George Perkins Marsh: The Times and their Man

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ABSTRACT

David Lowenthal is correct in suggesting that George Perkins Marsh was America's most influential mid-nineteenth-century conservationist. Lowenthal's biography, however, fails to address Marsh's intellectual and social 'times'. This article challenges the premise that Marsh was unique in laying out an ecological justification for conservation. It suggests that these principles were common currency in early American natural history. Drawing on theological and evolutionary thinking, naturalists searched for patterns of purpose and interrelatedness in nature, and this quest laid the groundwork for ecological consciousness and conservation thinking, well before publication of Marsh's *Man and Nature*.

KEY WORDS

George Perkins Marsh, David Lowenthal, natural history, ecology, deforestation, conservation.

There can be no mistaking the importance of George Perkins Marsh as an architect of American conservation, nor the importance of David Lowenthal's biography in bringing this neglected figure into the pantheon of American conservation heroes. Although many of the ideas espoused in *Man and Nature* were evident in scientific literature before 1864, Marsh was among the first to formulate a global conception of the disturbed balance of nature. As Lowenthal demonstrates, Marsh's grasp of classical and contemporary societies and his understanding of nature laid the foundations for American conservation.

Lowenthal draws out the significance of this monumental work, but as a consummate intellectual biographer, he minimises Marsh's debt to other thinkers and his relation to his times. Despite his transcendent qualities, Marsh was

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indeed a nineteenth-century Vermonter who formulated his ideas in dialogue with those of his contemporaries. Acknowledging this, Lowenthal points to the emphasis on 'free will and human agency' in Puritan New England and to Marsh's own experience as a world traveller, which allowed him to compare Vermont to the ruined landscapes he encountered abroad. As for literary background, Lowenthal notes that the 'immediate' sources of *Man and Nature* were 'wildly heterogeneous': excerpts from French hydraulic engineers, for example, paired with quotes from German foresters and 'piquant anecdotes from Marsh's boyhood and travels'.[1]

But in setting the scene for *Man and Nature*, Lowenthal studiously avoids reference to popular sources of conservation concern. 'It has become fashionable', he writes, 'to dismiss Marsh in favor not only of free-spirited romantics like Thoreau and Muir but of unsung hoi polloi on the mainstream's margins'. These 'voiceless underlings all over the globe', he insists, are given 'far too much credit' for the 'conservation insights and observations' formulated at mid-century in Marsh's homelands. Lowenthal acknowledges that 'Marsh himself credited many of his intuitions to observant neighbors', but he insists that Marsh's ideas were the product of pure intellectual research.[2] There are three premises in his biography that bear scrutiny: First, that grand ideas issue only from great men; second, that Marsh preceded all other great men in his analysis of the environment; and third, that mid-century conservation impulses sprang essentially from *Man and Nature*.

The first is difficult to pin down. Social and labour historians launched a challenge to elite history in the late 1960s using precise forms of quantitative analysis to document the behaviour of so-called inarticulate classes. The prospect of attributing unquantifiable intellectual trends to common people – an intellectual history of the inarticulate – is clearly more problematic. However, we can draw some suggestive inferences from the scientific and popular literature.

First, interest in natural history was intense in the early national period. By the end of the War of 1812, Americans were less absorbed in practical matters, and they embraced natural history as a means to comprehend their newly won western territories. 'A spirit of inquiry' was awakened, according to James Ellsworth De Kay. 'The forest, and the mountain, and the morass have been explored. The various forms and products of the animal, vegetable, and mineral kingdoms have been carefully, and, in many instances, successfully investigated.' Popular publications noted widespread public interest in natural history, evident at scientific lectures and in drawing-room gatherings. Despite a trend toward professionalisation, natural sciences gained popular appeal.[3]

There were several reasons for this. The Linnaean system of classification was widely accepted by the late eighteenth century, and its simple formulations based on direct observation democratised scientific pursuits. Wernerian classification offered a similar system for amateur geologists.[4] In America the newly opened western lands promised explorers a wealth of new discoveries,

and the profound transformation under way in this vast new country piqued scientific interest. The prospect of modifying the face of a land 'so extensive, still fresh, as it were, from the hand of nature', fascinated observers and settlers alike.[5] New journals like Samuel L. Mitchill's *Medical Repository* and Benjamin Silliman's *American Journal of Science* appealed to amateur and professional alike.[6] Natural history also drew interest because of its religious overtones. Well into the nineteenth century the study of nature was popularly viewed as an exaltation of God's works. 'Religious tracts, treatises, and sermons featured countless discussions of animals and plants, water and rocks, thunder and lightning, the universe and the earth, treated in the strictly natural historical sense.'[7] Natural history also inspired 'a proper feeling of nationality', De Kay noted; encouraged Americans to 'examine for themselves, instead of blindly using the eyes of foreign naturalists, or bowing implicitly to the decisions of a foreign bar of criticism'.[8]

Second, scientific inquiry was a shared endeavour. Naturalist-explorers employed a network of correspondents and contacts to disseminate scientific information. 'My first object, after my arrival in America, was to form an acquaintance with all those interested in the study of Botany', Polish naturalist Frederick Pursh remembered. In Pennsylvania he contacted the Rev. Dr. Gotthilf Henry Ernest Mühlenberg, a distinguished Lutheran minister and botanist known for his botanical garden. Pursh also conversed with the aged Humphrey Marshall, author of an authoritative treatise on American forests, and with botanists John and William Bartram. At Woodlands, he inspected William Hamilton's magnificent garden, with plants from all over the world, and later talked with Benjamin Smith Barton at the University of Pennsylvania and with Meriwether Lewis, governor of Upper Louisiana.[9] Only then was Pursh prepared to launch his own botanical research.

