

Conservation and Preservation

Nature, to be commanded, must be obeyed.

–Francis Bacon, *Novum Organum* (1620)

2.1 Conservation and the Gospel of Efficiency

The wise stewardship of natural resources is a virtue universally acknowledged. But in western countries, a distinct science of conservation began in forestry, perhaps because forests so obviously have a long time horizon, while too their decline was so visible (Pinchot 1891; Warde 2011). By the late nineteenth century, there was already a 100-year tradition of professional forestry in Europe, especially in Germany, often traced back through the work of Georg Ludwig Hartig and Johann Heinrich Cotta and the founding of professional schools of forestry there as well as in France.¹

But in the United States, scientific management of forests and other resources was still a new idea, imported from Europe by immigrants like Bernhard Fernow and by Americans studying abroad like Gifford Pinchot and Richard Ely. Fernow (1851–1923) was a German forester who immigrated to the United States after marrying an American. After early struggles in his new country, he became chief of the USDA's Division of Forestry in 1886. Although not the zealot that his successor Pinchot would be, Fernow steadily championed ideas of sustainability and professional management.

¹ And from there back further to the seminal forestry manual of Hanns Carl von Carlowitz, *Sylvicultura oeconomica* (1713). On the intellectual history of forestry and resource management in Europe, see Bennett (2015), Schmithüsen (2013), and Warde (2011). Crabbé (1983) and Smith (1982) touch on the connection between German forestry and the economics of conservation in the United States at the turn of the century. For contemporaneous histories and appraisals of forestry in Europe from America's first professional foresters, see Pinchot (1891) and Fernow ([1907] 1913).

He authored two influential texts, *Economics of Forestry* (1902) and *A Brief History of Forestry* ([1907], 1913), and an 1891 American Economic Association publication organized by Ely, among other essays. He founded the *Forest Quarterly* (now the *Journal of Forestry*) and served as the first dean of the College of Forestry at Cornell and then at the University of Toronto's Faculty of Forestry. In these ways, Fernow, in his modest fashion, prepared the way for the work of Pinchot to come.²

Gifford Pinchot (1865–1946) graduated from Yale University in 1889, still unsure of his future. The son and grandson of wealthy real estate magnates and lumbermen, he longed for an active life in the outdoors. He also felt the calling of Christian ministry. Influenced, as were Ely and the founders of the American Economic Association, by the Social Gospel movement, he combined the two callings, atoning for his family's sin of denuding the land. As Pinchot explained, "among the first duties of every man is to help in bringing the Kingdom of God on earth," which would require "the application of Christianity to the commonwealth," with "loyalty to our country, to the brotherhood of man, and to the future." And the future depended on better management of our resources, for "nothing less than the whole agricultural and commercial welfare of the country" was in the balance. With the zeal of these convictions, he pursued what Hays (1959) has called the Progressive "Gospel of Efficiency."³

Pinchot sought training in Europe, formally at the French *École nationale des eaux et forêts* but also informally under the tutelage of Dietrich Brandis, the German-born forester and Inspector General of Forests in British India. After this training, Pinchot's career ascended rapidly: by 1898, he was appointed chief of the young US Division of Forestry (later to become the US Forest Service under his watch), a position he held until 1910. In 1900 he founded the Society of American Foresters. In the same year, he co-founded, with his father, the Yale School of Forestry. A skilled politician, he worked closely with President Theodore Roosevelt to achieve his objectives and, eventually, would become governor of Pennsylvania.

Pinchot advocated "wise use" of natural resources, which he interpreted in utilitarian terms, extending Jeremy Bentham's maxim to emphasize the importance of maintaining resources for future generations. Following W. J. McGee, he defined conservation as "the greatest good to the greatest

² For additional background on Fernow, see Twight (1990) and Rodgers (1951).

³ On Pinchot and his role in the conservation movement, see Hays (1959), Balogh (2002), and Miller (1992, 2001). On his association with the Social Gospel movement, see Naylor (2005). For his autobiographical account, see Pinchot (1947). Quotations from Pinchot (1910 pp. 95–6, 94).

number for the longest time.” Note here the subtle shift from Bentham’s “greatest happiness” to “greatest good.” Though inherently anthropocentric, utilitarianism potentially can celebrate a great range of ends. But Pinchot combined his utilitarianism with a narrow materialism. He argued that “there are just two things on this material earth – people and natural resources.”⁴

In identifying threats to the wise use of resources, Pinchot emphasized Progressive Era concerns about waste and inefficiency as well as monopoly control, which concentrated natural wealth so that it would not flow to the greatest number. He wanted to replace the chaos of *laissez-faire* competition and its “law of the jungle” with rational guidance from experts and the State, a “new order” “based on co-operation instead of monopoly, on sharing instead of grasping,” and on “mutual helpfulness.”⁵

Importantly, Pinchot did not confine his understanding of waste to excessive harvest and extraction. Although it seems ironic when looking back from today’s configurations, he emphasized *developing* resources as much as conserving them. From Pinchot’s perspective, development and conservation were two prongs in the progressive attack on waste. Or, rather, development was actually part of conservation. As he explained in *The Fight for Conservation* (1910):

The first principle of conservation is development, the use of the natural resources now existing on this continent for the benefit of the people who live here now. There may be just as much waste in neglecting the development and use of certain natural resources as there is in their destruction....

Conservation stands emphatically for the development and use of water-power now, without delay. It stands for the immediate construction of navigable waterways under a broad and comprehensive plan as assistants to the railroads. More coal and more iron are required to move a ton of freight by rail than by water, three to one. In every case and in every direction the conservation movement has development for its first principle, and at the very beginning of its work. The development of our natural resources and the fullest use of them for the present generation is the first duty of this generation....

