

Mayflowers and Sleeping Johnnies: Nature-Study, Local Knowledge, and A. H. MacKay's Phenological Research in Rural Nova Scotia, 1892-1925

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Article abstract

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Résumé : *Cet article explore le contexte social entourant une expérience unique de science participative au début du XXe siècle et dont l'objectif résidait dans l'enregistrement de données phénologiques dans les régions rurales de la Nouvelle-Écosse. Il porte plus particulièrement sur l'interaction entre les administrateurs du projet et les populations rurales qui y ont participé, amenant ainsi des acteurs non traditionnels – des jeunes femmes et des enfants de zones rurales – à l'avant-plan de l'histoire des sciences au Canada. Ces interactions continues ont révélé les efforts déployés au début du XXe siècle pour consolider l'autorité scientifique parallèlement à ceux visant à normaliser la mobilisation des collectivités rurales par rapport au monde naturel. Toutefois, les participants ont mis en doute les idéaux scientifiques du projet, affirmant la pertinence des connaissances locales et propres aux milieux ruraux de Nouvelle-Écosse.*

Keywords: history of education, nature-study movement, phenology, crowd-sourced science, Nova Scotia

ALWAYS A WATCHED-FOR SIGN OF SPRING, the annual blooming of mayflowers was regularly reported in newspapers across Nova Scotia in the late nineteenth century [Fig. 1, next page]. The province's official floral emblem since 1901 and closely associated with the province long before, these “fragrant little harbingers of Spring” are tiny, sweet-smelling, pink and white forest ephemerals. They grow along the edges of the woods, where the rays of the sun find their earliest purchase in the frozen earth, and often “bloom amid the snow.” From late March through early May, local newspapers could report simply that “Mayflowers have made their appearance” to invoke the whole range of emotions and sensory longings that accompanied the changing seasons. As the spring progressed, a walk in the woods might also reveal a number of other early wildflowers—violets, bluets, goldthread—but these plants rarely made the papers.¹



Figure 1. Mayflowers in bloom. Photo by Sara Spike.

In 1901, Ella Gaetz and her students in the coastal village of West Petpeswick, Halifax County, found their first mayflowers on March 24, among the earliest in the province that year. In the Acadian community of Meteghan, Digby County, Sister Mary Alexius and her students found mayflowers on April 15. For Christina Baillie's students in Loganville, Pictou County, it was April 20.² More than the seasonal observations of their neighbours, these sightings were recorded as part of an ambitious crowd-sourced science project run through the provincial school system. Beginning in the late 1890s and continuing through the first quarter of the twentieth century, teachers and students across rural Nova Scotia recorded thousands of phenological observations in their communities. Phenology charts the timing of seasonal life cycles. In addition to an extensive list of wildflowers, participants noted events such as the first alder catkins shedding pollen and the first frogs peeping in the spring, the first ripe wild strawberries in early summer, the first geese migrating in the fall, the opening and closing of rivers, the planting and harvesting of potatoes, and so on. The project encouraged teachers to record more than one hundred natural and agricultural phenomena.

Phenology was the pet project of Alexander H. MacKay, Nova Scotia's provincial Superintendent of Education from 1891 to 1926, who insisted on its inclusion in the rural school curriculum during his tenure. Teachers were requested to submit detailed schedules at the end of each school year, using elaborate forms printed into their official school registers.³ [Fig. 2] MacKay

kept extensive ledgers of the collected data, attempting to produce a scientific picture of the province's natural life cycles. Although phenological reporting was a common hobby of naturalists at the time, MacKay has the unique distinction of having mandated thousands of rural teachers and schoolchildren to feed his statistics. Nothing on a similar scale was implemented anywhere in North America at the time and MacKay's assertion in 1903 that "the Nova Scotian Phenological Observations are the most complete ... observations of the kind conducted in any country" appears to have been true.⁴

This article explores the cultural history of MacKay's phenology project in rural communities across Nova Scotia. It introduces and provides historical context for the project and then focuses in particular on the interaction between the project administrators and the rural people who participated, bringing non-traditional actors—young rural women and children—to the foreground of the history of science in Canada. Over the course of a quarter century, thousands of rural teachers and many thousands of their students participated in MacKay's project, often with great enthusiasm. But they did so on their own terms, in ways that consistently defied and challenged MacKay and his colleagues. Participants were regularly chastised for their inappropriate and incomplete submissions. But rather than simply taking at face value the alleged failure of rural participants to adhere to the demands of this elaborate science experiment, a broader interpretation reveals a self-aware, ambivalent community response to the project. Embedded in the provincial education system, MacKay's phenology project was part of a larger reform movement to modernize rural communities. Its ongoing interactions reveal early twentieth-century efforts to consolidate scientific expertise and authority alongside efforts to standardize rural engagements with the natural world. However, in the locally-situated, idiosyncratic nature of their participation, generations of rural teachers pushed back against the narrow purview of the project and made a claim for the legitimacy of their local knowledge.

Lessons from Nature

Across North America and Europe, a variety of nature-study lessons—object-based precursors to elementary school science classes—were integrated into the curricula of rural and urban schools through the late nineteenth and early twentieth centuries.⁵ In rural areas, these initiatives coincided with larger education-centred reform movements intended to overcome the "rural problem" of depopulation, specifically of young people leaving agriculture for work and life in urban areas.⁶ Nature-study programs were also consistent with the philosophy of the progressive New Education movement, moving away from rote memorization toward a new emphasis on practical skills by training and refining the nascent senses of children through student-centred object lessons.⁷ Although in practice it was frequently combined with vocational agricultural training and school gardens, nature-study as an educational philosophy was distinct from either of these. In general, nature-study prioritized children's

direct observation of the natural world in a way that encouraged curiosity, imagination, and individual learning. Lessons were to be drawn from the local environment through excursions and the collection of specimens, rather than from books. A 1901 article in the *Nova Scotia Journal of Education* titled “False Nature Lesson Teaching” chastised teachers who gave nature lessons through traditional methods: for instance, “a short essay on the ‘potato bug’” written on the blackboard “*for the children to copy and learn to recite parrot fashion on the morrow.*” The author insisted, using frequent italics for emphasis, that “*pupils should not be required to memorize notes and facts which they have not, at least, to some extent actually observed or verified for themselves. ... Such memorizing is pure cram, injurious instead of being useful. ... The lesson must be direct from nature itself.*”⁸ On the question of where sources for nature-study lessons might be found, another author in the *Journal* advised, “Every hill has its history. Every brook tells a dozen stories. Every plain is a museum of wonders.”⁹

A. H. MacKay was an accomplished and respected amateur naturalist who served as president of the Nova Scotian Institute of Science from 1899 to 1902 and communicated regularly with the Royal Society of Canada on a variety of topics. He was also a motivated and influential educator and an early and enthusiastic promoter of nature-study and other aspects of progressive education.¹⁰ In 1887, he was a founding editor of the *Educational Review*, a professional journal for educators in the Maritime provinces, and was the author of the monthly “Ferndale School” series, offering local nature lesson ideas for teachers. MacKay was well connected, serving as president of the Dominion Education Association from 1895 to 1898, and his phenology project received national and international attention. Amid the avalanche of prescriptive literature on nature-study and rural education reform, the project was recommended in pamphlets from the Ontario Agricultural College, the UK Board of Education, and the US Bureau of Education, all of which included modified versions of MacKay’s observation schedule for teachers to use in their schools.¹¹ The emphasis in all these recommendations was on the pedagogical value for children: phenological observations as the basis for hands-on nature-study lessons. It was never suggested that other jurisdictions should follow the lead of MacKay’s larger project of collecting and analyzing the data en masse.