Accumulating letters of introduction as they travelled westward, itinerant naturalists used these local contacts to flesh out their understanding of American natural history. British geologist I. Finch stopped on his western tour in Pennsylvania to visit the Rev. P. Schweinitz's herbarium in Lancaster and the Rev. Bishop Heiffell's collection of shells and minerals. At Wilkesbarre he conversed with naturalist Z. Cist, a collector of insects and minerals who was 'zealous in every pursuit that would elucidate the resources of his country'. Journeying through Pennsylvania, Francois-André Michaux, like Pursh, visited Mühlenberg and Hamilton, finding them both 'very communicative'. In Cincinnati Daniel Drake showed James Flint a place 'where large detached masses of granite' lay over a sedimentary stratum of limestone. Drake hypothesised that the granite had 'been brought from the primitive country north of the lakes, by the agency of water passing from north to south'.[10]

This network centred on members of a class New Hampshire historian Jeremy Belknap called 'gentlemen of standing and character': locally prominent individuals with an abiding interest in some aspect of the natural sciences. But

not all informants were this exclusive. Belknap collected a voluminous natural history of his state from personal observation, public records, correspondence with 'clergymen and other gentlemen of public character', and from conversations with those whose work in the new settlements – logging, hunting, scouting, farming, manufacturing, store-keeping, surveying, and fishing – gave them a particular intimacy with the workings of nature. Vermont's Samuel Williamson compiled his natural history using similar sources, and Franklin Hough, who wrote a history of Jefferson County, New York, visited each town and village in the county to conduct interviews with local citizens and old pioneers. In addition to consulting the 'works of the oldest and best authors', William D. Williamson drew his two-volume history of Maine from some 150 correspondents residing in different parts of the State.[11]

The acknowledgments in Belknap, Hough, and the two Williamsons raise a third point about natural science in the early national period: interest in nature was not limited to an 'educated elite'. British historian Anne Secord documented the participation of artisans and operatives in scientific discussion during the late eighteenth century, and it is reasonable to assume that American workers and farmers were equally involved in a 'pub botany', as she calls it, since nature was so accessible from most urban areas. This type of natural history, Secord reminds us, 'required little expertise'.[12]

Thus in addition to prominent naturalists, lesser-known authorities played an important part in the accumulation of scientific information. Almost any sizeable community harboured, according to newspaper correspondent James Parton, 'a farmer or mechanic who has addicted himself to some kind of knowledge very remote from his occupation. Here you will find a shoemaker … who has attained celebrity as a botanist. In another village there may be a wheelwright, who would sell his best coat for a rare shell; and, not far off, a farmer, who is a pretty good geologist.'[13] Communicating across class lines, these local amateurs spanned the divide between folk knowledge and natural science.

Travelling naturalists frequently boarded with pioneer families as they explored the transappalachian frontier; they were hungry for local information, and they received it from their accommodating hosts. Botanist Thomas Nuttall was 'introduced in a very friendly manner' to Mr. Collins of Pittsburgh, a salt manufacturer who explained the chemical characteristics of the nearby mineral springs. Nuttall and Collins searched for fossil ferns while discussing local rock formations, coal and peat deposits, and the 'tooth of a mammoth and some other bones' Collins had donated to a natural history cabinet in Pittsburgh. In passing through Pennsylvania, François-André Michaux met Patrick Archibald, who lived in a 'miserable log-house about twenty feet long' but grew an azalea shrub the fruit of which provided 'excellent oil'. Michaux commissioned Archibald to send him a bushel of seed when it was ready. Near Pittsburgh Michaux encountered Chevalier Dubac, who had 'very correct ideas concerning the western country', and he queried two fellow Frenchmen – a physician and a farmer – about the

forests around Lexington. Michaux learned how land was cleared and pearl ash made from fellow-traveller Samuel Craft, and at Wheeling, he 'stopped at the hut of one of the inhabitants of the right bank, who shewed us, about fifty yards from his door, a palm-tree [sycamore], or *platanus occidentalis*, the trunk of which was swelled to an amazing size'. Still later the naturalist talked with a farmer near Knoxville, who 'in his leisure hours … busies himself in chemistry'.[14]

Communication across social lines was fluid on the frontier, and scientific information flowed freely from the grass-roots upward. Travel accounts like Michaux's contain abundant references to the hospitality western settlers extended when a scientific party passed beyond the reach of public taverns. 'I like these Western men', Tyrone Power wrote. 'Their off-hand manner makes you at once at your ease with them; they abound in anecdote growing out of the state in which they live, full of wild frolic and hardy adventure, and they recount these adventures with an exaggeration of figure quite Oriental, in a phraseology peculiar to themselves, and with a manner most humorous.' Liancourt explained that as far as possible he asked the same question of several men 'of different interests and opinions', thus presumably purging his account of bias. He was predisposed to converse with commoners, since they were they were more likely to be Democrats than Federalists and thus better disposed toward a Frenchman. John Bradbury found settlers 'as ready to give information as to ask for it'. In his advice to frontier travellers, George Temple cautioned: take 'as small a quantity of dress as possible; more important to have *address* than dress'. Naturalists accepted what Thomas R. Dunlap calls folk-biology because this was often the only knowledge available in the new country. In context, the fact that 'Marsh himself credited many of his intuitions to observant neighbours' may be more significant than it appears in Lowenthal's text.[15]