In the second place conservation stands for the prevention of waste. There has come gradually in this country an understanding that waste is not a good thing and

⁴ Pinchot (1947 p. 325). For Pinchot’s formulation of the utilitarian maxim, see Pinchot (1910 p. 48, 1947 pp. 325–7); on his materialism (1947 p. 325). Mill himself had united a kind of materialism to his utilitarianism. He argued that utilities are “fixed” in material object and later extracted. Thus, for example, the violinmaker and violin teacher both are productive, because the fruits of their labor are embodied in the violin and the musician, but the violinist is not productive, because the music is ephemeral. By Pinchot’s time, neoclassical economists were obliterating this distinction. See Schabas (2005 pp. 127–8).

⁵ Pinchot (1947 pp. 506–9).

that the attack on waste is an industrial necessity. I recall very well indeed how, in the early days of forest fires, they were considered simply and solely as acts of God, against which any opposition was hopeless and any attempt to control them not merely hopeless but childish. It was assumed that they came in the natural order of things, as inevitably as the seasons or the rising and setting of the sun. Today we understand that forest fires are wholly within the control of men. So we are coming in like manner to understand that the prevention of waste in all other directions is a simple matter of good business. The first duty of the human race is to control the earth it lives upon.⁶

Thus, Pigou, for example, displayed a common misunderstanding when he stated that “the whole movement for ‘conservation’ in the United States is based on [the conviction that] the State should protect the interests of the future *in some degree* against the effects of our irrational discounting and of our preference for ourselves over our descendants.”⁷ In saying that, he was only half right. The half he missed is that, according to the conservation movement, the state should develop resources immediately, so they are not “wasted” by remaining unused. The state also had to protect them from natural processes like forest fires, which lay waste to their productive potential.

This quest to develop more resources arguably was deeply embedded in the American psyche, with the propensity to move west and open new frontiers a central part of its national identity. In his “Frontier Thesis” ([1893] 1920), Frederick Jackson Turner had famously argued that America’s civic development was intertwined with a cycle of resource development and depletion. As Americans moved west, Turner argued, taming the frontier first made them strong and self-reliant. Then, when they exhausted the soils, some pioneers remained behind to farm the land more intensively, while others moved on, continuing the cycle. Meanwhile, as settlements grew in the wake of this westward movement, Americans became more civilized as well as independent. In this way, a virtuous balance of self-reliance and civilization was inculcated into the American spirit – thanks to the process of developing, exhausting, and again developing natural resources. Thus, Turner argued America relied on wilderness, but not in its preserved state; rather, it relied on wilderness as a supply of virgin lands available for development.

Whatever the merits of Turner’s thesis, it was quite influential. Consequently, when the frontier closed at the end of the nineteenth century, it provoked national angst. When he said “the whole agricultural and

⁶ Pinchot (1910 pp. 43–5). For additional discussion of development as conservation, see Hays (1959).

⁷ Pigou ([1932] 1962 p. 29, emphasis in original).

commercial welfare of the country” was at stake, Pinchot was not merely dabbling in hyperbole, the way today somebody today might complain about the price of gasoline. He was issuing a call to arms against an existential threat.

To help meet this threat, Pinchot organized a famous 1908 Conference of Governors on natural resource conservation. The conference was attended by twenty-two governors among other leaders, with addresses from Andrew Carnegie, future president William Howard Taft, and President Theodore Roosevelt. Reflecting the concerns of the times, Roosevelt remarked in his opening address that:

Every step of the progress of mankind is marked by the discovery and use of natural resources previously unused. Without such progressive knowledge and utilization of natural resources population could not grow, nor industries multiply, nor the hidden wealth of the earth be developed for the benefit of mankind.⁸

In other words, natural resources are not just a material input with fleeting benefits vanishing as they are consumed, but an engine of lasting advancement.

While these luminaries drew national attention to conservation, behind the scenes the conference was supported by an immense research project drawing on experts throughout the federal bureaucracy, published in two massive volumes (some 1,500 pages) of technical reports about the state of the nation’s resources. This research was organized around the themes of waste and development. For example, a report on water resources highlighted the fact that only one-sixth of the 215 trillion cubic feet of precipitation that falls on the United States is captured for human use in some way, while about half evaporates and one-third flows to the sea. Not all this water is wasted, the report explained, for even water flowing to the sea is useful in transit for hydropower and navigation. Nevertheless, it estimated that some 85–95percent was indeed totally wasted. To prevent this waste, dams and reservoirs should be built, to control the flow and capture it when needed, preventing floods.⁹

2.2 Conservation Economics in the Academy

Motivated by this policy relevance, academic economists too exhibited increasing interest in conservation issues. Many shared the conservation movement’s Progressive vision for economic reforms and government

⁸ Roosevelt (1908).

⁹ Joint Committee on Conservation (1909), Van Hise (1909), McGee (1909).

control to bring about greater efficiency. Especially for agricultural economists, who were just beginning to form as a distinct field under the leadership of Ely, Henry Taylor, and George Warren, conservation was a natural place to extend their sphere of influence.

The academic literature on the economics of conservation from this period conveys three themes that are an important inheritance of post-war environmental economics. First, as with Pinchot, it started with the premise that resources existed to be developed for the benefit of humanity. It could hardly be otherwise. Political economy arguably is inherently anthropocentric. Moreover, in this time before Lionel Robbins's definition of economics as the study of choice under scarcity, it was materialistic as well, indeed *defined* as the study of material welfare. In the UK, economists like Marshall at Cambridge defined the field as the "study of men as they live and move and think in the ordinary business of life." Moreover, he said, "the steadiest motive to ordinary business work is the desire ... for the material reward of work." At the London School of Economics, Edwin Cannan likewise defined economics by the study of wealth and material welfare. In the United States, Ely, in his widely used *Outlines of Economics*, defined its subject around man's "efforts to get a living." Ely interpreted "a living" more broadly than some, going well beyond bread and butter to encompass literature, art, religion, and government. Nevertheless, all these activities, he said, depend "on material things." Even if it wasn't always utilitarian, given its emphasis on the material, at this time economics *qua* economics entailed the efficient *use* of resources.¹⁰

This posture clearly was reflected in the literature on the economics of conservation. For example, Taylor's (1907) summary of the socially ideal use of resources was to create "the largest gross return from the sum-total of the resources of the country." Similarly, Ely, in *The Foundations of National Prosperity* (1918), wrote that

*Conservation, narrowly and strictly considered, means preservation in unimpaired efficiency of the resources of the earth, or in a condition so nearly unimpaired as the nature of the case, or wise exhaustion, admits. And broadly considered, it means more than the word itself implies, for it naturally includes an examination of methods whereby the natural inheritance of the human race may be improved.*¹¹

¹⁰ Quotations and related statements in Marshall ([1920] 1946 p. 14), Cannan (1922 pp. 1–3), and Ely (1893 p. 3).