In fact, the project did not originate within the education system. It emerged in 1891 when distinguished botanist George Lawson organized a national Botanical Club under the auspices of the Royal Society of Canada and MacKay became its first secretary. Lawson imagined a friendly and informal “band of gleaners” and proposed “the publication of every season’s botanical field observations throughout Canada.”¹² Efforts to encourage nature observation by non-specialists, particularly college students and science teachers, also had the support of the Nova Scotian Institute of Science.¹³ Beginning with observations from 1892, MacKay presented yearly findings of the phenology project to the Institute.¹⁴ In the first year, ten associates across mainland Nova Scotia observed twenty-eight natural phenomena. These were amateur naturalists like

Figure 3. Completed ledger of phenological observations for Eastern Halifax, coast belt, 1901. A. H. MacKay Ledger Collection, Nova Scotia Museum Library, Halifax.

MacKay, many of them educators, both women and men. Over the next several years they expanded their provincial network and also included scattered observers in locations across Canada: a few in New Brunswick, Charlottetown, Muskoka, ON, Blackfalds, AB, Vancouver, and others. However, any notion of a real national survey was illusory. Nova Scotia was the only province with meaningful coverage, particularly after 1897 when MacKay used his position as Superintendent of Education to begin phasing the project formally into the provincial curriculum. Noting that the province's rural schoolchildren could easily cover more ground than a small group of naturalists, he wrote with pride that "the eyes of a whole school daily passing over a whole school section will let very little escape notice."¹⁵

Selecting carefully from among the completed schedules sent in by teachers, MacKay and his colleagues amassed detailed ledgers of the collected phenological data, tabulating and averaging dates to develop a picture of the natural life cycles of the province. [Fig. 3] These completed forms and ledgers are held by the Nova Scotia Museum and MacKay would be delighted to know that since the late twentieth century his botanical data have been used by climate scientists to analyze historical climate change.¹⁶ Although today's scientists use different methods, the basic science of phenology—documenting the annual appearance of natural phenomena as an indicator

of local climate—has not changed. For his part, MacKay called his calculated averages *phenocrons* (each phenomenon had its phenocron, or average first date of appearance). He saw the province as divided into twelve distinct regions, which he called *slopes*, each with three *belts*: coast, low inlands, and highlands. “Every locality has a *flora, fauna, climate*, etc., more or less distinctly its own,” he wrote in his instructions to observers.¹⁷ MacKay even saw these environmental micro-regions as pitted against each other in a friendly bit of climatic rivalry. Reporting on his 1895 findings, just before the project began to include schoolchildren, he felt compelled to reassure the Institute of Science about the objectivity of his project. Noting that the averages for some phenomena in northern Nova Scotia had advanced considerably over those of the previous year, MacKay suggested that perhaps the observers there were compelled to “be more constantly watchful than usual” so as not to be outdone by their southern counterparts. He explained, “they may have made a greater effort to get the exact facts, which would tend to bring phenomena more promptly to their notice,” but insisted that “there need not be the slightest suspicion that any of the observers, who are well known to me, put a single figure down in the ‘interest of any particular climate.’”¹⁸ In later years, observers were reminded that the figures “must be as accurate as possible Very early dates ... do not prejudice the compiler in favour of the observers, but very much the reverse.”¹⁹ Nevertheless, the subjective character of the project was already evident.

From one perspective, MacKay’s project may be seen as a sympathetic collaboration with rural communities, drawing on and privileging local knowledge. Positioned along with more recent crowd-sourced science, we can read MacKay’s project as one that took the knowledge of rural observers seriously, celebrating and formalizing the long-standing observational activity of farmers, sailors, and other rural people who had long been watching the weather and keeping track of environmental changes around them. However, it is also important to contextualize the project in relation to widespread rural reform movements in the period. MacKay was a fervent advocate for rural modernization and he, like many others, saw education as key to this transformation. MacKay was confident about the positive influence his project would have on students. He insisted that participating in compulsory observations on the walk to school would “fill an idle and wearisome hour with interest, and be one of the most valuable forms of educational discipline.”²⁰ When the phenology project was underway he remarked that “it was good to see that so much of the leisure time often given to unproductive recreation is now being directed to research. It is a good thing to feel that the search for more truth is in the air.”²¹ MacKay was also confident about the results of this discipline, writing that his program of phenological observations was “no doubt, starting a very many young pupils on the beginning of an observant course which will make them specially useful citizens.”²² Elsewhere, with more characteristically gendered language, he added that the program starts pupils “thinking in the way of the men who have done something in the world,”

and “such exercises have special power in developing the habit of accurate observation (which is the soundest basis for any career ranging from that of the poet and professional man to the tiller and lord of the soil, the tradesman, the manufacturer and inventor).”²³ Training rural children and teachers in scientific observation was part of a broader effort intended to transform rural lives and to produce productive, morally upstanding citizens who would modernize rural places and fulfill the demands of the liberal state.

At the heart of such notions and the reform initiatives they underwrote was a belief in the potential of these people to “be modernized”—and a belief that their ongoing place on the land was appropriate and desirable.²⁴ In the case of the phenology project, there is also the inherent implication that these rural people had knowledge of the natural world that was valuable and legitimate. This stands at odds with the cultural genocide and devaluation of knowledge experienced by the Mi’kmaq, upon whose unceded lands those settlers made their lives.²⁵ Efforts to remake and modernize rural communities were always part of larger processes to rationalize rural spaces and to consolidate and formalize settler authority over Indigenous lands. By drawing on and then overwriting Mi’kmaw environmental knowledge, European observers had long since begun to make the flora and fauna of the province legible to themselves, a process that was ongoing in the late nineteenth century.²⁶ MacKay’s project offers an opportunity to think through the ways that the logic and practices of science worked in tandem with the settler colonial state in contexts well beyond imperial narratives of so-called discovery.²⁷

Observers in Training

MacKay’s annual reports as Superintendent include his running commentary on the phenology project, much of it laced with concern about the actual reach of his authority into rural places. The mandatory status of the project did not mean that it was universally followed by rural teachers. Participation and administrative support for the program ebbed and flowed, and even at its height in the first decade of the twentieth century, fewer than ten percent of the province’s 1700 schools ever submitted reports in a single year. Nevertheless, MacKay took the project very seriously and continued to cajole and admonish teachers to participate. He even threatened to revoke the teaching license of anyone caught forging data.²⁸ It is important to note that it was teachers, rather than children, who were expected to be the main participants of the project, the vast majority of whom were young rural women with very little, if any, formal training as educators. Although initiatives such as a Summer School of Science were intended to help teachers upgrade their qualifications, the vast majority of rural teachers never accessed these resources. They were paid among the lowest wages in Canada, typically worked for only a few years, and frequently switched schools from year to year, conditions that mitigated efforts to modernize and standardize education across the province.²⁹

Rural elementary school students and their young, typically female teachers,

were considered to be “observers in training” by MacKay and his colleagues.³⁰ This analysis shares its focus with the work of Lianne McTavish on efforts by the New Brunswick Natural History Society to train the visual practices of New Brunswickers through nature observation, encouraging a kind of “geographical citizenship” and pride in the province. McTavish wrote about the aims of the Society, but noted the records to which she had access did not reveal “whether or not the ‘students’ they targeted actually adopted the desired visual practices.”³¹ The substantial existing evidence of MacKay’s project reveals that the rural people who participated in fact challenged his ideals of scientific practice and collective empiricism. And their refusal to adhere to appropriately scientific modes of observation was a constant frustration to the aims of the phenology project.

