–50 period in the United States. The second is analytical, and concerns broader historical dynamics of meteorological government and theories of state-science coproduction.

Regarding historical narratives of meteorology, as Fleming (1990) and others show, meteorological networks in the nineteenth century were foundational to subsequent developments in meteorology in the United States. Yet the narrative I have sketched of the formation of meteorological networks and climate knowledge in the 1800–50 period has not been uncovered through a historical approach seeking to trace the pre-history of weather forecasting and later modeling techniques that form the technical bases of contemporary atmospheric and climate sciences. Nor did meteorological observation succeed only by the hard work of those seeking accounts of storms patterns

or stable regional characteristics, even if they later contributed to such efforts. Rather, climate knowledge succeeded by actors' efforts to practically link meteorological networks to western territoriality and to develop an analytic of government that could make legible and then integrate new lands and stratified populations. Clearly, what gets stabilized throughout this period is something never achieved—a centralized meteorological observation network with widespread applications. But this network, its precipitating causes for institution and its meaningful significance, did not stand apart from broader networks of power. Rather it was constituted through the course of statecraft. From the management of the unruly and diseased military body, to evaluations and imaginaries of western territorial expansion, to the racial politics of diminishing or “civilizing” inferior groups, we find climate knowledge imbricated in a larger apparatus of power. Any historical assertion that meteorologists' tables and maps of the climate of the United States might stand alone, to be considered in isolation, presents a myth that in effect sustains claims to an autonomous rationality of climate science and the apolitical nature of the very category of “climate.”

Regarding science-state coproduction, the analysis shows that statecraft involved neither an instrumental harnessing of scientific authority for an autonomous political logic, nor any inevitable capacity to make bodies, diseases, habitable territories, and state agents governable by a central bureaucratic administration. Rather, statecraft and climate knowledge were coproduced through practical and analytic forms of meteorological government. Governing relations between atmospheres and populations, in other words, first entailed aligning physical networks, including the diverse components assembled in meteorological statistics and the tenuous peripheries of state institutions. Second, meteorological government involved prospective evaluations of climate-population dynamics, making climatic and social orders legible and, hence, categories of governmental concern.

The analysis here presents one case of meteorological government, and reflects related analyses that have sought to recover the historical developments of social power and climate knowledge, especially in European colonial contexts. Such a project remains unfinished, not only because of other possible case studies but also because critical historical investigation, as Foucault (1980) outlines in his approach to genealogical analysis, is reflexively marked by ongoing developments in social power and “regimes of truth.” In this light, the conceptualization of meteorological government developed here, and an analytic focus on state-science coproduction more generally, may help inform recent studies of climate knowledge that seek to bridge histories of colonialism, imperialism, and science with emergent scientific and political discourse concerning global warming (see Mahony and Hulme 2016). Although critical studies of climate science first emerged within a broad concern over globalization and its reflection in international science and climate policy arenas, climate expertise has shifted in recent decades. Attempts to govern the climate-society relationship have sharply turned toward building “resilience” to imminent climate impacts, primarily under a paradigm of “climate change adaptation.” The governmental apparatus that substantiates “adaptation” involves an array of scientific fields and a biopolitical concern with populations' possible exposures to risk, insecurities, and

disorder. As in the mid-nineteenth century, legibility projects are therefore underway to ensure that possibly radical changes in climatic and social orders remain governable. Coproduction of science and the state is here both practical, comprised chiefly of regional climate modeling and strategic scenario-building, and analytic, buoyed by a logic of maintaining an orderly relationship between global climate and variously stratified populations.

Yet we do not have a genealogy of climate knowledge that pulls together these and other such ordering strategies with reference to the power relations and trajectories they may entail. The dominant approach to the climate knowledge-power relationship in the social sciences is to show how political and economic interests impede the development and salience of scientific truth regarding global warming. Complementing this stake in current struggles over scientific authority, scholars have traced genealogies of climate science, arguing the field proceeds through a logic autonomous from the politics that surround or inhibit its progress (Weart 2008). The analysis presented here, however, suggests that climate knowledge—in its truth—may comprise practices of meteorological government. Reconstructing such practices remains an important project in various historical and contemporary contexts.