¹¹ Quotations from Taylor (1907 p. 214) and Ely (1918a p. 3, emphasis in original).

Ely's narrow and broad definitions correspond, roughly, to today's notions of "strong" and "weak" sustainability, respectively meaning the sustaining of natural capital *per se* or human welfare, though Ely spoke of "inheritance" here, not welfare.¹² Nevertheless, in preferring the broader definition, he emphasized anthropocentric ends. According to this way of thinking, if, say, the soil has been partially depleted of its fertility, but at the same time new methods of agriculture or forestry have been devised to coax from it a higher yield, then we can say we have conserved resources. Similar logic guides Ely's understanding of a word like "to waste," the antonym of to conserve. In a gentle critique of movement conservationists like Pinchot who he thought focused excessively on physical waste *per se*, Ely countered that allowing a resource to go unused actually is efficient if its economic value is less than the cost of procuring it.¹³ Thus, in Ely's hands, the everyday meaning of a phrase like "conservation of resources" is transformed to mean "economically efficient use of resources."

Later, this theme would be on full display in postwar work, such as the 1952 Paley Commission. Like Pinchot, the Paley Commission rejected a definition of "conservation" that would make it synonymous with "hoarding," emphasizing that wise use and expanding supplies are integral to the concept. Like Ely, it also emphasized the role of costs, rejecting, for example, the attitude of devoting a dollar's worth of work to save a few cents worth of waste paper. To the Paley Commission, as to Ely, conservation was synonymous with "efficient management."¹⁴

A second theme from the turn-of-the-century literature on conservation is the fluidity among the concepts of farmland, other natural resources, and man-made capital. In the first edition of *Outlines*, Ely suggested classifying the factors of production into three categories: *Nature*, labor, and capital. Replacing "land" here with "nature" in the classical land-labor-capital formulation was meant to convey the fact that all natural forces play a role in production. Many of those forces are "free goods," with no scarcity value. "Land," then, can be thought of as those aspects of nature that are priced and exchanged, or the subset that falls under political economy. Viewed this way, land is still a very broad category, encompassing "standing space" (pure Cartesian extension), soil fertility, and subsurface

¹² For more recent discussion and a defense of each respective position, see Ayres, Van den Berrgh, and Gowdy (2001) and Solow (1993). While there are clear parallels between these literatures, they are not perfectly congruent. In particular, today's literature is more explicitly utilitarian.

¹³ Ely (1918a p. 27).

¹⁴ President's Materials Policy Commission (1952, I, 21).

minerals and fossil fuels.¹⁵ Over the course of revising various editions of his books, Ely steadily expanded these themes. In the second edition of *Outlines* (1908), Ely et al. disputed Ricardo's notion of the "original and indestructible properties of the soil" as wrong on two counts, first because soil fertility is not indestructible and second because other properties of land not directly related to soil, such as the local climate, are. By 1940, Ely and Wehrwein organized *Land Economics* first around chapters related to land as nature and standing space respectively, then, after a discussion of property rights, around various uses of land.

In Ely's writing and others' in the period, the analogies between land and other resources ran both ways. Just as we can understand many natural resource problems by analogy to agricultural economics, so too can we understand some questions in agricultural economics by reasoning analogically to depletable natural resources. Completing the triangle, both were comparable to capital. In particular, the soil is a resource, with an efficient path of depletion and/or renewal, like depreciating capital. This theme is well represented in the work of Lewis Gray, a student of Ely and Taylor at Wisconsin, who made important contributions to the economics of exhaustible resources. In particular, Gray analyzed the optimal depletion of resources as a function of the time path of the resource's price, the rate of interest, and the cost of extracting it, factors that would be further developed in Harold Hotelling's better known contributions. Using common principles, Gray's treatment of natural resources moves back and forth between applications to farmland and to coal, comparing and contrasting the two cases. For example, whereas coal is necessarily depleted through use, farmland is renewable through cover crops and manuring, but nevertheless, farmers may deplete it depending on their habits, the property rights and other institutions in which they operate, and prevailing prices and interest rates.¹⁶

Picking up on these themes, Ely and Wehrwein wrote that

"Indestructible" agricultural land is a myth, and the reason why it has been depleted and destroyed is that it must have paid the farmer to do so. It is useless to argue that it *should pay* to maintain or build up soil fertility unless the operator has a

¹⁵ Ely (1893 pp. 99–100) and Ely and Morehouse (1924 Ch. 2). As Castle (1965) concluded, viewed this way, "there is no difference between land and natural resource economics" (pp. 542–3, n. 1).

¹⁶ See Gray (1913, 1914). Earlier, Fernow had made a similar point about the relationship between mines and forestry (1902 pp. 167, 250). For biographic background on Gray and overviews of his work, see Kirkendall (1963) and Crabbé (1983). Missemer, Gaspard, and Ferreira da Cunha (2022) consider Hotelling's (1931) work in historical context, including Gray's earlier analysis.

long-time interest in the soil. Soil has an exhaustion value similar to a forest or a mine. The American farmer has often found it more profitable to exhaust the virgin fertility of one farm and move to a new farm than to try to maintain or restore the fertility on his old one. The farmer who claimed he was a good farmer because he had worn out four farms already was not far from the truth if judged by narrow “economic” standards.¹⁷

As a rule, Ely, Wehrwein, and Gray viewed those “narrow ‘economic’ standards” as altogether too narrow, though they admitted the logical possibility that exhaustion could be socially efficient in some situations. They blamed particular property rights structures that created poor incentives for farmers. Going further, they also argued that in some cases soil exhaustion is not even in the narrow self-interest of the farmer, but is a consequence of custom and habit, which can prolong wasteful practices long after they are in a farmer’s self-interest. In these cases, the solutions were expert intervention and/or education.