The collected data were compiled by the men and women MacKay called his “staff of phenologists,” a group of fellow educators and naturalists, mostly science teachers and principals at the county academies. The group was made up of people like the young Loran DeWolfe, who would later become the first provincial Director of Rural Science, and others who shared, at least to some extent, MacKay’s passion for nature and its pedagogical potential.³² Compilers were assigned the completed schedules of one or more regions and were requested to tabulate and average the data received. They published yearly remarks on their work in the *Journal of Education*, often editorializing as they did so. Writing in 1904, DeWolfe shared his worries and his hopes: “I fear too many teachers have never learned what pleasure it is each night after school to go for a long walk through the woods and fields, by the brook or the lakeside, and observe for themselves the advance of vegetation and the appearance of the birds,” adding, “a short talk about this trip next day in school may stimulate a few of the pupils to go on similar excursions, until at last the whole school would be a band of enthusiastic observers.”³³ There is no doubt MacKay, DeWolfe, and their colleagues were sincere in their desire for Nova Scotian children and teachers to engage with the world around them, to become enthusiastic nature lovers, and in their faith in the benefits this would bring.

But the phenology project was no childish diversion; it was a real scientific investigation of regional plants and birds that many people today would struggle to identify. The completed schedules demonstrate an astonishing breadth of engagement and knowledge of the natural world by many young rural women who chose to dedicate their time to its study. However, this was not universally the case. Over several pages annually, the compilers’ remarks were typically filled with sarcastic admonitions about the inability of teachers to recognize even common birds and flowers and their propensity for confusing those of similar species. The compilers complained of the “great confusion,” the “many irregularities and errors,” and the “manifest absurdities” that allegedly appeared in the reports before them.³⁴ Although some teachers were celebrated as “enthusiastic botanists” and “good observers,” and compilers often noted that the best schedules came from small, ungraded “country” schools,³⁵ on

the whole, the remarks reveal a perceived widespread inattention to detail and general failure across two decades to adhere to the kind of precision demanded by this scientific experiment. Surely this was an indictment of the education system rather than the fault of individual under-resourced teachers, but this was not apparent in the compilers' commentary. Teachers were regularly called "careless," or accused of "carelessness." Misidentifying the arrival of mayflowers was seen as particularly egregious, one compiler writing, "as usual, some mistakes occur, which in the case of the rarer plants can readily be excused, but in the case of such common plants as *Viola blanda* [sweet white violet] and *Epigaea repens* [mayflower], carelessness is the only cause one can ascribe."³⁶

Among the common complaints, Goldthread and Starflower, two small white star-shaped blooms of late spring, were regularly mistaken. The relatively rare Adder's Tongue Lily was often entered in place of the more common yellow forest lily *Clintonia*. Buttercup species were routinely confused. One particular thorn in the side of the compilers over the entire life of the project was the persistent confusion between Pale Laurel, Lambkill, and Rhodora, three showy purple flowers that all grow in or near bogs. [Fig. 4] One exasperated compiler was already insisting in 1903 that the three plants were "so generally taken one for the other, that any average of observations is useless."³⁷ In response to such complaints, MacKay himself made a rare intervention in the *Journal* to chastise teachers, suggesting that these plants "can be mistaken only by observers who are shamefully ignorant of botany, for nothing can be easier than to distinguish them apart. It is hoped that the blunder will not occur again."³⁸ Nevertheless, misidentifications were reported by compilers every year through to the 1920s. "Our boys and girls doubtless hear the Rhodora called 'Lamb-kill' [in their communities] and the name sticks," wrote one. Compilers regularly called for these and other plants to be removed from the list, or replaced with species that were more widely known and less easily confused. This was never done.³⁹

Birds posed a unique challenge. Compilers complained that of the eighteen birds on the list, few of them were widely known—"the song sparrow, robin, and humming bird are the only ones everybody knows," according to the compiler for central Nova Scotia in 1903. The compiler for Shelburne County the same year was more incredulous, claiming "the Peabody bird, though known to few by sight, must be known to every teacher by its song" and "there is no reason why the Kingbird should not be reported, for I am sure that it is quite widely known in this County by the name of Martin bird." A third compiler was more sympathetic, asking: "Would it not be advisable to publish short descriptions of the birds mentioned in the schedule, as the books of reference recommended in the *Journal of Education* are too expensive for most teachers?"⁴⁰ Moreover, compilers routinely pointed out that the method of averaging dates of appearance was in fact inappropriate for most of the birds on the list. When the migration of wild geese was recorded a month apart in adjoining school districts in 1909, the compiler for Halifax County suggested "again the propriety of taking the date of one reliable observer from each belt"



Figure 4. (Top to bottom) Pale Laurel, Lambkill, and Rhodora in bloom. Photos by Sara Spike.

rather than averaging the dates. “I believe both observers honest, but I have no doubt that the early flock flew over the late observer, without attracting attention. One teacher is on the watch for the Song Sparrow, and hears its note ten days before her neighbour, who only hears it when brought suddenly into such close proximity to the song that it cannot escape the attention of the most careless.”⁴¹

These troubles with birds along with frequent confusion among wildflowers also signalled broader weaknesses with the project as a whole—namely its inflexibility and overall inaccessibility—which compilers pointed out to MacKay in their correspondence year after year, duly printed in the *Journal of Education* and soundly ignored. It is also clear that participants did not understand where their data were going, or to what end. As late as 1917, one compiler complained of the small number of schedules submitted and suggested “no doubt most teachers have an idea that these are never used and pile up ‘Somewhere.’”⁴² Two years later, and more than twenty years after the project began, a short piece on the utility of the phenological observations for the timing of crops attempted to answer its own rhetorical question: “Are the Phenological Observations, then, that we are asked to keep, after all, useless? Apparently not.”⁴³ By 1920, a new generation of compilers was publishing remarks identical to those of their predecessors, still noting that “the Observation schedules had mistakes similar to other years” and exhorting: “Let us all try to improve our Phenological returns. This can be accomplished by keener observation.”⁴⁴

Harry Piers, long-time curator of the Nova Scotia Provincial Museum, and a colleague and friend of A. H. MacKay, was certainly a keen observer and he provides an evocative phrase to describe the aim of all natural history pursuits. Namely, he extolled the virtues of his “very pleasant duty of keeping Nature under police surveillance.”⁴⁵ Extending Piers’s metaphor, it might seem that MacKay had deputized rural teachers and schoolchildren in a province-wide stakeout of buttercups and robins. But in this particular arrangement, rural people were not necessarily on the side of the law. Rather, they were more often than not treated as unreliable eyewitnesses in the court of capital-S-Science, where their colloquial, undisciplined ways of interacting with the world were put on trial. And indeed, this project placed rural people themselves under scrutiny as much as the plants and animals it purported to study. Teachers were publicly congratulated for their excellent submissions, and the names of all teachers who sent in schedules were published in the *Journal of Education* each fall with the number of their observations. At the same time, however, even as they were assured that recording observations was “entirely voluntary,” teachers were reminded that “our Inspectors are observing the differences between the schools in which they are made and those in which they are not, in order to form judgements on the effect of such scientific amusements.”⁴⁶ It was suggested that “the character of the schedule should be an index of teaching” and a poor quality schedule could put into question a teacher’s “fitness to hold even a permissive license.”⁴⁷ The disciplinary function of the phenology

project was manifold. Not only did it train young minds in civic virtue, it also functioned as an additional surface for the surveillance of rural teachers both in and out of school.