References

- Abbott, Andrew (2005) "Linked ecologies: States and universities as environments for professions." *Sociological Theory* 23 (3): 245–74.
- Anderson, Katharine (2005) *Predicting the Weather: Victorians and the Science of Meteorology*. Chicago: University of Chicago Press.
- Anderson, Warwick (2006) *The Cultivation of Whiteness: Science, Health and Racial Destiny in Australia*. Durham, NC: Duke University Press.
- Arnold, Daniel (1996) *Warm Climates and Western Medicine: Emergence of Tropical Medicine, 1500–1900*. London: Rodopi.
- Baker, Zeke (2017) "Climate state: Science-state struggles and the formation of climate science in the US from the 1930s to 1960s." *Social Studies of Science* 47 (6): 861–87.
- Bashford, Alison (2004) *Imperial Hygiene: A Critical History of Colonialism, Nationalism and Public Health*. New York: Palgrave.
- Beattie, James, Emily O’Gorman, and Matthew Henry, eds. (2014) *Climate, Science, and Colonization: Histories from Australia and New Zealand*. New York: Palgrave.
- Bedini, Silvio A. (1990) *Thomas Jefferson: Statesman of Science*. New York: Macmillan.
- Benson, Michael, ed. (1988) *From Pittsburgh to the Rocky Mountains: Major Stephen Long’s Expedition, 1819–1820*. Golden, CO: Fulcrum.
- Bolton, Herbert (1908) "Papers of Zebulon M. Pike, 1806–1807." *American Historical Review* 13 (4): 798–827.
- Caldwell, Charles (1843) "Review: Samuel Forry’s ‘The Climate of the United States.’" *Western Journal of Medicine and Surgery* 7 (2): 142–53.
- Carroll, Patrick (2006) *Science, Culture, and Modern State Formation*. Berkeley: University of California Press.
- Cassedy, James H. (1986) *Medicine and American Growth, 1800–1860*. Madison: University of Wisconsin Press.
- Coen, Deborah R. (2011) "Imperial climatographies from Tyrol to Turkestan." *Osiris* 26 (1): 45–65.

- Conklin, Alice L. (1997) *A Mission to Civilize: The Republican Idea of Empire in France and West Africa, 1895–1930*. Stanford, CA: Stanford University Press.
- Darby, William (1818) *The Emigrants' Guide to the Western and Southwestern States and Territories*. New York: Kirk and Mercein.
- Davis, Diana K. (2016) *The Arid Lands: History, Power, Knowledge*. Cambridge, MA: MIT Press.
- Disturnell, John (1849) *The Emigrant's Guide to New Mexico, California, and Oregon*. New York: Disturnell.
- Dorn, Michael (2001) "(In)temperate zones: Daniel Drake's medico-moral geographies of urban life in the Trans-Appalachian American West." *Journal of the History of Medicine and Allied Sciences* 55 (3): 256–91.
- Drake, Daniel (1850) *A Systematic Treatise, Historical, Etiological, and Practical, on the Principal Diseases of the Interior Valley of North America*. Philadelphia: Lippincott.
- Drayton, Richard (2000) *Nature's Government: Science, Imperial Britain, and the "Improvement" of the World*. New Haven, CT: Yale University Press.
- Duncan, James S. (2007) *In the Shadows of the Tropics: Climate, Race and Biopower in Nineteenth-Century Ceylon*. Hampshire, UK: Ashgate.
- Elias, Norbert (2000 [1939]) *The Civilizing Process: Sociogenetic and Psychogenetic Investigations*. Oxford: Blackwell.
- Epstein, Steven (1996) *Impure Science: AIDS, Activism, and the Politics of Science*. Berkeley: University of California Press.
- Espy, James (1843) *First Report on Meteorology to the Surgeon-General of the United States Army*. Washington, DC: Surgeon General Office.
- Feldman, Theodore S. (1990) "Late Enlightenment meteorology," in Tore Frangsmyr, J. Heilbron, and Robin Rider (eds.) *The Quantifying Spirit in the Eighteenth Century*. Berkeley: University of California Press: 143–79.
- Fleming, James R. (1990) *Meteorology in America, 1800–1870*. Baltimore: Johns Hopkins University Press.
- (1998) *Historical Perspectives on Climate Change*. Oxford: Oxford University Press.
- Fleming, James R., Vladimir Janković, and Deborah R. Coen, eds. (2006) *Intimate Universality: Local and Global Themes in the History of Weather and Climate*. Sagamore Beach, MA: Science History Publications.
- Flint, Timothy (1826) *Recollections of the Last Ten Years*. Boston: Cummings.
- Fory, Samuel (1840) *Statistical Report on the Sickness and Mortality of the US Army*. Washington, DC: Gideon.
- (1842a) *The Climate of the United States and Its Endemic Influences*. New York: Langley.
- (1842b) "Do the various races of man constitute a single species?," *New York Lancet* 2 (6): 113–33.
- (1843a) *Meteorology: Comprising a Description of Atmospheric and Its Phenomena, the Laws of Climate in General*. New York: Winchester.
- (1843b) "The Mosaic account of the unity of the human race, confirmed by the natural history of the American Aborigines." *American Biblical Repository* 10 (19): 29–80.
- (1843c) "Bibliographic notice: Climate of the United States, meteorology." *New York Journal of Medicine and the Collateral Sciences* 1 (1): 116.
- (1848) "Vital statistics—The development of man's faculties, and the laws of his mortality and reproduction, viewed in their relations to hygiology or state medicine." *New York Journal of Medicine* 10 (30): 289–307.
- (1856) "Considerations on the distinctive characteristics of the American aboriginal tribes," in Henry Schoolcraft (ed.) *Information Respecting the History Condition and Prospects of the Indian Tribes of the United States*. Philadelphia: Lippincott: 354–65.
- Foucault, Michel (1980) *Power/Knowledge: Selected Interviews and Other Writings, 1972–1977*, ed. Colin Gordon. New York: Vintage.
- (1991) "Governmentality," in Graham Burchell, Colin Gordon, and Peter Miller (eds.) *The Foucault Effect: Studies in Governmentality*. Chicago: University of Chicago Press: 87–104.