Similar issues, of course, arise in forestry. Ely and Wehrwein approach this topic by first considering “the forest as a mine,” before turning to questions of conservation and reforestation. As developed over the course of the twentieth century, the parallels between forestry and capital became even stronger than those between farmland and capital. For example, as noted by Bowes and Krutilla (1985), optimal rotations for a forest that yields environmental “services” while it grows and timber value when harvested look, mathematically, exactly like the optimal life cycle for a machine that yields a flow of output and has scrappage value.¹⁸

According to Ely, the upshot of all this is that “there is no absolute line of division between land and capital.” “From the case where capital is embodied in the land and entirely assimilated to it in character, we pass by insensible gradations to fences, barns, houses, etc., which more and more assume the character of capital as distinguished from land.” Consequently, it follows that the distinction between land rent and interest on capital also is ambiguous. Interestingly, Ely argued that no rent should be attributed to “free nature.” While it is productive in some everyday sense, it is only useful when another productive input is applied to it, and technically we should attribute productivity there. Thus, “the wind is not productive, but windmills are.” “We harness natural forces to the work of production, but we impute productivity only to the harness.” The key test is whether there are property rights of some sort, some rights of control. Common

¹⁷ Ely and Wehrwein (1940 p. 216; see also pp. 390–91).

¹⁸ “Forest as a mine” (Ely and Wehrwein 1940 Ch. 9). See also Gaffney (1957) and Hirshleifer (1970).

property – by which he meant property with open access – can never be thought of as productive.¹⁹

Such discussions of natural capital are by no means unique to Ely for the time. Fernow (1902) referred to forests as “wood capital,” and similarly to “soil capital” and “water capital.” They were not even unique to land economics. Hotelling appears to have developed his theory of natural resource rents first through thinking about capital goods, and then applying the model to resources (Missemer et al. 2022). Similar logic was also at work in more general theories of capital and productivity, as in the work of Frank Knight and, earlier, John Bates Clark and Alvin Johnson. Indeed, it easily could be traced through the classical economists back to Adam Smith and Turgot.²⁰ Though not unique in the history of economic thought, nevertheless the heavy use of these analogies to capital, at this particular time and place, suggests the possibility of a continuous line of reasoning from the conservation economics at the opening of the twentieth century to the metaphor of “ecosystem services” provided by “natural capital” at its close.²¹

¹⁹ “No absolute division” (Ely 1908 p. 350); “wind is not productive” (Ely 1908 pp. 454–6). To say the least, this discussion muddies the waters about the origins of natural capital at the turn of the century, especially if we accept DesRoches’s (2018b) definition of natural capital as being (relatively) detached from human agency. On Ely’s account, such capital cannot be productive. Perhaps an alternative way to define “relatively detached” would be by the extent to which it is used in conjunction with human-made inputs, or, in economics jargon, the degree of complementarity in production.

²⁰ For discussions of the later capital theory of Knight, Clark and others, see Henry (1995), Plassman and Tideman (2004), and Emmett (2008). Missemer (2018) discusses Johnson’s contributions.

In Book II of the *Wealth of Nations*, Smith gives as one type of fixed capital, “The improvements of land, of what has profitably laid out in clearing, draining, enclosing, and manuring, and reducing it into the condition most proper for tillage and culture. An improved farm may very justly be regarded in the same light as those useful machines which facilitate and abridge labour ...” (WN II.i). Too, as discussed by Jonsson (2013 Ch. 5), Smith paints a picture of the rational exhaustion of land (at least as one stage of development) so long as it is abundant relative to the value of produce (WN I.xi.3). Warde (2011) offers additional details on Enlightenment views about soil fertility, nutrient flows and circulation, and the possibility of exhaustion.

²¹ On the contemporary concept of ecosystem services and natural capital, and the way they work as a metaphor, see Costanza et al. (1997), Daily (1997), Boyd and Banzhaf (2007), Barbier (2011), and Fenichel and Abbott (2014). For histories of natural capital concepts, including discussion of its role in neoclassical economics and ecological economics respectively, see Christensen (1989), Pearce (2002), Röpke (2004), Gaffney (2008), DesRoches (2015, 2018a, b), Missemer (2018), and Barbier (2021). Missemer’s (2018) discussion is especially helpful for his consideration of early 20th C. capital theory, but most other narratives treat natural capital and/or ecologically based economic approaches as late 20th C. inventions, perhaps harking back to the classical era of Smith and Ricardo. The potential importance of Ely and the school of agricultural economics he helped shape is yet to be explored.

The analogies between land and other resources also provided a logical pathway for economists to begin thinking about air and water *quality*. The first step in this logic is the idea, associated with David Ricardo, that more fertile agricultural land earns a rent. The second step is Ely's insistence that the concept of "land" encompasses more than just soil. Ely had already included water availability and quantity within the concept, so including water quality and then air quality as well was not too great a leap. Thus, like differential soil quality, differential water and air quality too could earn a rent. Finally, as Ely argued against Ricardo, even soil fertility is not indestructible, so it is reasonable to consider policy analyses of changes in the quality of any of these attributes. Thus, while air, and sometimes water, were still thought of as "free goods" at the turn of the twentieth century, by embedding resource economics within a broader "land economics," Ely and others paved the way for thinking about the scarcity value of environmental resources. As discussed in Chapter 6, analogical reasoning between land, water quantity, and water and air quality, and the property rights governing them, guided the thinking of economists developing ways to price pollution in the 1960s.