Unlike his naturalist colleagues, whose objectivity and impartial enthusiasm could be counted on in the early years of the project, it is significant to note the lack of trust that MacKay and the compilers clearly had in the rural teachers they were compelling to participate. MacKay repeatedly declared with pride that the Nova Scotia observations were “more accurate in the great majority of cases than the observations made by individuals of the scientific societies, who often were able to make their observations only once or twice a week, and then only over a comparatively circumscribed ground.”⁴⁸ Nevertheless, the compilers were always considered the reliable authorities in the frequent cases of discrepancy. Year after year teachers were told that their observations were inaccurate or outright wrong because the compilers assessed the value of the submitted reports against historical data. Only the “most accurate”—those that conformed to the compilers’ expectations—were included in the final rendering of the data. Each year, teachers were singled out and congratulated for having submitted “correct” and “accurate” observations while those who fell outside the acceptable dates were admonished. The words *accurate* and *inaccurate*, *correct* and *incorrect*, *too early* and *too late* recur persistently throughout the compilers’ remarks. Only the ten “most accurate” schedules for each of MacKay’s thirty-six regions were compiled and averaged.

The logic of drawing parameters around the acceptable dates for observations is clear if considered as a complement to boundaries around the known localities for particular plants or animals. Observations outside these boundaries would rightly be received with skepticism and require additional support. The accuracy of the phenological observations certainly mattered, and it was appropriate for project administrators to question and scrutinize the data supplied by teachers. However, following Tina Loo, it is also important to consider the conditions within which notions of accuracy, reliability, and relevance were determined—how some knowledge came to be labelled as local and other knowledge as expert and universal.⁴⁹ Compilers were forthcoming that they relied heavily on their own personal knowledge of the teachers when selecting which schedules to include in their averages. From the earliest years of the project distinctions were made between those known to be “enthusiastic botanists” and the remaining “average observers.”⁵⁰ The compiler for Halifax County in 1901 admitted he was very skeptical of the dates given for black currant, lilac, and white clover by teacher Ella Gaetz in West Petpeswick, whose mayflowers opened this article, but added that because “Rev. Mr. Rosborough is there and instructs the teachers often in Botany, I accepted them.”⁵¹ Rosborough was a friend of MacKay’s and one of the original phenologists in the earliest years of the project.⁵² The very same data coming from Gaetz alone would have held no authority and would have been rejected out of hand. Compiler and vice-principal Antoinette Forbes added that she also considered

the “sex and temperament of the observer” when selecting which schedules to average.⁵³ This comment may explain the note she wrote on the 1901 schedule of fifty-nine-year-old Mary Hilton, teacher in Rockville, Yarmouth County: “[teacher] born in section, yet sheet of little value.” Hilton’s return provides a rare example of a teacher recording the name of the student who made each observation.⁵⁴ While she clearly used the phenology project as directed—as an opportunity to encourage the study of nature among her students—Forbes’s doubts about the value of Hilton’s schedule point to the fact that the project was not to be taken lightly or treated simply as a game for the children.

The artificiality and disciplinary function of the pre-determined averages and norms was most apparent when it came to recording the timing of agricultural activities. Crop timing is an important undertaking, certainly worthy of study, but it is not clear that this was always the aim of MacKay’s project. The case of spring plowing and potato planting points to the ways that norms were established and shaped by boundary-making and exclusions. In a rare occasion of personal commentary from a teacher, Louise Freeman in West Middle Sable, a fishing village in Shelburne County, added a note to her 1910 schedule to specify and apologize that in her community, plowing, sowing, and potato planting “probably commenced earlier than in some sections on account of the men going away to the ‘Banks’”—a reference to local fishermen leaving for the first offshore schooner trip of the season.⁵⁵ She recorded these activities as underway by early April, a full month ahead of the same in dedicated farming districts such as the Annapolis Valley. This is supported by the Shelburne County compiler’s remarks from 1903, which indicate that in fishing settlements along the coast, potato planting was noticeably earlier than in the inland communities.⁵⁶ Likewise, a news column from nearby Wood’s Harbour in the *Yarmouth Herald* noted that with the early opening of spring in 1892, by the last week of April “some [had] already finished planting, while a large number will have none planted, having left so early on their fishing voyages.”⁵⁷ This suggests the dates for potato planting in that community were in fact widely divergent—both very early and very late according to MacKay’s standards—but this information would not have been conveyed by recording simply the date on which the activity began or was judged to have become common. These comments point to the locally-specific variations in dates that were obscured by MacKay’s project. Rather than acknowledging that potatoes might successfully (if not ideally) be planted on a wider range of dates, these coastal communities were positioned as outliers and left out of the averages in favour of the dates for “normal” communities that did not engage in such apparently disruptive occupational pluralism.⁵⁸

In the case of sheep shearing, the compilers complained that the idiosyncrasies of rural practice meant that no average was even possible, that the timing of sheep shearing depended as much as anything “on prejudice, or custom, or ... even on superstition.” One compiler grumbled that “adjoining sections differ by a month or three weeks, because one waits for mild weather,

and the other shears ‘in the light of the moon,’ for shearing in the ‘dark of the moon’ will cause deterioration next year in the quality of the cut.”⁵⁹ The arbitrariness of the phenomena MacKay included in his study—some despite their ill fit for the task at hand—the rigidity with which he excluded outlying data, and the commentary that emerged in relation to these categories suggests that in some cases establishing norms or averages for agricultural activities was an aspirational or disciplinary endeavour, an effort to formalize normative behaviours and extend the logic of the modern state and of science into rural areas.

Local Names

Natural history observation has always been a collective, cumulative process, but positioning MacKay’s project in relation to histories of scientific observation is complicated by the coerced involvement of thousands of rural observers. Daniela Bleichmar’s comments about the eighteenth century are also relevant to the communities of amateur naturalists practicing in the early twentieth century. She writes that botanists and other naturalists have often been represented as solitary workers, but in fact they participated in broad networks of exchange across time and space: “Natural history observation did not occur in a single session or location, but rather over extended periods of time, sequentially, and in various settings. It implied a series of comparisons and conversations, as naturalists attempted to see something that had not been seen before, to correct what someone else had seen, and to describe so that others could see what they had.”⁶⁰ Characterized as a conversation, these interactions between naturalists were dependent on shared standards and on mutual faith in the commensurability of their observations—what Lorraine Daston calls “the reciprocal calibration of observers.”⁶¹ The ideals of collective empiricism did not always hold up, leading to confusion and disputes, but the guiding presumption was that these “comparisons and conversations” were taking place between peers qualified (or at least aspiring) to the standards of the day.