- (2004) *Security, Territory, Population: Lectures at the College de France, 1977–1978*, trans., Graham Burchell. New York: Picador.
- (2008) *The Birth of Biopolitics: Lectures at the College de France, 1978–1979*, trans., Graham Burchell. New York: Picador.
- Frank, Johann (1976 [1799]) *A System of Complete Medical Police*, ed. Erna Lesky. Baltimore: Johns Hopkins University Press.
- Frémont, John C. (1845) *Report of the Exploring Expedition to the Rocky Mountains in the Year 1842, and to Oregon and North California in the Years 1843–44*. Washington, DC: Gales and Seaton.
- Frémont, John Charles, and Charles Preuss (1846) “Topographical map of the road from Missouri to Oregon, Section V.” Baltimore: US Congress, <https://www.loc.gov/item/99446202/> (accessed October 20, 2017).
- Gillett, Mary (1987) *The Army Medical Department, 1818–1865*. Washington, DC: US Army Center of Military History.
- Goetzmann, William H. (1966) *Exploration and Empire: The Explorer and the Scientist in the Winning of the American West*. New York: Knopf.
- Goldberg, Daniel T. (2002) *The Racial State*. Malden, MA: Blackwell.
- Golinski, Jan (2008) “American climate and the civilization of nature,” in James Delbourgo and Nicholas Dew (eds.) *Science and Empire in the Atlantic World*. New York: Routledge: 153–74.
- Grove, Richard H. (1995) *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860*. Cambridge: Cambridge University Press.
- Harper, Kristine C. (2008) *Weather by the Numbers: The Genesis of Modern Meteorology*. Cambridge, MA: MIT Press.
- Harrison, Mark (1999) *Climates and Constitutions: Health, Race, Environment and British Imperialism in India, 1600–1850*. New York: Oxford University Press.
- Hickey, Donald, and Connie Clark, eds. (2016) *The Routledge Handbook of the War of 1812*. New York: Routledge.
- Horsman, Reginald (1981) *Race and Manifest Destiny: The Origins of American Racial Anglo-Saxonism*. Cambridge, MA: Harvard University Press.
- Hulme, Mike (2008) “The conquering of climate: Discourses of fear and their dissolution.” *The Geographical Journal* 174 (1): 5–16.
- Hunt, Gaillard (1908) *The Writings of James Madison*. Vol. 3, 1809–1819. New York: Putnam’s Sons.
- Jackson, Robert (1795) *A Treatise on the Fevers of Jamaica*. Philadelphia: Campbell.
- James, Edwin, ed. (1823) *Account of an Expedition from Pittsburgh to the Rocky Mountains*. Philadelphia: Carey.
- Jankovic, Vladimir (2000) *Reading the Skies: A Cultural History of English Weather, 1650–1820*. Chicago: University of Chicago Press.
- Jasanoff, Sheila, ed. (2004) *States of Knowledge: The Co-production of Science and Social Order*. New York: Routledge.
- Jasanoff, Sheila, and Marybeth Martello, eds. (2004) *Earthly Politics: Local and Global in Environmental Governance*. Cambridge, MA: MIT Press.
- Jefferson, Thomas (1780) “Letter to George Rogers Clark. 25 December,” in US National Archives and Records Administration, Thomas Jefferson Papers, founders.archives.gov/documents/Jefferson/01-04-02-0295 (accessed January 12, 2017).
- (1794 [1785]) *Notes on the State of Virginia*. Philadelphia: Carey.
- (1803) “Instructions to Meriwether Lewis,” in Rivers, Edens, Empires: Lewis and Clark and the Revealing of America, loc.gov/exhibits/lewisandclark/transcript57.html (accessed June 4, 2017).
- Johnson, James (1827 [1813]) *The Influence of Tropical Climates on European Constitutions*. London: Underwood.
- Kovarsky, Joel (2014) *The True Geography of Our Country: Jefferson’s Cartographic Vision*. Charlottesville: University of Virginia Press.
- Kupperman, Karen O. (1984) “Fear of hot climates in the Anglo-American colonial experience.” *William and Mary Quarterly* 41 (2): 213–40.