A third theme in the turn-of-the-century conservation literature is the importance of property rights. Again, this is a ubiquitous theme in economics and politics: one could trace the idea through an economic canon of western Greats back through Aquinas to Aristotle.²² Too, at a popular level, one frequently encounters such aphorisms as "everybody's property is nobody's property."²³ But in the hands of American institutionalists such as Taylor, Katharine Coman, and R. P. Teele, this commonsense notion was analyzed systematically. They brought to bear detailed historical case studies of property rights in natural resources, especially the evolving property rights over water and rangeland in the Western frontier. In the case of water rights, the combination of the arid climate and open-access property rights led to intense pressures. Analyzing this issue, Ely and Wehrwein

²² "For that which is common to the greatest number has the least care bestowed upon it. Everyone thinks chiefly of his own, hardly at all of the common interest" (*Politics* II.iii).

²³ This quotation enters the academic literature on the economics of common property with Gordon (1954) as if a commonplace observation and is repeated by Scott (1955), Dales (1968a), Crocker (1968), Ciriacy-Wantrup and Bishop (1975) and numerous others since. I do not know the history or origins of this phrase, but it appears now to exist more in the academic literature than in common usage; many sources actually credit Gordon with it. However, it was used in political discussions at least as early as Coffin (1863 p. 168), in the context of land management in the Indian Territories. It also appeared in a debate over public ownership of natural resources in *Debates in the Massachusetts Constitutional Convention 1917-1918* (p. 568).

observed that, like land, water resources too can be distinguished between the space it occupies and the resource itself. But because groundwater flows throughout a basin, a single user can deplete the shared resource, especially in the arid West. Thus, California developed the doctrine of “correlative right,” which limits users to a reasonable share.²⁴

Open access was similarly problematic on rangelands. W. J. Spillman, director of the Office of Farm Management before it was reorganized under Taylor’s leadership, argued that it made it “impossible for the ranchman to conserve in any way a supply of range feed for his animals, even for the near future; for any conservation he may practice is as likely to benefit his competitor as himself.” Creating private property by parceling out lands among ranchmen would be required to incentivize conservation.²⁵

In thinking about these kinds of property rights arrangements, economists again leaned on analogical reasoning between soil and other resources, and the property rights governing each. With respect to soil, Ely and Wehrwein pointed to tenant farming, which they said misaligns a tenant farmer’s incentives for soil conservation. They described a farming cycle in which tenants who were “climbers” up the rungs of agricultural ownership depleted land along the way, in an effort to raise cash to buy their own farm, then, having made it, retired and turned their farm over to tenants. They also pointed to the homestead laws, which made it easy to treat agricultural land as a disposable commodity, cheapened by oversupply and readily replaced by the next government-supplied land.²⁶

Starting with his masters and PhD theses, Henry Taylor made the study of tenure systems his particular specialty, with extensive travel abroad, especially in England, both to unearth archival sources and to observe current practices in the field. Taylor agreed with the conventional view that tenant farming led to more rapid depletion of soils than freeholding. However, two strategies could ameliorate these effects. One was longer-term contracting, such as the twenty-one-year lease championed long ago

²⁴ See, specifically, Teele (1904, 1926), Taylor (1907), Coman [1911] (2011). Taylor and Taylor (1952 Ch. 27) suggest that Teele’s work was influenced by an unpublished 1904 manuscript of Ely’s, titled “Economics of Irrigation,” commissioned by Teele’s USDA office. They reproduce extensive excerpts from this manuscript. On correlative right, see also Ciriacy-Wantrup (1956). Franco and Missemer (2023 Ch. 10) also note the importance of institutional analysis in the history of environmental economics, highlighting the importance of Wehrwein.

²⁵ Quote from Spillman (1918 p. 71). But see also Anderson and Hill (2004) for a historical discussion of how the evolution of property rights among cattlemen helped to overcome such problems.

²⁶ Ely and Wehrwein (1940 pp. 216–7).

by Arthur Young. Another, and in Taylor's view more effective, strategy was more complete contracting, introducing clauses to pay tenants for assets left behind when the lease expires (Taylor 1919).²⁷

These lessons about tenant farming could be used to understand the wasteful use of natural resources. Highlighting the ubiquity of such analogies, President Theodore Roosevelt at the 1908 Governors' Conference stated, "Every one knows that a really good farmer leaves his farm more valuable at the end of his life than it was when he first took hold of it. So with the waterways. So with the forests." But stewardship of the land is grounded in the incentives of property rights. "We should exercise foresight now," he said,

as the ordinarily prudent man exercises foresight in conserving and wisely using the property which contains the assurance of well-being for himself and his children. We want to see a man own his farm rather than rent it, because we want to see it an object to him to transfer it in better order to his children. We want to see him exercise forethought for the next generation. We need to exercise it in some fashion ourselves as a nation for the next generation.

In this way, care of resources can be understood by analogy to questions of land tenure. Indeed, Roosevelt explicitly linked homesteading, with its privatization of public lands for farming, to forest policy on public lands. But for Roosevelt and Pinchot, as for Ely and Taylor, the analogy did not imply forests and waterways should be privately owned. To the contrary, in their view, as a farmer needs to take private ownership of his land, the nation needed to take public ownership of its public resources.