With his accumulated data in hand, MacKay was in conversation with other naturalists across the province, the country, and internationally. And his “staff of phenologists” were enthusiastic observers interested in the mutual exchange of botanical information as well. It is less clear where the majority of MacKay’s rural participants fit into this conversation. While certainly not voiceless, it would be inappropriate to suggest they were considered peers in the project. Contemporary crowd-sourced science projects are generally voluntary, undertaken by “people who have chosen to use their free time to engage in the scientific process” and who tend to become involved for altruistic reasons (such as concern for the environment), or to gain knowledge for their own hobbies and interests. While some scientists continue to perceive the public with a “deficit view” of their potential for scientific understanding, the combination of compulsion and criticism in MacKay’s project seems to put it at odds with other crowd-sourced efforts, recent and past.⁶²

Lorraine Daston writes that in scientific training, “convergence is indispensable. Novices must be taught to see things and to see the *same* things, a world held in common. But it is not the common world that they learn to see.”⁶³ The cultivation of a scientific self, through training and experience, means learning to see not as an individual but as a member of a community. A. H. MacKay and his colleagues were eager to create such a community in rural Nova Scotia, but they offered little beyond criticism to help bring their potential adherents into form. Instead, the rural people who participated in MacKay’s project challenged his scientific ideals, revealing the persistent relevance of local, place-based knowledge in rural Nova Scotia. Daston writes that since the sixteenth century, the work of botanical description and illustration has been characterized by “concerted attempts to represent a universal, not a particular.” This “atlas image of record,” which becomes a figure of authority, pits “the universalized plants of scientific ontology” against the “the particular plants of everyday experience.”⁶⁴ In response to the attempted imposition of a standardized scientific view of the natural world in rural Nova Scotia, participants pushed back, asserting the legitimacy and value of the “particulars” of their local knowledge.

A common grievance of the phenological staff was the use of colloquial or regional names for plants and birds. For instance, the teachers who interchanged the names of Lambkill and Rhodora were following a naming convention common throughout the province. The persistence and use of colloquial names was most obvious when teachers added additional notes to the end of their forms, as many did. These extra entries were encouraged by the administrators for the sake of general interest, but they were not averaged or tabulated. Nevertheless, it was expected that they would adhere to scientific method and nomenclature. A compiler in 1910 repeated a common refrain when he asked that teachers, when “reporting additional observations, give the scientific name in preference to some local name, such as ‘Bird’s Eye Primrose.’”⁶⁵ Most teachers included just a handful of extra entries. Ella Gaetz in West Petpeswick, whose reliability was questioned save for her relationship with Rev. Rosborough, added seven items that year: Daisy, Butterfly, Swallows, Elder flowering, Robin’s nest seen, Peas planted, and peas blooming. Mary Hilton of Rockville, whose schedule was rejected as “of little value” by the compiler, added twenty-five.⁶⁶ It is common to find dozens of additional items, and occasionally more than one hundred, either scribbled into the margins of a schedule or listed in tidy handwriting on extra sheets of paper attached to it. [Fig. 5] These submissions demonstrate a remarkable engagement with local environments and often an impressive scientific vocabulary and knowledge, sometimes combined with the use of colloquial naming.

MacKay and many of his colleagues believed that the use of colloquial names led to inaccurate and incomplete data. As teachers only knew the local names of plants and birds, they did not recognize the “correct” names listed on their forms, and consequently they left many entries blank, or mistook certain species

Extra Observations		Eastville	
	When First Seen		When First Seen
Wetland Willow	85	Golden Rod (<i>Solidago canadensis</i>)	226
Blackbird	108	Swallows going South	242
Swallow	120	Swallows going North	120
Black Honeycucklee (<i>Diervilla trifida</i>)	134	Butterflies (<i>Dicentra cucullaria</i>)	128
Small Solomon's Seal (<i>Smilacina Racemosa</i>)	137	Yellow Violet (<i>Viola pubescens</i>)	121
Butcher's Broom (<i>Dicentra cucullaria</i>)	139	Red Eye Primrose (<i>P. matronalis</i>)	134
Yellow Violet (<i>Viola pubescens</i>)	140	Trillium (<i>Cernuum</i>)	141
Winged Stalk (<i>Shelopsis Roseus</i>)	142	Loosestrife (<i>Dentaria diphylla</i>)	141
Wild Black Currant (<i>Ribes Floreudum</i>)	143	Red Honeycucklee (<i>Lonicera alata</i>)	138
Common Hemlock	141	Parasol (<i>Pratia pauciflora</i>)	141
Mountain Fly Honeycucklee (<i>Lonicera alata</i>)	148	Simons (<i>Aralia trifolia</i>)	147
Simons (<i>Aralia trifolia</i>)	152	Bellwort (<i>Utricularia grandiflora</i>)	150
Bellwort (<i>Utricularia grandiflora</i>)	148	Wood Sorrel (<i>Oxalis corniculata</i>)	157
Arthwort (<i>Dentaria diphylla</i>)	148	Indian Turnip (<i>Brassica sp. phytol.</i>)	163
Solomon Seal (<i>Polygonum biflorum</i>)	144	Mountain Maple (<i>Acer sp. spicatum</i>)	164
Trillium <i>Cernuum</i>	152	False Solomon Seal (<i>Smilacina bifida</i>)	163
Wetland Willow (<i>Dirca palustris</i>)	152	Cingula to oil (<i>Potentilla canadensis</i>)	165
Wild Strawberry (<i>Fragaria virginiana</i>)	152	Trusty Buttercup (<i>Ranunculus acris</i>)	164
Small Redstart (<i>Galium trifidum</i>)	155	Choke Cherry (<i>Prunus virginiana</i>)	158
		Rain Archio (<i>Habenaria fidentata</i>)	173
		Common Natch (<i>Urtica dioica</i>)	172
		Black Maple (<i>Acer sp. sp.</i>)	170
		Black Maple (<i>Acer sp. sp.</i>)	145
		Mountain Fly Honeycucklee (<i>Lonicera alata</i>)	155
		Common Hemlock	165

Figure 5. Extra entries provided by Olive Lyle Archibald for the year ending July 1906, Eastville Upper Stewiacke, Colchester County. A. H. MacKay Ledger Collection, Nova Scotia Museum Library, Halifax.

for others. Proper scientific observation in MacKay's project as elsewhere was not only the bodily act of purposeful, attentive looking. It was an intellectual process that included the ability to effectively connect received sensory information with a relevant body of scientific knowledge. It was participation in a collective endeavour, of which all members connected "the same words to the same things."⁶⁷ Moreover, underlying the insistence on the use of scientific vocabulary was a broader implication that its absence denoted an immature relationship with the natural world. One compiler unintentionally made this explicit when he helpfully offered a list of local names for his region, noting, "this was my own boyish nomenclature, so it may prevail in many parts of the country still." But these colloquial names were not simply made up by children. They were locally meaningful, passed through generations, and often denoted a unique relationship to the places where they were used. Nevertheless, in the commentary on the phenology project, all names not common to science were lumped together as "local or childhood names."⁶⁸

It is notable, however, that the compilers frequently acknowledged they were familiar with the colloquial names of plants and birds, and therefore their work was often not hindered by their use. Some compilers asked MacKay for local names to be provided directly on the schedule, a suggestion that was

never implemented. Instead many included local names in their comments in the *Journal*. Loran DeWolfe found in his own school in North Sydney “that Gold Thread was locally known as ‘Morning Star,’ and Star Flower as ‘Evening Star.’”⁶⁹ A compiler for Shelburne County offered local names for Rhodora (Rosebay, Azalea) and Lambkill (Sheep Laurel).⁷⁰ A notable example was a compiler in Cape Breton who included some Gaelic names for plants and birds in his report: Spring Beauty (*Ditheanan Cnothan nam Muc*), Nighthawk (*Clamhan nan Chuileag*), and Snipe, which had four local names (*Gobhar-athair*, *Gobhar-oidche*, *Ianrag*, and *Ian-ghobhrag*).⁷¹ It is clear that some compilers chose to act as facilitators or interpreters between local communities and the world of science. Many of them were enthusiastic observers who shared a vocabulary with the teachers in their counties and acknowledged that colloquial names were not in fact the opposite of scientific objectivity, but could coexist with it. This was not, however, the policy of the project.