Naturalist-explorers, in short, exchanged information with both the educated and the hoi polloi along their route.[16] Geologist David Thomas recalled that he 'applied to several intelligent persons' residing on the Wabash before making a geological assessment of the region. Thomas Nuttall's journals show a similar willingness to gather local opinion. In Cincinnati, Daniel Drake introduced him to H. Glenn, 'lately sutler to the garrison of Arkansa', who provided information on the territory Nuttall planned to visit. At Detroit he spent several days with 'the Abbé Rishard' [Richard], a 'learned & intelligent observer' who discussed the area's soils, geology, and antiquities. Like Zebulon Pike before him and Henry R. Schoolcraft after him, Nuttall derived much information from the Indians and the Canadian voyageurs with whom he travelled on the upper Great Lakes – individuals who had 'passed the greatest part of their lives' in the territory he was exploring. Geologist and surveyor George W. Featherstonhaugh described his voyageur-guides as 'men of great experience … and trustworthy in everything except the abuse of ardent spirits'. John James Audubon collected a detailed natural history of the beaver from a 'trapper named Prevost', and Crèvecoeur described the sagacity of his guide in almost mythical tones: 'he

judges of the soil by the size and the appearance of the trees; next he judges of the goodness of the timber by that of the soil. The humble bush which delights in the shade, the wild ginseng, the spignet, the weeds on which he treads teach him all he wants to know. He observes the springs, the moisture of the earth, the range of the mountains, the course of the brooks. He returns at last; he has formed his judgment as to his future buildings, their situation, future roads, cultivation, etc.' Nuttall's journals, like those of other naturalists, are replete with passive-construction introductory phrases like 'I am informed', and 'I am told', and his *Manual of Ornithology* acknowledges a number of unidentified 'obliging friends' who sent him specimens and fleshed out his understanding of birds and their habits.[17]

In short, it would be impossible to sort out the complicated mix of folk knowledge and academic science in early American natural science. Louis Agassiz wrote in the introduction to his four-volume *Contributions to the Natural History of the United States* that 'it would be difficult for me to convey an adequate idea of the value of all the different contributions I have received for this part of my work.' Agassiz's acknowledgments include hundreds of individuals, ranging from university-trained geologists and botanists to local amateurs like Zadock Thompson of Vermont, James E. Mills of Maine, and 'Mr. D. Henry Thoreau' [sic] of Concord.[18] Although precise attribution is difficult in this heady exchange of ideas, one should not discount the contribution to natural history made by amateurs from all walks of life.

Lowenthal's second premise, that Marsh preceded all other great men in his understanding of ecological dynamics, can be examined with more precision. Well before *Man and Nature* was published, scientists understood that natural landscapes were both dynamic and interconnected. As early as 1740 John Bartram was describing the 'transformations & transmutations' he observed in the natural world. 'Matters seems never at rest', he wrote, 'but allway in a state of contraction or expansion'. He explained to Peter Collinson how easy it was to find fossil shells in mountain country, because 'ye high rocks is yearly tumbling down being composed of scaly mater which is penetrated by rains descending which in winter freeezeth bursteth & tumbles down roling to ye bottom'. The world, as Compt de Buffon said, was a place of 'perpetual destruction and renewal'. British geologist Charles Lyell, who explored America on three occasions and incorporated these experiences into his *Principles of Geology*, described nature as a state of 'perpetual flux'.[19]

The idea of flux in nature proceeded from the geological sciences, with their narratives of earthquakes, volcanoes, and floods as nature's instruments for making the earth habitable for humankind.[20] Geologists presumed that the earth in its uncorrupted form was arranged, like other heavenly bodies, in concentric spheres, one rock stratum lying over the next. In time, this elemental form was stirred by volcanoes, explosions, upheavals, comets, subsidences, depositions, floods, rain, winds, changes in the earth's axis, and other profound natural forces.

As the layers mixed, the earth was perfected: useful minerals and rocks were scattered in convenient places near the surface, and the upper stratum was fitted with a diversified soil constituted so as to be 'easily pulverized by instruments of husbandry'.[21]

To at least one school of geological thought, these dynamics could be violent. On viewing the South Pass through the Appalachians, Charles Varte imagined that at some point the 'stupendous and rugged mountain, … [was] cut asunder, and torn, as it were, by some gigantic stroke of nature'. In parting, it released a huge inland sea pent up behind the Appalachian ridge, presenting a scene that would have 'fill[ed]the soul with inexpressible sensations'. Geologist Samuel L. Mitchell envisioned this ancient sea pounding against the 'grand rampart' of the Alleghenies, and eventually sluicing through the gaps, carrying 'devastation … like the waters from cloud-bursts or bursting reservoirs of today, but on a thousand-fold larger'. Although catastrophic, such events prepared the land for productive habitation, in this case leaving behind the alluvial soils and coal strata of the upper Midwest.[22]

These changes continued into present times. Mountain peaks slid down into the valleys; lake levels dropped suddenly and mysteriously; rivers abandoned their ancient courses; banks washed away, making new land further downstream; forests changed from one species to the next.[23] After reviewing the formation of the White Mountains, Edward Hitchcock observed that 'all the agencies' that produced these stupendous summits and valleys were 'still in operation in some part of the globe'. These and other phenomena revealed a restless and as yet incomplete topography moving in resonance with a preordained design.[24] Daniel Botkin records Thoreau's conversation with an old farmer who lost a 'crittur' in a Cape Cod swamp. Since then, Thoreau said, the farmer had 'lost the swamp' as well, although he had 'since seen signs of it appearing on the beach'. Botkin concludes that Thoreau 'began to understand that nature is dynamic', and makes much of this epiphany: 'The idea of the naturalness of change ran counter to the great, ancient myth of the balance of nature, which, before and during Thoreau's time, was the accepted explanation of how nature worked.'[25] In fact, Thoreau's contemporaries well understood change to be part of nature's order.