The logical connection between land tenure for farmers and open access to environmental resources would be developed throughout the twentieth century. Perhaps most famously, at the peak of the environmental

²⁷ For example, Taylor quotes approvingly from a Yorkshire survey, which recorded the following system:

The landlord covenants to allow the tenant, on quitting his farm, what two indifferent persons shall deem reasonable, for what is generally called full tillage and half tillage, being for the rent and assessment of his fallow ground, the plowing and the management of the same; the lime, manure, or other tillage laid thereon; the seed sown thereupon; the sowing and harrowing thereof; also for the sowing, harrowing, manuring, and managing any turnip fallow which he may leave unsown; also for any clover seed sown on the premises; and harrowing and rolling in of such seed; and for every other matter and thing done and performed in a husbandry-like manner on such fallow lands, in the two last years of the term; also for the last year's manure left upon the premises; and for any manure and tillage laid upon the grass land. (1919 p. 335)

See also Ely and Wehrwein (1940 Ch. 7). Given these contractual possibilities, Gray and others at the BEA's Division of Land Economics held out a more optimistic view of the potential efficiency of tenant farming than Ely (e.g., Gray et al. 1924).

movement, Garrett Hardin's "Tragedy of the Commons" invited readers to "picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons." The result is ruin for each herdsman, as overgrazing destroys the grass. In the same way, Hardin said, the earth and its ecosystem are a common resource supporting all humanity, a commons being depleted.²⁸

Over a decade earlier, Scott Gordon (1954) and Anthony Scott (1955) also had drawn attention to common property problems. Both recognized the wisdom in the popular aphorism that "everybody's property is nobody's property," but demonstrated formally how, under open access, competition would deplete the value of resources. Though their focus was on overfishing, they too made the connection to common tenure in land. Gordon, especially, complemented his formal model with a discursive discussion of hunting and trapping as well as agriculture, and the endogenous formation of alternative forms of property rights when resources become scarcer.

Taken together, these earlier themes in conservation economics have three important implications for how the postwar generations who inherited them would fashion a new environmental economics, as explored in the remainder of this book. First, they created a ready roadmap for agricultural economists to expand their work, not only from questions of farm policy to other natural resource questions, but later to dams and other capital projects involved in water resource development. Agricultural economists had long been applying benefit–cost analysis in a rough-and-ready way in the management of individual farms and in agricultural policy. In making those calculations for water projects, they also could draw on a history of relating economic development to resource exploitation as well as the inter-temporal dynamics of services provided by capital, whether natural or man-made, and their rates of depreciation.

Second, though in retrospect the concept of Pigouvian externalities certainly is one possible lens through which to view environmental problems, American economists working in the 1950s and 1960s had other lenses at hand. With a rich homegrown literature on resource problems, the mystery of the absence of Pigouvian ideas during this period, discussed in Chapter 1, now comes into better focus. To better understand the relationship between these viewpoints, it is useful to employ Pigou's own three-part categorization of situations where private and social interests diverge. The first, recall, comprises situations where productive investments in a resource might be made by people who do not own it, as with tenant

²⁸ Hardin (1968), with quotation from p. 1244.

farmers. The second is the one refined by later writers into what essentially is the modern theory of externalities, where actions affect third parties not party to a contract. The third category comprises situations where increasing returns to scale extend beyond a firm's boundaries, with one firm's economic activity improving the efficiency of others, perhaps through learning by doing or by facilitating finer degrees of specialization.

It was actually the first and third categories that were most relevant to first-generation environmental economists working at mid-century. Like the conservation economists before them, they were engaged with problems of *developing* resources for use, when the services provided by environmental amenities first came to their attention. The whole idea that developing and conserving natural resources is a matter of public interest, irreducible to the sum of private values, almost inevitably involves logic resembling economies of scale (Pigou's third category). But American economists had other sources for thinking through these issues besides Pigou. Take as an example Turner's Frontier Thesis, for here is a story of external economies projected onto a John Ford-sized screen: the development of resources spilling over to all civilizing and democratizing forces. Such a theme played out in many smaller ways as well. For example, west of the 100th meridian, farming requires irrigation, but even the irrigation ditches dug by early settlers required cooperative construction and management, as a ditch scaled to serve only a single farm would lose all its water to evaporation. Thus, economies of scale at the industry level were present (Teele 1904, 1926; Coman 1911). As recently argued by Leonard and Libecap (2019), the evolution of water rights in the American West from riparian rights to prior appropriation was one organic response to this problem. As discussed in Chapter 3, later the development of ever larger regions, further from water sources, seemingly justified federal support for massive water projects.

When resource economists turned next to studying pollution, they understood the problem in the context of pricing access to common-property resources. This context relates the problem to Pigou's first category, but, again, American economists had other sources for thinking about such issues. Indeed, Pigou himself relied on Taylor's history of English property rights in his own discussions of land tenure.²⁹ (The importance of these connections to the earlier American literature, and the absence of Pigou, will be revisited in Chapter 6.)

A third and final implication of this earlier history is that economists' long focus on developing resources to increase material welfare, while later

²⁹ Pigou ([1932] 1962 p. 178).

providing the *occasion* for thinking about the amenities of undeveloped landscapes, also constrained their ability to do so. What did environmental amenities from preserved landscapes have to do with development? Or with material wealth? It seems a clash was inevitable with forces preferring the preservation of wilderness to its development.

2.3 The Great Schism: Conservation versus Preservation

Pinchot and other conservationists fit well into a category that Worster (1994) has referred to as the “imperial” attitude towards nature (Figure 2.1). Represented earlier by such figures as Francis Bacon and Carl Linnaeus, that attitude emphasizes mankind’s dominance over nature and acts of management and control of resources for material gain. Worster contrasts this imperial attitude with the “Arcadian” attitude, represented by such figures as Gilbert White and, in America, Henry David Thoreau and Ralph Waldo Emerson, who emphasized either the sublimity of nature and mankind’s posture of awe before it, or its beauty and our delight. At the

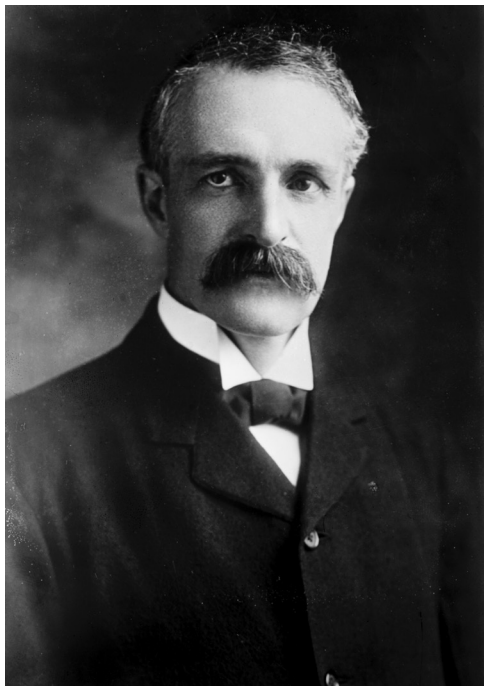


Figure 2.1 Gifford Pinchot



Figure 2.2 John Muir

turn of the American century, it was John Muir who most famously demonstrated this posture (Figure 2.2).