Particularly when they are few, the extra entries added to schedules were often quite sweet—such as noticing the first butterflies, bees, and pussy willows, very common entries that certainly seem to reflect what may have been of interest to young children. A compiler in 1906 suggested that swallows, butterflies, fireflies, and bees were the most common additions and “should find a place on the [official schedule] as they are watched for by parents and pupils.”⁷² Swallows were eagerly observed returning to Nova Scotia each spring, and their absence from the official list was an unusual omission. The inclusion of extra entries reveals that many rural teachers embraced MacKay’s project, but they did so in ways that broadened and complicated the boundaries of his scientific agenda, bringing the local priorities and preferences of their communities and classrooms into the conversation.

These extra entries not only broadened the parameters of MacKay’s project, but also challenged the imperative of focused, circumscribed observation. Rural Nova Scotians instead approached their environment with a roving, promiscuous, inclusive gaze. Many of the extra observations and notes fell well beyond the boundaries of MacKay’s project, making reference to meaningful events of significance to particular communities. On December 5, 1900, Florence Fultz in Lower Ship Harbour, Halifax County, noted what she called the “highest tide for years.” The following spring, seventeen-year-old John Millar, schoolteacher in Pleasant Lake, Yarmouth County, noted the arrival of the herring in the Tusket River on April 3. Aspects of local economies were also made apparent in these notes, for example, Louise Freeman’s note about the relationship between potato planting and the local fishery. And in 1908, A. McPherson in Charlo’s Cove, Guysborough County, recorded the dates for the first local catches of lobster, mackerel, haddock, and herring. Myra Ross in Brule, Colchester County, noted the day that the harbour froze one winter (December 12, 1905) and the day that it was first crossed on foot (January 8, 1906), while Olive Lewis in Upper Economy, Colchester County, noted the first lighting of the Burntcoat lighthouse on March 15, 1924, the same day the

first vessel came into the bay that spring.⁷³ It is no coincidence that all of these examples make reference to a close relationship with the ocean, something MacKay's list did not call for. These extra notes are similar to the observations that rural people were making in private, affirming the public relevance of knowledge that would otherwise have been tucked away in daybooks and diaries. As much as they illustrate the keen interest and enthusiasm that many teachers had for MacKay's project, the extra notes are also an assertion of the continuing value of local knowledge and rural ways of making sense of place.

MacKay and his staff certainly acknowledged that rural people had specialized knowledge and access to the natural world around them. Indeed, this is why they were sought out. But the idiosyncratic and variable character of their experience was often a direct challenge to the "calibration of observers" demanded by scientific objectivity. A compiler for Queens County in 1907 offered the kind of backhanded encouragement common to the project when she wrote: "Many show the deep interest they take in this work by making a number of additional observations. May I suggest that, in reporting these, they use the scientific names of the plants, or the common ones recognized by botanists. Such names as 'wild corn,' 'tame gooseberries,' 'garden lilies,' 'water-berries,' 'sleeping Johnnies,' etc., while intelligible in their own districts, are rather out of place in scientific records."⁷⁴ These five colloquial names were submitted by three young women in well-filled schedules that each demonstrate an extraordinary knowledge of local flora. Teacher Myra Matthews in Port Joli submitted an extremely tidy schedule with twenty additional entries where colloquially named water-berry, garden lily, June roses, and wood daisy appear alongside the more familiar-to-science bluets, cinquefoil, chickweed, and harebells. Effie Munroe in Summerville Centre included twenty-six additional entries, including sleeping johnnies and wild corn, alongside cranberry and chokecherry blossoms [Fig. 2, page 27]. Buelah Gross in St. Catherine's River added eleven entries, wild corn and tame gooseberries among them, along with Labrador tea and wood sorrel. All three women added pussy willows, swallows, and butterflies.⁷⁵

While the administrators of the project continued to believe in the power of science to create a consistent and coherent picture of the world, these young rural women knew otherwise. By asserting these local variants rural teachers may have been demonstrating their ignorance of scientific language and practices, and they were certainly declaring their ambivalence for the rules of MacKay's project, but year after year for more than twenty-five years, generations of rural teachers were also affirming locally-meaningful knowledge, and arguing for the legitimacy of this knowledge—arguing that it was in fact *not* out of place in official records. These extra notes express a desire for their local observations and experiences to be recorded, in spite of repeated efforts to overwrite them.

A. H. MacKay's collected Nova Scotia phenological observations are an incredible achievement. Another version of the project, one which embraced the idiosyncrasies of local knowledge, might have held even greater historical



Figure 6. Foxberries. Photo by Sara Spike.

significance. Local names for some wild plants persist and are often embraced as part of regional identities: for instance the plant known in English as foxberry in mainland Nova Scotia is known in Newfoundland as partridgeberry, in northern Canada as low-bush cranberry, and in Europe as lingonberry (*Vaccinium vitis-idaea*) [Fig. 6]. But it is clear that many more local names were once known and understood within communities, counties, or regions. By connecting local names to their common names, some compilers of the phenological data hinted at the possibility for an ethnography of rural Nova Scotia that might have preserved locally meaningful naming that has long since been lost through the modernization (and depopulation) of rural communities.⁷⁶ The handwritten schedules submitted by teachers across the province contain many local names that were simply scorned and overlooked rather than engaged and translated. Dwelling on the loss of these situated rural meanings only highlights the even greater loss of the Mi'kmaw knowledge and naming practices that were forcibly displaced by rural settlement. Like the ideal botanical illustration that sought to depict a universal specimen over the particulars of everyday plants, the aim of scientific inquiry has historically tended to calibration rather than eccentricity, a so-called universal language to the detriment of other ways of knowing. Local knowledge (whether Indigenous knowledge or from rural settler communities) can be messy—it does not always fit into tidy columns; it is difficult to crunch or average.⁷⁷ The young rural women who chose to

participate in MacKay's remarkable phenology project did not know why their observations were being collected, but they knew what was important to their communities and they documented the world around them to the best of their abilities with thoughtfulness and care.