According to geologist James Dwight Dana, these movements constituted a system of 'dynamical geology', an evolutionnary process by which all elements of nature – geology, botany, zoology, anthropology – was interconnected. Step by step from primordia to the present, the world was 'fitted up' as life passed through its 'long succession of forms, ever increasing in rank, until at last man stood up erect, fitted to subjugate the mightiest energies of nature'. All natural history pointed to the moment of settlement in western America. Dynamical geology – a cosmic evolution from the simple to the complex – gave assurance that nature was unfolding according to plan.[26]

Underlying this assumption was a simpler and more subliminal truth, drawn more from theology than from science, that these changes were both predictable

and benevolent. Nature, in short, was moving toward a foreseeable anthropocentric end, guided not by blind forces but by rational design.[27] Mark Catesby, one of America's earliest trained botanists, hypothesised that natural elements were in constant interplay – topography, climate, atmospheric chemistry, geological mechanics, soils, plants – and they were tending toward 'a dynamic equilibrium of forces'.[28] Nature was a 'well governed state, in which there are a proper number of inhabitants, each in the place appointed for it'.[29] Naturalists confronted the endless varieties of form in nature with the understanding that they could reason out the underlying connections. Nothing was lost; nothing stood alone; nothing was without use. 'Every part of nature, from the largest to the smallest, from the planet to the atom, … all have their action and use, and are bound together by a reciprocity of dependence and advantage.'[30] According to Ohio naturalist S.P. Hildreth, 'the laws of climate, soil, &c. are … adapted to vegetable life, [and] … the geology of a country is intimately connected with the trees which clothe and beautify its bold and rugged features'.[31]

This purposive view of nature obliged scientists to search for ecological interconnections. Nature, as historian George H. Daniels puts it, was an 'ingeniously contrived mechanism designed explicitly for the use of man and the glory of God'. John Bartram observed an unusual number of bears one fall in the woods around Philadelphia and reasoned that the oak trees further west must have been deficient in acorns, owing, perhaps, to cycles of insect infestation. This also explained the appearance of an unusual number of passenger pigeons. 'I shall now beg leave to make some remarks on these observations', he wrote, 'as first the wonderfull order and ballance that is maintain'd between ye vegetable and animal oeconomy, that the animal should not be too numerous to be supported by the vegetable: nor the vegetable production be lost for want of gathering by the animal.'[32]

Beyond the matter of plant or mineral identification and classification – the primary preoccupation of early natural history – was a search for correspondence: for patterns of uniformity and interrelatedness in nature, which would in turn reveal nature's basic laws.[33] Naturalist Ezekiel Holmes deliberated the purposes of western Maine's mountains: 'On a cursory view of this immense congregation of lofty and craggy summits', he noted, 'it would seem to have been a mistake of creative power in thus piling together so much rugged earth in a form and condition to make it entirely waste land, … but God makes no mistakes.' Mountains played an important role in the 'great economy of animal as well as vegetable life'; they generated the snows that protected the fields and meadows in winter and sent down pure waters in the spring to replenish 'the reservoirs and lakes … at their feet'. Without the 'rude and uncomely mountains' springs would fail, rivers would dry up, and the lands would parch. Geologists Charles T. Jackson and French naturalist Charles Varte reminded their readers that mountain freshets brought down alluvial soils to 'top-dress' the lowlands with 'fertilizing substances'. The earth was constantly improving as mountains

eroded. 'Nothing is more striking throughout the animal and vegetable kingdoms than the unity of plan in the structure of the most diversified types. From pole to pole, in every longitude, Mammalia, birds, reptiles, and fishes, exhibit one and the same plan of structure, involving abstract conceptions of the highest order, far transcending the broadest generalizations of man', Louis Agassiz wrote. These 'beautiful harmonies' linked aspects of nature into an ecological whole. Historian Richard Grove, who studied the colonising of tropical islands, discovered an 'embryonic' awareness of ecological interrelations as colonials began to alter their island bio-communities in the mid seventeenth century. On a land mass the size of America, ecological sensitivity slumbered longer, but as Grove points out, these connections, particularly regarding forests and climate, were in vogue long before Marsh wrote *Man and Nature*.[34]

Given this interest in ecological processes, early naturalists were attentive to instances of human disturbance. Many remarked on the implications of burning the forest to clear land in the new plantations, for instance, and on the smoke that at times obscured the sun for days hundreds of miles away.[35] Traveling west of the Alleghenies, Thaddeus Mason Harris noted that he and his companions 'seemed to have ridden all day in a chimney, and to sleep all night in an oven'.[36] Those who witnessed these annual conflagrations were driven to speculate about their effects. Reckless forest clearing, by some accounts, destroyed valuable timber and incinerated an 'almost endless' variety of useful plants. Settlers' fires disrupted the process of renewing the soils – the cycles of growth and decay that produced a 'luxuriancy' of plants exceeding 'any thing that can afterwards be procured, by all the improvements of agriculture'.[37] Vermont naturalist Samuel Williams saw this renewal as part of a delicately balanced mechanism whereby the 'vegetable productions of the uncultivated parts of America, return to the earth by decay and death, and corrupt on the surface from which they grew'. Since forests drew nourishment from air and water as well as from the soils, this process was accumulative.[38]

The relation between forest clearing and climate became a major scientific debate between 1750 and 1850. Ezekiel Holmes mused that 'one may easily conjecture what must be the natural consequence when so large a tract of country is covered so completely with apparatus for evaporation'.[39] Speculations like this derived from a phenomenon that puzzled even the earliest explorers on the continent: North America was much colder than Europe in the same latitudes. Most naturalists ascribed this to America's forested landscapes. Biblical and classical literature – King David's reference to snow, frost, and ice; Horace's record of the Tiber River freezing; Ovid's complains about frost in the wine country – suggested that Europe had been colder when it was heavily forested, particularly in the kingdoms of Hungary, Poland, and Germany. 'From these uncultivated deserts', Harvard Professor Hugh Williamson wrote, 'piercing North-Winds used to descend in torrents on the shivering Italian, though his own little commonwealth were finely cultivated'.[40]