Relative to Pinchot's privileged upbringing, John Muir (1838–1914) had a very different background.³⁰ Born in Scotland, he moved to the Wisconsin frontier when he was eleven. He worked on the family farm with his father, then in a machine shop, where he was an expert on managing efficient workflows. He always loved the wilderness but led a fairly conventional life until an accident in 1867 left him blind for one month. After recovering, he decided life was too short to do anything but live for his passion, and so he went to the wilderness. He hiked 1,000 miles from Indiana to the Gulf of Mexico, then famously hiked the Sierra-Nevada Mountains. There, he was inspired to think and write and, soon, to work on the signature project of his life: to preserve as wilderness the area that would become Yosemite National Park. That work yielded fruit in 1890 with the passage of the Yosemite Act, the first act of conservation explicitly tied to preserving land

³⁰ For biographies of Muir, see Wolfe ([1945] 2003) and Worster (2008).

in its wild state.³¹ Understanding the need to watch over this new treasure, Muir founded the Sierra Club in 1892 as an advocacy group and nascent political force.

In contrast to Pinchot's mix of the Social Gospel and utilitarianism, Muir was a transcendentalist, reworking his orthodox Christian upbringing into a spiritual faith in Nature as the path to God (Nelson 2010). He hiked with a well-thumbed copy of Emerson's essays, and his hero would eventually seek him out in Yosemite. To Muir, leaves, rocks, and bodies of water are "sparks of the Divine Soul." Landscapes are "blessed," "waters will wash away sins as well as dirt," and Nature shows material care. Consequently, wilderness is the best avenue to divinity, for it best reflects God's creation, untarnished by human hands: "The clearest way into the Universe is through a forest wilderness."³²

Consistent with this spiritual view of Nature, Muir opposed anthropocentric world views like Pinchot's. "No dogma taught by the present civilization," he wrote, "seems to form so insuperable an obstacle in the way of a right understanding of the relations which culture sustains to wildness as that which declares that the world was made especially for the uses of man." To the contrary, nature's value was intrinsic, in the sense that it was non-instrumental but also in the sense that it had objective value independent of human valuation. For example, to a question about what rattlesnakes are good for, "[a]s if nothing that does not obviously make for the benefit of man had any right to exist; as if our ways were God's ways," he answered that "they are good for themselves, and we need not begrudge them their share of life."³³

³¹ In contrast, Yellowstone, established in 1872, had been preserved as a "pleasuring ground" for its "curiosities." Earlier, the Yosemite Grant of 1864 had deeded ten square miles to the State of California for a state park at Yosemite, but that small area soon became the center of a thriving tourist business (Nash 1982 Ch. 7). In contrast, the Yosemite Act of 1890 added nearly 1,200 square miles.

³² "Landscapes are blessed" etc. (Muir [1875] 1980 *passim*). "Clearest way into the universe" (quoted in Nash 1982 pp. 125–6). The encounter with Emerson proved disappointing. Muir invited him to join him "in a month's worship with Nature in the high temples of the great Sierra Crown beyond our holy Yosemite," but Emerson and his companions preferred the comfort of a nearby inn. Emerson later reciprocated, writing from Massachusetts to invite him to "bring to an early close your absolute contacts with any yet unvisited glaciers or volcanoes" and join him as a permanent guest, for solitude "is a sublime mistress, but an intolerable wife." Muir declined (Nash 1982 p. 126; Worster 2008 pp. 210–15).

³³ The term "intrinsic value" itself has many subtleties with distinct meanings that often are conflated (O'Neill 1992; Callicott 1999). These two senses of the term (non-instrumental and independent of a human evaluator) may well have been conflated by Muir. "No dogma..." (Muir [1875] 1980 pp. 235–6); rattlesnakes (Muir [1901] 1980 p. 200).

Initially holding one another in mutual respect, Pinchot and Muir began as allies against the status quo and *laissez faire*, which Muir referred to as the “gobble-gobble school of economics.” But their alliance began to unravel as the necessity of making specific land use decisions exposed their differences. For example, in 1891, the United States had established its first forest reserves, creating some 13 million acres of federal forestland, but how those lands would be used was by no means clear. In 1896, Pinchot and Muir both were appointed to a committee of the National Academy of Sciences commissioned by the Secretary of the Interior, to survey the newly created reserves and to make recommendations about their disposition. Muir envisioned them to be preserved as wild places, like Yosemite; Pinchot favored managed development for wise use. The committee could not agree on a recommendation, and individual members soon turned to working against one another in a game of political chess. In the end, the wise use side won, as Congress declared the purpose of the reserves to be “to furnish a continuous supply of timber” plus ongoing mining and grazing. When they met later that year, a comment by Pinchot supporting the grazing of sheep on federal lands so enraged Muir, who had long viewed sheep as “hoofed locusts” that denuded natural landscapes, that Muir declared “I don’t want anything more to do with you.” The fault line dividing the leading spokesmen for the romantic and the bureaucratic impulses in American environmentalism had widened to a cleft.³⁴

Aptly, the final, epic battle between Muir and Pinchot was fought over a dam. In 1906, shortly after its devastating fire, the City of San Francisco petitioned the federal government to allow the damming of the Hetch Hetchy valley, some 150 miles away in Yosemite, for municipal water supplies. Roosevelt tried to finesse a political compromise that placated Muir, but, in the end, the political forces in San Francisco carried the day, and the Hetch Hetchy was dammed, but not before a seven-year fight that further opened the divide between the development and preservation camps. In retrospect, this fight proved to be only the first of a series of battles, fought over the next seventy-five years, where development and preservation forces clashed at dam sites, from Hetch Hetchy to Tellico, via Hells Canyon and Dinosaur Monument.³⁵

³⁴ “Gobble gobble school” (quoted in Wolfe [1945] 2003 p. 102). On the NAS commission and “hoofed locusts,” see Nash (1982 pp. 130–38).