- Lawson, Thomas (1840) *Meteorological Register for the Years 1826–1830*. Philadelphia: Haswell.
- (1844) *Directions for Taking Meteorological Observations*. Washington, DC: Surgeon General Office.
- Leighly, John (1954) “Climatology,” in Preston James and Clarence Jones (eds.) *American Geography: Inventory and Prospect*. Syracuse, NY: Syracuse University Press: 334–61.
- Le Treut, Hervé, et al. (2007) “Historical overview of climate change,” in Susan Solomon et al. (eds.) *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the 4th Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press: 93–127.
- Livingstone, David N. (1991) “The moral discourse of climate: Historical considerations on race, place and virtue.” *Journal of Historical Geography* 17 (4): 413–34.
- (2002) “Race, space and moral climatology: Notes towards a genealogy.” *Journal of Historical Geography* 28 (2): 159–80.
- (2015) “The climate of war: Violence, warfare and climatic reductionism.” *Wiley Interdisciplinary Reviews: Climate Change* 6 (5): 437–44.
- Lovell, Joseph (1873 [1817]) “Remarks on the sick report of the Northern Division for the year ending June 30, 1817,” in Harvey E. Brown, *The Medical Department of the United States Army from 1775 to 1873*. Washington, DC: Surgeon General’s Office: 102–7.
- (1873 [1818]) “Regulations of the Medical Department of the United States Army,” in Harvey E. Brown, *The Medical Department of the United States Army from 1775 to 1873*. Washington, DC: Surgeon General’s Office: 110–24.
- (1826) *Meteorological Register for the Years 1822–1825*. Washington, DC: Krafft.
- Maguire, William, ed. (1889) *Exploratory Travels through the Western Territories of North America*, by Zebulon Montgomery Pike. Denver, CO: Lawrence and Co.
- Mahony, Martin (2014) “The predictive state: Science, territory and the future of the Indian climate.” *Social Studies of Science* 44 (1): 109–33.
- (2016) “For an empire of ‘all types of climate’: Meteorology as an imperial science.” *Journal of Historical Geography* 51: 29–39.
- Mahony, Martin, and Mike Hulme (2016) “Epistemic geographies of climate change: Science, space and politics.” *Progress in Human Geography*, December 9, doi: [10.1177/0309132516681485](https://doi.org/10.1177/0309132516681485).
- Mann, Michael (1993) *The Sources of Social Power*. Vol. 2, *The Rise of Classes and Nation-States, 1760–1914*. New York: Cambridge University Press.
- Mazlish, Bruce (2004) *Civilization and Its Contents*. Stanford, CA: Stanford University Press.
- McCandless, Peter (2011) *Slavery, Disease, and Suffering in the Southern Lowcountry*. Cambridge: Cambridge University Press.
- Miller, Clark A. (2004) “Climate science and the making of a global political order,” in Sheila Jasanoff (ed.) *States of Knowledge: The Co-production of Science and Social Order*. New York: Routledge: 46–66.
- Morton, Samuel G. (1839) *Crania Americana*. Philadelphia: Dobson.
- Mukerji, Chandra (1997) *Territorial Ambitions and the Gardens of Versailles*. New York: Cambridge University Press.
- Nicollet, Joseph N. (1839) *Essay on Meteorological Observations*. Washington, DC: Gideon.
- Nott, Josiah (1851) *An Essay on the Natural History of Mankind: Viewed in Connection with Negro Slavery*. Mobile, AL: Dade, Thompson and Co.
- Oels, Angela (2005) “Rendering climate change governable: From biopower to advanced liberal government?,” *Journal of Environment and Planning* 7 (3): 185–207.
- Omi, Michael, and Howard Winant (2015) *Racial Formation in the United States*, 3rd ed. New York: Routledge.
- Parenti, Christian (2014) “The environment making state: Territory, nature, and value.” *Antipode* 47 (4): 829–48.
- Parsons, Meg (2014) “Destabilizing narratives of the ‘triumph of the white man over the tropics’: Scientific knowledge and the management of race in Queensland, 1900–1940,” in James Beattie, Emily O’Gorman,