How forests affected climate was a matter of debate. Zadock Thompson, who wrote a natural history of Vermont in1842, speculated that when the country was 'equally shielded by the forest', heat was distributed more evenly and changes in the wind and weather were less frequent. Geographer Rodolphus Dickinson thought that clearing and cultivation dried and warmed the earth's surface, which increased atmospheric temperature and diminished rainfall and snowfall. Dickinson proclaimed that 'within memory' easterly winds off the Atlantic had grown more prevalent, due to warmer air rising off the cleared uplands. East winds were advancing into the interior 'exactly in proportion as the land is divested of wood.'[41]

Nor were the implications of these changes clear. Linnaeus's protégé Peter Kalm, who travelled in America in the 1750s, reported that weather patterns were growing more erratic and extreme. 'It happens at all times of the year that when a day has been warm, the next is very cold and *vice versa*. It frequently happens that the weather alters several times in one day.' This explained why Americans were 'more unhealthy at present, than they were formerly'. William Currie wrote in 1792 that 'some parts of Italy bear melancholy proofs of the alterations that accidental causes make on the atmosphere'. The Campagna di Roma, he pointed out, 'where the ancient Romans enjoyed as salubrious air as is to be found on any part of the globe, is now almost pestilential'. Some thought that deforestation would desiccate the land. Samuel Williams experimented by placing a bottle over a single tree leaf to determine the amount of moisture it transpired in a day. He felled the tree, counted the leaves, and multiplied the result by the number of trees on an average acre, estimating that his one-acre forest threw off 3,800 gallons of water each day in hot weather. Williams also thought that deforestation would make the weather 'more variable and uncertain'. Winds would change direction; the land become 'dry and hard'; the snowfall diminish; the surface waters disappear; and the streams dry up. Further west, settlers were already observing 'a great decrease of snow' as they cleared the land.[42]

Naturalists writing before Marsh also saw a connection between deforestation and stream flow. Williams pointed out that the deep mosses on forested slopes allowed water to descend 'gradually and constantly' or penetrate into the earth. Streams, he noted, 'can never fail, while the present economy of nature shall subsist'. Citing common knowledge, he wrote that 'before the country was cleared, the whole surface of the ground was deeply covered with leaves, limbs, and logs, and the channels of all the smaller streams were much obstructed by the same'. From these littered slopes, waters discharged evenly over the summer. 'But since the country has become settled, … the streams are raised suddenly, run rapidly, and soon subside.' Jeremy Belknap saw mountain forests as gigantic mechanisms for recycling water. 'No sooner has a shower descended from the clouds, but the vapor rises from the leaves of the forest in innumerable little columns, which, having gained a certain height in the atmosphere, collect and converge toward the mountains, where they either fall again in showers or are

imbibed by the moss … seeking their way to the hard stratum or pan which is impenetrable, and which guides them till they find vent in springs.'[43]

There is ample evidence of ecological awareness before *Man and Nature*, but in one important respect, these theories differ from those Marsh espoused in the 1860s: many early naturalists saw anthropomorphic change in positive terms. Aware of ecological interconnections, naturalists understood that deforestation affected the balance of nature, but their interpretation, as Lowenthal notes, was shaped by a sense of optimism that pervaded early national society. In 1814 the *Niles Weekly Register* commented on the 'mighty improvements made' beyond the Alleghenies, where the region's 300,000 new settlers had 'prostrated the forests' and replaced them with 'rich fields of grain'.[44] Given the search for purpose in natural events, it is not surprising that naturalists saw this pioneering pageant as a capstone to the earth's evolution; natural forces were not capricious, and neither were human modifications. Clearing the forest desiccated the soils, they agreed, but most Americans saw wetlands as pernicious anyway, emitting 'infectious smells' that caused debilitating ague and fevers.[45] After slogging through a portion of Ohio's notorious Black Swamp, one traveller expressed a hope that 'the greater part … would be dried up' when the forests were cleared and the country settled.[46] Swamps were regarded simply as unredeemed farmland, repositories of rich organic soils washed down by rains from the adjacent highlands. Freed from their 'superabundance of waters' and exposed to the sun, these 'mephitic pools' would extend the domain of agriculture.[47] Forests suffered a similar reputation for disease. European travellers considered America an unhealthy country and attributed the prevalent fevers and agues to the 'vast quantity of vegetable matter which goes to decay in Autumn' and to the general dankness of the forested landscape. American health would improve as the country was cleared of forests.[48]

Thus early in the century deforestation was viewed as a mixed blessing. Scientific thinkers like Cotton Mather, Thomas Jefferson, and Benjamin Franklin expected a warmer and healthier climate as the land was cleared.[49] Numerous 'experiments and observations', according to Currie, demonstrated that 'when in the course of time, this continent becomes populated, cleared, cultivated, improved, and the moisture of the soil exhausted far into the frozen regions of the north, that the bleak winds will become more mild, and the winters less cold'. Northeastern farmers informed Peter Kalm that their corn never ripened when they first arrived, but 'since the woods have been sufficiently cleared, the beams of the sun have had more room to operate, and it ripens perfectly'. New York agriculturalist John Mitchell insisted that the climate had been 'vastly improved since the country has been cleared of wood and brought into cultivation'. Winter winds were less intense, the summer air was more pure, the country was healthier, and the farmers more prosperous and secure. Geographer Moses Greenleaf reasoned that 'the great coldness' in Maine was due in some measure to 'the uncommon number of *evergreens* in our woods', which absorbed calories

and prevented the sun's rays from reaching the earth's surface. Forest clearing, he hoped, would equalise Maine's climate with those in 'the corresponding parallels of latitude in Europe'. The prospect of a Mediterranean winter would have consoled anyone concerned about forest destruction in Maine in 1829.[50]