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Endnotes

- 1 *Truro Daily News*, May 2, 1899; *Yarmouth Herald*, April 23, 1890; *Digby Courier*, April 24, 1885. This research was supported by the Social Sciences and Humanities Research Council of Canada. My thanks to David Banoub, Jessica Dunkin, and James Opp for feedback on earlier versions of this work.
- 2 A. H. MacKay Ledger Collection, Nova Scotia Museum Library, Halifax, Nova Scotia, Collected Returns, year ending July 1901, West Petpeswick, Meteghan, Loganville.
- 3 The blank "Local 'Nature' Observations" form was printed in each issue of the *Nova Scotia Journal of Education*, circulated as a loose sheet, and printed at the back of the school registers kept in each school.
- 4 *Nova Scotia Journal of Education*, October 1903, 137. (Hereafter *NSJE*.)
- 5 On the nature-study movement, see George Altmeyer, "Three Ideas of Nature in Canada, 1893–1914," *Journal of Canadian Studies* 11, 3 (1976): 21–36; Kevin Armitage, *The Nature Study Movement: The Forgotten Popularizer of America's Conservation Ethic* (Lawrence: University Press of Kansas, 2009); Sally Kohlstedt, *Teaching Children Science: Hands-On Nature Study in North America, 1890-1930* (Chicago: University of Chicago Press, 2010).
- 6 On rural education movements in Canada see, for example, Kristen Jane Greene, "The Macdonald Robertson Movement, 1899–1909" (PhD diss, University of British Columbia, 2003); Richard A. Jarrell, *Educating the Neglected Majority: The Struggle for Agricultural and Technical Education in Nineteenth-Century Ontario and Quebec* (Montreal: McGill-Queen's University Press, 2016); Donald Macleod, "Practicality Ascendant: The Origins and Establishment of Technical Education in Nova Scotia," *Acadiensis* 15, 2 (1986): 53–92.
- 7 On education reform and the New Education in Canada see Paul Axelrod, *The Promise of Schooling: Education in Canada, 1800–1914* (Toronto: University of Toronto Press, 1997), 44–68, 109–26; Neil Sutherland, *Children in English-Canadian Society: Framing the Twentieth-Century Consensus* (Toronto: University of Toronto Press, 1976), 155–224.
- 8 *NSJE*, April 1901, 87–88, italics in original.
- 9 *NSJE*, April 1912, 103–4.
- 10 On MacKay, see Janet Guildford, "MacKay, Alexander Howard," in *Dictionary of Canadian Biography*, vol. 15 (Toronto and Laval: University of Toronto/Université Laval, 2003–); N. M. Sheehan, "Alexander H. Mackay: Social and Educational Reformer," in *Profiles of Canadian Educators*, ed. Robert S. Patterson, John West Chalmers, and John W. Friesen (Toronto: D.C. Heath Canada, 1974), 253–70; B. Anne Wood, "Pictou Academy: Promoting 'Schooled Subjectivities' in 19th-Century Nova Scotia," *Acadiensis* 28, 2 (1999): 41–57.
- 11 A. H. MacKay, "Nature-Study in the Schools of Nova Scotia," *Nature-Study Review* 1, no. 4 (July 1905): 148–52; W. H. Muldrew and S. B. McCready, *Hints on Making Nature Collections in the Public and High Schools*, 2nd rev. ed., Ontario Agricultural College Bulletin 134 (Toronto: Ontario

- Department of Agriculture, 1906); James Ralph Jewell, *Agricultural Education Including Nature Study and School Gardens*, Bureau of Education Bulletin, no. 2 (1907), whole number 368 (Washington, DC: Government Printing Office, 1907); Liberty Hyde Bailey, *On the Training of Persons to Teach Agriculture in the Public Schools*, Bureau of Education Bulletin, no. 1 (1908), whole number 380 (Washington, DC: Government Printing Office, 1908); Ethel Spalding, *The Problem of Rural Schools and Teachers in North America*, Board of Education Educational Pamphlet, no. 13 (London: H.M.S.O., 1908).
- 12 George Lawson, "On the Present State of Botany in Canada," *Transactions and Proceedings of the Royal Society of Canada* 9, sec. 4 (1891): 20.
 - 13 James Gordon MacGregor, "Opening Address," *Proceedings and Transactions of the Nova Scotian Institute of Science* 7, pt. 3 (1889): 185–96. See Suzanne Zeller, "Reflections on Time and Place: The Nova Scotian Institute of Science in Its First 150 Years," *Proceedings of the Nova Scotian Institute of Science* 48, 1 (2015): 18–19.
 - 14 A. H. MacKay, "Natural History Observations, Made at Several Stations in Canada during the Year 1892," *Proceedings and Transactions of the Nova Scotian Institute of Science* 8, pt. 3 (1893): 378–79.
 - 15 "Local 'Nature' Observations," blank form.
 - 16 The A. H. MacKay Ledger Collection at the Nova Scotia Museum Library, Halifax, contains the collected returns of phenological observations and MacKay's compiled data ledgers. Hereafter cited respectively as Collected Returns and Data Ledgers. For examples of climate science using MacKay's data, see Madison Culbertson-Paoli et al., "In Search of a Climate Change Signal in Nova Scotia: The Alexander MacKay Data, 1901–1923," *Proceedings of the Nova Scotian Institute of Science* 50, no. 1 (2019): 131–63; Adam Fenech et al., "Impact of Climate on Changes in the Seasonal Timing of Life Cycle Events of Eastern Canada from 1901 to 1923," in *Integrated Mapping Assessment*, ed. Adam Fenech et al. (Toronto: Environment Canada, 2005), 55–69; Liette Vasseur, Robert L. Guscott, and Peta J. Mudie, "Monitoring of Spring Flower Phenology in Nova Scotia: Comparison over the Last Century," *Northeastern Naturalist* 8, 4 (January 2001): 393–402.
 - 17 "Local 'Nature' Observations," blank form. Italics in the original.
 - 18 A. H. MacKay, "Phenological Observations Made at Several Stations in Canada during the Year 1895," *Proceedings and Transactions of the Nova Scotian Institute of Science* 9, pt. 2 (1896): 206.
 - 19 *NSJE*, October 1903, 136.
 - 20 *NSJE*, April 1902, 107; "Local 'Nature' Observations," blank form.
 - 21 *NSJE*, October 1905, 206. These attitudes toward intellectual and recreational discipline were consistent with broader trends in Canadian critical thought and moral philosophy, including the promotion of citizenship through "rational recreation." See Nancy B. Bouchier, *For the Love of the Game: Amateur Sport in Small-Town Ontario, 1838–1895* (Montreal: McGill-Queen's University Press, 2003); Colin D. Howell, *Northern Sandlots: A Social History of Maritime Baseball* (Toronto: University of Toronto Press, 1995); Bruce Kidd, *The Struggle for Canadian Sport* (Toronto: University of Toronto Press, 1996).
 - 22 "Local 'Nature' Observations," blank form.
 - 23 *NSJE*, April 1904, 103; *NSJE*, October 1908, 162.
 - 24 See Ian McKay, "The Liberal Order Framework: A Prospectus for a Reconnaissance of Canadian History," *Canadian Historical Review* 81, no. 4 (2000): 616–78; Daniel Samson, *The Spirit of Industry and Improvement: Liberal Government and Rural-Industrial Society, Nova Scotia, 1790–1862* (Montreal: McGill-Queen's University Press, 2008); Graeme Wynn, "Exciting a Spirit of Emulation Among the 'Plodholes': Agricultural Reform in Pre-Confederation Nova Scotia," *Acadiensis* 20, 1 (1990): 5–51.
 - 25 On efforts to "modernize" and assimilate the Mi'kmaq, and successful Mi'kmaw resistance to these efforts, see Martha Walls, *No Need of a Chief for This Band: The Maritime Mi'kmaq and Federal Electoral Legislation, 1899–1951* (Vancouver: UBC Press, 2010). See also, Daniel N. Paul, *We Were Not*