³⁵ The fight over Hetch Hetchy is one that has been told many times by historians. For excellent accounts, see Hays (1959), Nash (1982), and Worster (2008). It is noteworthy that the fight also was caught up in the so-called “Ballinger controversy” over access to Alaskan mineral rights, which eventually cost Pinchot his job, as he was fired by President Taft for

Muir and his allies launched a furious campaign to preserve their beloved Yosemite. They emphasized its spiritual significance. “Dam Hetch Hetchy!” exclaimed Muir, in the final words of his book, *The Yosemite*. “As well dam for water tanks the people’s cathedrals and churches, for no holier temple has ever been consecrated by the heart of man.”³⁶ Interestingly, for its foreshadowing of future debates, Muir and the “nature lovers” also appealed to Yosemite’s value as a place for recreation. As Nash (1982) argues, this was a tactical error, for the proponents of the dam could just as well turn this argument to their advantage, with the resulting reservoir providing many more recreational opportunities for boating and fishing.

For his part, Pinchot appealed to science and posed the problem in terms of the utilitarian calculus rather than spiritual values. In his testimony to Congress, he framed the question as centering on “whether the advantage of leaving this valley in a state of nature is greater than ... using it for the benefit of the city of San Francisco.” While he admitted the idea of preserving the valley was appealing when viewed in isolation, the city’s need was “overwhelming.”³⁷

The clash between Pinchot and Muir extended to the very definition of the word “conservation” and related vocabulary. Pinchot claimed to have personally coined the term, though historians have considered that claim rather dubious.³⁸ Using Pinchot’s vocabulary, “conservation” inherently meant the wise use of resources. Muir and his allies would be said to advocate “preservation” in contrast to “conservation.” For their part, Muir and his allies were unwilling to concede the term “conservation” to Pinchot. In their rival vocabulary, the wise-use or utilitarian school and the preservationist school were two sides of the “conservation” coin.

It is tempting to reduce the differences between Pinchot and Muir to a simple difference in values: Pinchot valued timber, Muir preferred wilderness. But as Meyer (1997) argues, there are difficulties with that interpretation. Pinchot in fact first went into forestry as an act of propitiation, motivated by the sense of damage his family’s lumbering business had done to the woods. He frequently referred to the sublimity and beauty of nature. Describing his reaction upon first seeing the Grand Canyon, he wrote,

fomenting division over the affair. Subsequent fights over dam projects are described elsewhere in this book, but notable discussions are provided by Berkman and Viscusi (1973), Brooks (2006), Harvey (1994), and Plater (2013).

³⁶ Muir ([1912] 1989 p. 218).

³⁷ Nash (1982 pp. 170–1).

³⁸ On his own claims, see Pinchot (1947 p. 326). Hays (1959 pp. 5–6) appraises their credibility.

“awe-struck and silent, I strove to grasp the vastness and the beauty.” By the same token, Muir was hardly the prototype of the misanthropic deep ecologist as some would paint him. At the risk of logical inconsistency for the sake of diplomacy, he frequently conceded the necessity of forestry and development.³⁹

On Meyer’s reading, the differences between Pinchot and Muir were as much about politics as values. Muir sought a space for wilderness sheltered from the pressures of political economy and self-interest. He built Tocquevillian mediating organizations like the Sierra Club. Given his spiritual view of wilderness, a reasonable comparison for the place of preservation in Muir’s politics would be to the space traditionally given to religion in American politics, and for preservationist organizations to institutions like churches. But just as some versions of modern liberalism would remove religion from politics and exile it to a realm of private feeling, Pinchot dismissed love of wilderness as private feelings that had no place in his technocracy. Accordingly, in the debate over the Hetch Hetchy, he conceded private feelings for the beauty of the wild valley, but gave no role to them in public decision-making. “The fundamental principle of the whole conservation policy,” he testified to Congress, “is that of use, to take every part of the land and its resources and put it to that use in which it will serve the most people.” As love of wilderness – of *non*-use – was by definition omitted from his version of the utilitarian calculus, Pinchot’s science of conservation management led inevitably to the recommendation to develop.⁴⁰

In summary, each side recognized the values espoused by the other but could make no room for it in its politics. According to Muir’s poetic and spiritual approach, one must serve either Nature or mammon; no one can have two masters. According to Pinchot’s scientific approach, spiritual and aesthetic values had no place in the utilitarian calculus.

Thus, on that winter day when the God Committee met to decide the fate of the snail darter, the distrust of the environmentalists was no mere prejudice against economists, it was an expression of feelings and impressions formed from a hundred years of intellectual debate and political maneuvering between the “wise use” of natural resources for human ends and the preservation of wilderness for its own sake. Though their distrust

³⁹ “Awe-struck and silent...” quoted in Meyer (1997 p. 272). See also Miller (1992) and Nash (1982 pp. 136 ff).

⁴⁰ Quoted in Nash (1982 pp. 170–1). Later in life, Pinchot seems to have reevaluated this position. As governor, he preserved the last large stand of virgin hardwoods (Miller 1992).

was understandable, it was by then a little behind the times. As explored in the following chapters, economists wrestled with the unsatisfying impasse left behind by Pinchot and Muir – particularly the exclusion of nonmaterial but no less real values from the utilitarian calculus – for much of the twentieth century. In many ways, dissatisfaction and frustration with it led to the emergence of environmental economists from natural resource economics, as a newer and distinct subfield.