Although some early scientists saw deforestation as a negative influence on the climate, almost everyone agreed that human action could indeed modify natural processes. Army surgeon Samuel Forry, who wrote *The Climate of the United States and Its Endemic Influences* in 1842, posed a question that underlay the debate over deforestation and climate change: 'Does the climate of a locality, in a series of years, undergo any permanent changes?' Most naturalists would have responded positively: if natural systems were dynamic, then surely human influences would alter them profoundly. 'By the end of the eighteenth century', historian Gilbert Chinard wrote in 1945, 'people in America, … had come to realize that for better or worse man was able to modify the climate in which he lived and that natural conditions could be altered by man's handiwork'.[51]

Although scientists were divided on the implications of forest destruction in the first few decades of the nineteenth century, they had reached a remarkable consensus by the 1840s – two decades before publication of *Man and Nature*. By mid-century they almost universally viewed deforestation as disaster rather than destiny. Understanding how these perceptions changed brings us to Lowenthal's third premise: that mid-century conservation sprang primarily from *Man and Nature*.

If indeed Marsh's pronouncements were the kernel of conservation thought, they fell on incredibly fertile ground. In 1847 Marsh delivered an obscure speech on forest destruction before the Rutland Agricultural Society – his first articulation of the theses he would elaborate in *Man and Nature*. Just two years later the *New England Farmer* disclosed that forest preservation was claiming 'great attention', and by the 1850s – a decade before *Man and Nature* – eastern farm editorials were alive with Marsh-like observations on forest destruction. Everyone, according to one article, was 'noticing the diminution of water in his own neighborhood'. Virtually over night, apparently, the forest had become a fulcrum for the balance of nature.[52]

But in fact, by 1847 attitudes toward forests were already in transition. Observers both scientific and amateur expressed alarm about anthropogenic climate changes.[53] Historian Samuel P. Hildreth noted in 1848 that Ohio's 'thick growth of forests' had defended the earth from the 'rays of the summer sun, and … the cold blasts of winter'. Before the forests were cleared, the winters had been milder and the summers more temperate. According to an1857 New York publication, it was 'universally conceded that the winters of the Northern States are colder now than they were thirty and forty years ago' when a thick belt of woodland 'broke the force of the winter and spring winds'.[54] Why was deforestation, once accepted with such equanimity, now a cause for concern?

The answer depends as much on historical circumstance as on the weight of Marsh's arguments.

The decades just before the Civil War brought a wave of pessimism to the rural Northeast. As early as 1809 travellers noted the 'great number of farms that had been abandoned' in the eastern states, and in 1816, the 'year without a summer', more than fifteen thousand wagons passed over the Cayuga Bridge bound for the West. The Erie Canal and the advent of steam navigation on the western waters added to the appeal of western lands, and a sharp decline in wool production, along with rising living costs, falling agricultural prices, and a loss of farm markets to western producers exacerbated anxieties about farm abandonment. Dairy and sweet corn production took up some of the slack after the Civil War, but in the 1840s the Northeast was at the bottom of a economic cycle.[55] In fact, agriculture remained vibrant in the lowlands through these decades, but hill-country farms disappeared at an alarming rate, leaving behind, an old farmer mused, a scene 'of desolation and ruin'. The farmer's concern for this abandoned landscape shifted seamlessly from demographic to environmental declension:

> Near this summit, four or five families resided in our boyhood … . but scarcely as much of their old buildings as a cellar-hole now remains. A short distance at the northeast, a district of farmers then existed, in which there were boys and girls enough to fill an ordinary country school house, that is now without an inhabitant. … Their farms have become pastures and wood lots, or bare ledges, from which the thin soil that once covered them has been washed by the mountain torrent, or blown off by the mountain winds. Square rods – almost acres – of the bald rock are now exposed, where the reaper once laid heavy gavels of wheat or other grain, and where cattle and sheep were 'up to their eyes in clover'.[56]

Farm abandonment dispirited the region, eliciting a series of moralistic parables reminiscent of old Puritan jeremiads – this time aimed at the abuse of nature.

This sense of crisis encouraged talk of a 'wood famine'. Urban markets for fuel wood and construction timber made heavy drafts on the eastern forest, leaving some rural regions in a 'destitute condition'.[57] A brisk coasting trade in wood left the central Maine coast bare of even second-growth timber; stave and hoop manufacturers scrambled for remaining stocks, and some coastal families depended on driftwood for fuel. The arrival of the locomotive, with its voracious appetite for wood, linked these conservation concerns to a variety of anxieties about the new order in the Northeast – commercial production, western beef and produce in eastern markets, and competitive pressures on local artisans, manufacturers, and merchants. 'Given the social revolution at hand', Harold Wilson wrote in 1936, 'it is no wonder that the railroad seemed as much a destroyer as a provider'.[58] In 1842 a worried farmer drew together these various anxieties and focused them on the disappearing forests: 'In a climate like ours, … where … the mercury sleeps so many nights below zero; in a country like

ours, where cities are springing up on every hand, and … where enterprise … throws its curling smoke from every mountain and valley rill and secluded dell; in such a country and in such an age, where everything moves by steam, … the protection of woodlands is a subject of universal interest.'[59]