- the Savages: A Micmac Perspective on the Collision Between European and Aboriginal Civilization* (Halifax, NS: Nimbus, 1993); William C. Wicken, *The Colonization of Mi'kmaq Memory and History, 1794–1928: The King v. Gabriel Sylliboy* (Toronto: University of Toronto Press, 2012).
- 26 See Richard H. Field, “Colonizing Nature: Titus Smith Jr. and the Making of Nova Scotia, 1800–1850,” in *Land & Sea: Environmental History in Atlantic Canada* (Fredericton, NB: Acadiensis Press, 2013), 45–59; Janet Guildford, “Maria Morris Miller: The Many Functions of Her Art,” *Atlantis: Critical Studies in Gender, Culture & Social Justice* 20, 1 (1995): 113–23; Suzanne Zeller, “George Lawson: Victorian Botany, the Origin of Species and the Case of Nova Scotian Heather,” in *Profiles of Science and Society in the Maritimes Prior to 1914*, ed. Paul A. Bogaard (Fredericton, NB: Acadiensis Press, 1990), 51–62; Zeller, “Reflections on Time and Place.”
- 27 There is a substantial literature on the complicity of science in processes of imperialism and colonialism, much of it focusing on the seventeenth and eighteenth centuries. For example, on botany see Daniela Bleichmar, *Visible Empire: Botanical Expeditions and Visual Culture in the Hispanic Enlightenment* (Chicago: University of Chicago Press, 2012); James Delbourgo and Nicholas Dew, eds., *Science and Empire in the Atlantic World* (New York: Routledge, 2008); Richard Harry Drayton, *Nature's Government: Science, Imperial Britain, and the "Improvement" of the World* (New Haven, CT: Yale University Press, 2000); Fa-ti Fan, *British Naturalists in Qing China: Science, Empire, and Cultural Encounter* (Cambridge, MA: Harvard University Press, 2009); Londa L. Schiebinger, *Plants and Empire: Colonial Bioprospecting in the Atlantic World* (Cambridge, MA: Harvard University Press, 2004); Londa L. Schiebinger and Claudia Swan, eds., *Colonial Botany: Science, Commerce, and Politics in the Early Modern World* (Philadelphia, PA: University of Pennsylvania Press, 2005); Suzanne Zeller, *Inventing Canada: Early Victorian Science and the Idea of a Transcontinental Nation* (Toronto: University of Toronto Press, 1987).
- 28 *NSJE*, October 1905, 206. Before this warning, there were occasionally accusations that numbers may have been copied between teachers. See for example, *NSJE*, April 1903, 97; *NSJE*, April 1905, 83.
- 29 Janet Guildford, “‘Separate Spheres’: The Feminization of Public School Teaching in Nova Scotia, 1838–1880,” in *Separate Spheres: Women's Worlds in the 19th Century Maritimes*, ed. Janet Guildford and Suzanne Morton (Fredericton, NB: Acadiensis Press, 1994), 119–43; George Perry, “‘A Concession to Circumstances’: Nova Scotia's ‘Unlimited Supply’ of Women Teachers, 1870–1960,” *Historical Studies in Education* 15, 2 (2003): 327–60; George Perry, *The Grand Regulator: The Miseducation of Nova Scotia's Teachers, 1838–1997* (Montreal: McGill-Queen's University Press, 2013).
- 30 *NSJE*, October 1905, 206.
- 31 Lianne McTavish, “Learning to See in New Brunswick, 1862–1929,” *Canadian Historical Review* 87, 4 (2006): 556.
- 32 On Dewolfe, see Jane Margaret Norman, *Loran Arthur DeWolfe and the Reform of Education in Nova Scotia, 1891–1959* (Truro, NS: Atlantic Early Learning Productions, 1989).
- 33 *NSJE*, April 1904, 80.
- 34 *NSJE*, April 1907, 83.
- 35 *NSJE*, April 1905, 78, 79, 80; *NSJE*, April 1906, 60.
- 36 *NSJE*, April 1905, 82.
- 37 *NSJE*, April 1903, 97.
- 38 *NSJE*, April 1903, 98.
- 39 The list changed substantially only once, in 1902, when the future vexing *Rhodora* was actually added along with a handful of other plants. A few plants and agricultural activities were also removed. *NSJE*, October 1902, 143–156.
- 40 *NSJE*, April 1903, 98, 96. Kirsten Greer and Laura Cameron have noted that while birdwatching was becoming a common hobby in the period, it was dominated by urban participants. Kirsten Greer and Laura Cameron, “‘Swee-Ee-et Cán-a-Da, Cán-a-Da, Cán-a-Da’: Sensuous Landscapes of

- Birdwatching in the Eastern Provinces, 1900–1939,” *Material Culture Review* 62 (Fall 2005): 37. See also their discussion of the Peabody bird (White-throated Sparrow) and the reinterpretation of its call from I-I-Peabody-Peabody for American ears to their titular Sweet Canada for Canadian bird lovers (42).
- 41 *NSJE*, April 1909, 96.
 - 42 *NSJE*, April 1917, 75.
 - 43 *NSJE*, October 1919, 239.
 - 44 *NSJE*, April 1920, 94.
 - 45 Harry Piers, “Notes on Nova Scotian Zoology, No. 2,” *Proceedings and Transactions of the Nova Scotian Institute of Science* 8, pt. 2 (1891–1892): 175.
 - 46 *NSJE*, October 1897, 144.
 - 47 *NSJE*, April 1909, 95; *NSJE*, April 1906, 61.
 - 48 *NSJE*, October 1905, 206.
 - 49 Tina Loo, “High Modernism, Conflict, and the Nature of Change in Canada: A Look at *Seeing Like a State*,” *Canadian Historical Review* 97, 1 (2016): 34–58.
 - 50 *NSJE*, October 1899, 143.
 - 51 *NSJE*, April 1902, 62.
 - 52 Existing school registers for nearby Lower Lakeville show Rosborough visiting the school, where he “gave a lesson in Botany,” in June of 1902, 1903, 1906, and 1907. Eastern Shore Archives, Lake Charlotte, NS, school registers collection.
 - 53 *NSJE*, April 1902, 59.
 - 54 Collected Returns, year ending July 1901, Rockville.
 - 55 Collected Returns, year ending July 1910, West Middle Sable.
 - 56 *NSJE*, April 1903, 95.
 - 57 Wood’s Harbour community notes, *Yarmouth Herald*, April 26, 1892.
 - 58 On occupational pluralism, see Larry McCann, “Seasons of Labor: Family, Work, and Land in a Nineteenth-Century Nova Scotia Shipbuilding Community,” *History of the Family* 4, 4 (1999): 485–527.
 - 59 *NSJE*, April 1904, 78; *NSJE*, April 1902, 61–62.
 - 60 Daniela Bleichmar, “The Geography of Observation: Distance and Visibility in Eighteenth-Century Botanical Travel,” in *Histories of Scientific Observation*, ed. Lorraine Daston and Elizabeth Lunbeck (Chicago: University of Chicago Press, 2011), 375.
 - 61 Lorraine Daston, “On Scientific Observation,” *Isis* 99, 1 (2008): 102.
 - 62 Janis L. Dickinson and Rick Bonney, “Why Citizen Science?,” in *Citizen Science: Public Participation in Environmental Research*, eds. Janis L. Dickinson and Rick Bonney (Ithaca, NY: Comstock, 2012), 1, 7, 11.
 - 63 Daston, “On Scientific Observation,” 107.
 - 64 Daston, 103.
 - 65 *NSJE*, April 1910, 92.
 - 66 Collected Returns, year ending July 1901, West Petpeswick, Rockville.
 - 67 Daston, “On Scientific Observation,” 107, 104.
 - 68 *NSJE*, April 1904, 78; *NSJE*, April 1906, 62.
 - 69 *NSJE*, April 1904, 80.

- 70 *NSJE*, April 1917, 67.
- 71 *NSJE*, October 1921, 152–53.
- 72 *NSJE*, April 1906, 64.
- 73 Collected Returns, year ending July 1901, Lower Ship Harbour, Pleasant Lake; year ending July 1908, Charlo's Cove; year ending July 1906, Point Brule; year ending July 1910, West Middle Sable; NSA, RG 14, vol. 111, school papers, Colchester County 1895–1960, file: Upper Economy.
- 74 *NSJE*, April 1907, 81.
- 75 Collected Returns, year ending July 1906, Port Joli, Summerville Centre, St. Catharine's River.
- 76 On the loss of names for the natural world, see Robert Macfarlane, *Landmarks* (London: Penguin Books, 2016).
- 77 James C. Scott, *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998).