- and Matthew Henry (eds.) *Climate, Science, and Colonization: Histories from Australia and New Zealand*. New York: Palgrave: 213–32.
- Pike, Zebulon (1805–7) “Zebulon Pike’s notebook of maps, traverse tables, and meteorological observations.” National Archives and Records Administration, Records of the Adjutant General’s Office, Record Group 94, <https://catalog.archives.gov/id/5928242> (accessed June 5, 2017).
- Ponko, Vincent (1997) “The military explorers of the American West, 1838–1860,” in John Allen (ed.) *North American Exploration*. Vol. 3, *A Continent Comprehended*. Lincoln: University of Nebraska Press: 332–411.
- Pringle, John (1753) *Observations on the Diseases of the Army in Camp and Garrison*. London: Millar.
- Puckrein, Gary (1973) “Climate, health and black labor in the English Americas.” *Journal of American Studies* 13 (2): 179–93.
- Rupke, Nicolaas, and Karen Wonders (2000) “Humboldtian representations in medical cartography,” in Nicolaas Rupke (ed.) *Medical Geography in Historical Perspective*. London: Wellcome Trust Centre: 163–75.
- Schulten, Susan (2012) *Mapping the Nation: History and Cartography in Nineteenth-Century America*. Chicago: University of Chicago Press.
- Scott, James C. (1998) *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed*. New Haven, CT: Yale University Press.
- Shapin, Steven, and Simon Schaffer (1985) *The Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*. Princeton, NJ: Princeton University Press.
- Short, John R. (2009) *Cartographic Encounters: Indigenous Peoples and the Exploration of the New World*. Chicago: University of Chicago Press.
- Skowronek, Stephen (1982) *Building a New American State: The Expansion of National Administrative Capacities, 1877–1920*. Cambridge: Cambridge University Press.
- Taylor, Marcus (2014) *A Political Ecology of Climate Change Adaptation: Livelihoods, Agrarian Change, and the Conflicts of Development*. New York: Routledge.
- Tilly, Charles (1990) *Capital, Coercion, and European States, AD 990–1990*. Cambridge, MA: Blackwell.
- Tilton, James (1813 [1781]) *Economical Observations on Military Hospitals; and the Prevention and Cure of Diseases Incident to an Army*. Wilmington, DE: Wilson.
- Valencius, Coneverly B. (2002) *The Health of the Country: How American Settlers Understood Themselves and Their Land*. New York: Basic Books.
- Weart, Spencer (2008) *The Discovery of Global Warming*. Cambridge, MA: Harvard University Press.
- Zilberstein, Anya (2016) *A Temperate Empire: Making Climate Change in Early America*. New York: Oxford University Press.