Economic and environmental changes, coupled with the spectre of farm abandonment, precipitated a reform movement advocating intensive agriculture, better manuring and rotations, and a 'regular system of cultivation suited to a country more advanced'.[60] Pioneering land-extensive cultivation had 'had its day', reformers announced, and the means of pursuing it – abundant arable land, virgin soils, and unending forests – no longer existed. Care of the woodlot and the forest was a natural outgrowth of this campaign, since farmers could grow trees profitably on land abandoned to western migration or to more intensive farming. Already, a Burlington editor wrote in 1864, 'in some older portions of the country the process of restoring is … in progress'.[61] Ironically, George Perkins Marsh began thinking about Vermont's forests at a time when they were already reclaiming the hill country's abandoned fields, and some farmers preferred this crop to sending the 'plough in quest of a rye harvest that will scarcely repay the expense of cultivation'.[62]

For a variety of reasons New Englanders were discussing forest conservation at the turn of the century. This concern began much earlier with a decline in available stores of shipbuilding materials and an interest in ornamental trees for roadsides and parks. As early as 1798 the Massachusetts Agricultural Society offered premiums to encourage forest preservation and disseminated information about the 'proper and best [means] adapted to perpetuate … an adequate supply of ship timber'. From this point on, Society publications maintained a dialogue on wood cultivation, inspired by André François Michaux's *North American Sylva*, which introduced the art of arboriculture to America. The *Massachusetts Agricultural Repository* remarked in 1818 that Americans should reconsider their 'indiscriminate war upon the woods', and that year Noah Webster warned that a growing population in a cold climate could anticipate only greater drafts on the forest. By the early 1840s, woodlot management – yields, cutting rotations, soil types – was a familiar topic in the rural press.[63]

Like popular concerns, scientific interest in forest conservation developed even before the nineteenth century. In 1789 Dr. Nicholas Collin, rector of the Swedish Church in Philadelphia, read a paper before the American Philosophical Society proclaiming America's forests a 'national treasure, deserving the solicitous care of the patriotic philosopher and politician'. Forests, in Collin's opinion, had been 'too much abandoned to the axes of rude and thoughtless wood-choppers'. Collin stressed the importance of forests in the balance of nature. Writing to Benjamin Franklin, John Bartram noted that 'by a diligent observation in our province, and several adjacent, I apprehend, that timber will soon be very much destroyed, occasioned in part by the necessity that our farmers have to clear the greatest part of their land for tillage and pasture, and

partly for fuel and fencing'. Bartram suggested a plan to raise trees, suggesting red cedar as the most likely crop given its ease of planting, its rapid growth, its resistance to rot both before and after cutting, and its usefulness for fencing and construction. Bartram included in his recommendations a note on red-cedar ecology: 'the birds will carry the berries all over your plantation, which will come up and grow finely, so that you may dig up as many as you please to plant, or leave as many as you think proper to grow where they came up'.[64]

In part, naturalists like Bartram were reacting to the ecological devastation they witnessed in the western settlements. New York agriculturalist John Mitchell observed that 'rural management' in the West was miserable: 'seduced by the fertility of the soil on first settling, the farmers think only of exhausting it as soon as possible, without attendant to their own interest in a future day; this is a degree of blindness which in sensible people one may fairly call astonishing'. This was a country, he concluded, 'in which nature has done so much [and] man will do so little'. Instead of cutting every stick of timber on their land farmers should 'inclose and reserve portions of the best woods for the future use of themselves, and the general good of the country'.[65] Historian Hans Huth noted that scientists like Bartram, Michaux, and Audubon were transformed by their experience with the American wilderness. They began to envision 'an entirely new relationship … between man and nature, and even though the relationship was felt only by small groups of people it actually made for a better understanding of nature'.[66]

Thus a number of naturalists preceded Marsh in drawing attention to the environmental consequences of deforestation. In 1868 the *Burlington Free Press* expounded on the influence of forests, drawing numerous examples from 'the dry and sterile state of many parts of the Old World which were once prosperous and populous'. It cited not Marsh but rather a Dr. Coutzen of the German Stuttgard Polytechnic School.[67] Four years later the *New England Farmer* reported a 'wide-spread public impression that land clearing diminished the rainfall, increased the frequency of severe droughts, and otherwise affected the climate unfavorably'. Again the paper cited not Marsh but, among others, Samuel Williams's earlier experiments, Humboldt's *Aspects of Nature*, and John William Draper's 1847 *Text-book on Natural Philosophy*.[68]

Northeastern farm reformers took up these ecological principles and gave them practical meaning. The *Burlington Free Press* agricultural editor described the forest's role in 'creating and gradually improving the soil'. 'Year after year', he wrote, 'as the roots penetrate deeper and spread wider beneath the surface of the earth, the air is allowed to penetrate to produce its decomposing effects … and the leaves, by means of the action of heat and light upon them, transform, in their mysterious way, these substances into the materials of which the plant is composed.'[69]

Given the sombre mood in the mid-century rural press, these ecological issues could be frightening. 'In this season of the year, when the woodman's

axe is ringing through all our forests, prostrating millions of trees', an unnamed correspondent wrote in the *American Agriculturist* in February 1857, 'it is a timely subject of inquiry, 'What is to be the result of this wholesale demolition?'' The writer cited rising fuel and lumber prices, but went on to raise aesthetic and ecological concerns: Coming generations would 'lament the bleak and naked hills, and cry out against us for despoiling them of their chief beauty … !' Forests, he reminded his readers, were a 'beneficial influence upon the climate' and a shelter against drought and desiccation. 'Remove old trees, but touch the young with a sparing hand. Clear up your valleys, but do not strip bare the hill tops. Leave groups and single trees here and there in your pastures, both for the comfort of your flocks and herds, and for the beauty of the landscape.'[70]

Did this New York farmer happen upon a copy of Marsh's 1847 Rutland address? Had he read Samuel Williams? Or had he, perhaps, found inspiration in the multi-volume *Natural History of New-York*, published in 1843, in which the eminent naturalist Ebenezer Emmons warned that if New York's forests 'were to be replaced by pastures or open fields … , the quantity of rain which now falls would be materially diminished … ; or if it should not be diminished, the evaporation from the surface would be greatly increased, so that the result would remain the same under either condition'.[71] It is difficult to say where this unidentified correspondent gained his impression of the disturbed balance of nature. A.N. Somers, who wrote a history of Lancaster, New Hampshire, in 1899, asserted that his home state, 'so largely denuded of its forests', was growing less humid and consequently less fertile. He based these claims on the authority of the 'oldest residents of the town'.[72] Like the New York correspondent, these old folks might have read their Marsh, but there are numerous other possibilities, each as likely to have been a source for their conservation ethic.

Weighing this disconnected body of ecological and reform thought against the influence of Marsh's magisterial *Man and Nature* is one of those thorny epistemological problems that keeps social and intellectual historians from talking to each other. Marsh shaped this body of thought into a systematic global perspective, and he clearly inspired a later generation of Progressive conservationists. But to trace the intellectual premise behind this reform to a single member of the educated elite perpetuates a dangerous half-truth.[73] After all, the hoi polloi is, as it was in the nineteenth century, the medium through which environmental thought must pass before it becomes the law of the land, and if we fail to recognise ordinary people as part of this creative process, they will be far less willing to accept environmentalism as their own.

NOTES

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[2] Lowenthal, *George Perkins Marsh*, pp. 419–20.

[3] James Ellsworth De Kay, *Anniversary Address on the Progress of Natural Sciences in the United States Delivered Before the Lyceum of Natural History of New York, February 1826* (New York: G. and C. Carvill, 1826), pp. 6–7; Rebecca Bedell, *The Anatomy of Nature: Geology and American Landscape Painting, 1825–1875* (Princeton: Princeton University Press, 2001), p. 3.

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[6] Leonard G. Wilson, *Lyell in America: Transatlantic Geology, 1841–1853* (Baltimore: Johns Hopkins University Press, 1998), pp. 12–13.

[7] Martin Guntau, 'The Natural History of the Earth', in Jardine, Secord and Spary, *Cultures of Natural History*, pp. 216–27.

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[12] Anne Secord, 'Artisan Botany', in Jardine, Secord and Spary, *Cultures of Natural History*, pp. 278, 379.

[13] James Parton in *Burlington Free Press*, December 28, 1868.

[14] Thomas Nuttall, 'Nuttall's Travels into the Old Northwest: An Unpublished 1810 Diary', edited by Jeannette E. Graustein, *Chronica Botanica* 14 (1950–1951), pp. 30–31; Michaux, *Travels to the West of the Allegheny Mountains*, pp. 27–8, 47–8, 50, 73, 86–7, 131, 136.

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[21] Noah Webster, *An Address, Delivered before the Hampshire, Franklin and Hampden Agricultural Society* (Northampton, Massachusetts: Thomas W. Shepard, 1818), p. 3. See Baron Georges Cuvier, *Essay on the Theory of the Earth … To which are Now Added, Observations on the Geology of North America …* (New York: Mercein for Kirk & Mercein, 1818), p. 408–10.

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[61] *Burlington Free Press*, March 16, 1864.

[62] *The Farmer's Monthly Visitor*, 4 (September 30, 1842): 127. See *New England Farmer* 1 (March17, 1849): 100

[63] 'Forest Trees', *The Agriculture of Massachusetts, as shown in Returns of the Agricultural Societies, 1853* (Boston: William White, 1854), p. 117; Lowell, 'Remarks on the Gradual Diminution of the Forests', pp. 33, 34, 35, 39; Webster, *Address, Delivered before the Agricultural Society*, p. 16. See 'Daniel Alden's Statement: Forest Trees', *Transactions of the Agricultural Societies of the Commonwealth of Massachusetts, 1852* (Boston: White and Potter, 1853), pp. 491–92; *New England Farmer* 1 (December 9, 1848): 1–2; Jesse Smart in *New England Farmer* 1 (December 9, 1848): 1–2; *Report on the Agriculture of Massachusetts, 1841* (Boston: Dutton and Wentworth, 1841), pp. 390–91; William Blanchard, 'Forest Trees', *The Farmer's Monthly Visitor* (Concord New Hampshire) 4 (April 30, 1842), p. 51.

[64] Nicholas Collin in Huth, 1957, p. 16; Berkeley–Berkeley, Bartram Correspondence, p. 295.

[65] Mitchell, 1775, pp. 83–4, 126, 168–9.

[66] Hans Huth, *Nature and the American: Three Centuries of Changing Attitudes* (Berkeley: University of California Press, 1957), p. 23.

[67] *Burlington Daily Free Press*, November 28, 1868.

[68] *New England Farmer*, October 19, 1872.

[69] *New England Farmer*, June 17, 1871.

[70] 'Preservation of Forests', *American Agriculturist* 16 (February 1857): 32. The article was reprinted in the *Burling Daily Free Press*, February 28, 1857.

[71] Ebenezer Emmons, *Report of the Survey of the Second Geological District* in *Natural History of New-York*, Part 4, *Geology* (Albany: Carroll & Cook, 1842–43), p. 13.

[72] A.N. Somers, *History of Lancaster, New Hampshire* (Concord, NH: Rumford Press for the town, 1899), p. 284.

[73] Lowenthal, *George Perkins Marsh*, p. 303.