

1 Introduction to Environmental Management

Science is the key foundation of everything EPA does. Science has defined the challenges, pushed the discoveries, it has operated as the foundation to design new solutions . . . it has been EPA's professor, our prosecutor and our protector.

Gina McCarthy,
Environmental Protection Agency administrator, 2012–16

1.1 Introduction

Every year tens of thousands of Americans and millions of people worldwide die from pollution (Fuller, Sandilya, and Hanrahan 2019). Pollution is the single largest source of human-caused death, killing 15 times more people than all violent crime and warfare combined (Landrigan et al. 2017). While there are many professions that contribute to the monitoring of these deaths and to the development of technical solutions that address pollution of the water, air, built environment and our land, it is the understanding of risks and the application of these solutions that will save lives and protect our environment. The genesis of the environmental movement and the subsequent demand for environmental management derives, in part, from Rachel Carson's (1962) book *Silent Spring* in which she illustrated what follows when humans disassociate themselves from the ecosystem and are denied "the right to know" regarding their health and the health of the environment.

An ecosystem is "A unit of nature in which living and non-living substances interact, with an exchange of materials between living and non-living parts" (Odum 1971). This unit could be our body, where living microorganisms interact with the non-living molecule, oxygen (O₂). If these substances are not in balance our bodies fail. Thus, in many ways, what our doctors are always admonishing us to do is to manage *our* environment. Other professionals look at ecosystems within local, state, or national jurisdictions and, of course, at the planetary level.

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Environmental management in the broadest sense addresses how to keep these units of nature in balance in terms of what humans put into the ecosystem and take out. From a curricular perspective, **environmental management** is most often taught in terms of pollution, how humans unbalance the ecosystem by what they put into it, whereas **natural resource management** is taught in terms of how humans unbalance the ecosystem by what they take out of it. In general, the issues, trends, and human management in each are the same and there is much overlap. Probably the reason for these two “tracks” is that pollution laws regulating air, waste and water are most often enacted by standalone state and federal agencies, i.e., they are more centralized, and natural resource laws are regulated by a multitude of agencies associated with a natural resource: the Fish and Wildlife Service, the Conservation Service, the Bureau of Land Management, the Forest Service, etc.

Different cultures throughout history, from Indigenous peoples’ reverence for an integrated human–ecological kinship, to pagan naturalism, to Talmudic protections of trees, to the American Evangelical embrace of efforts to curb global climate change, have been and are concerned with environmental protection. Famed conservation biologist Aldo Leopold, considered the progenitor of the modern sustainability movement, argued that it is only “when we see land as a community to which we belong, we may begin to use it with love and respect” (Leopold 1949). This idea of nature and human well-being as being intertwined is represented in the cosmologies and worldviews of myriad human cultures throughout human history and still today (Francis 2015; Fuentes 2017; Grim 1997).

The major theme of *Silent Spring* is that rather than maintaining that “mankind” dominates the natural world, humans must understand that they are an integral part of the ecosystem. Pre-Carson in the US there were three dominant “environmental ethics” that categorized how humans view their “place” in environmental protection: John Muir’s *preservation ethic* – that we should protect the natural environment in a pristine, unaltered state; Gifford Pinchot’s *conservation ethic* – humans should put natural resources to use but also we have a responsibility to manage them wisely; and Aldo Leopold’s *land ethic* – humans should view themselves and “the land” as members of the same community and people are obliged to treat the land in an ethical manner (Westover 2016).

These ethics were originally applied to natural resource management. But, as the “ecology movement” grew from *Silent Spring*, it can be argued that Leopold’s land ethic was the one that most aligned with the realization that human health is inextricably connected to a balanced ecosystem, complemented by Carson’s recognition that human-produced pollution posed a new and grave assault on human health. The preservation and conservation ethics of Muir and Pinchot gave rise to organizations such as the US Forest Service and the National Park Service; and Leopold’s land ethic motivated the development of natural resource management organizations such as the United States Fish and Wildlife Service (USFWS). It was Carson’s *Silent Spring* combined with subsequent environmental disasters (e.g., the burning of Cuyahoga River and the Santa Barbara oil spill, both in 1969) that led to the development of the first national environmental management policy and agency in the world: the National Environmental Policy Act (US EPA 1969) and the US Environmental Protection Agency (EPA; Barnes, Graham, and Konisky 2021), respectively.

1.2 Environmental Management Is People Management

Often environmental scientists mix up environmental management with applied ecology which can be defined as a scientific discipline which uses ecological concepts to solve environmental problems. To be clear, humans can practice population ecology, study the effects of pollution on the ecosystem, and develop tools to manage the environment, but environmental management is people management. For example, whether or not we yet have an understanding or even a consensus that global climate change exists, what its causes are, and how to mitigate them, it will not be solved unless and until humans change their current behavior. Further, the mission of environmental managers, like that of the US EPA, is often “to protect human health and the environment,” and in that order, i.e., human health takes primacy over ecological balance, though they are usually interdependent.

These two disciplines, environmental management and applied ecology, are integral and in fact are part of a “scientific continuum” (Figure 1.1) which ultimately can allow for a balanced ecosystem.

1.3 The Successful Environmental Manager

Managing for the Environment (O’Leary, Durant, Fiorino, and Weiland 1999) is, to date, perhaps the most foundational text for our work as environmental managers. It defines environmental management as “an interactive process wherein we learn how social institutions can best reconcile humankind’s needs and aspirations with the limits that the natural world imposes” (O’Leary et al. 1999). It outlines and explains the three criteria for environmental managers to be successful:

1. Understanding volatile and complex issues and trends
2. Co-producing with the community methods for dealing with those issues and trends
3. Delivering those methods effectively in a dynamic, politically charged, and legally contentious environment populated by interorganizational networks of actors with often competing interests. (O’Leary et al. 1999: xxiv)

1.4 We Don't Own Environmental Solutions, But We Are Accountable for Their Implementation

In short, the environmental manager must realize how laws, legal and social trends along with public sentiment affect their everyday management decisions and that often solutions

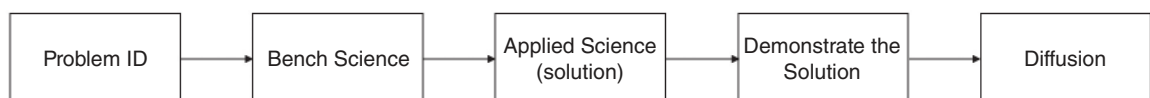


Figure 1.1 The scientific continuum.

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or interventions meant to address these issues as specific environmental problems must be produced with others, especially non-scientists. Just as a pilot does not fly a plane without a co-pilot or ground control, the public manager is accountable for good management but requires assistance. Allowing stakeholders to “co-produce” ethical environmental solutions requires leadership by the environmental manager and the mindset that the manager does not “own,” in the sense of controlling the decision as it applies to the solution or situation. As the reader will learn, many management disasters have been blamed on “bureaucrats” and “technocrats,” who are often depicted as people disengaged with the people affected by the environmental problem at hand and found to be at fault for not addressing their needs which usually expand past the “science” of the issue; and too often the accusers are right.

Whereas there are those who since the publication of *Silent Spring* believe that the basic missions of environmental regulatory agencies have not been properly focused on human health, in fact the mission has always been “protecting human health and the environment.” And at its inception this mission has had the primary goal of protecting human health, with a secondary goal of protecting the environment. Indeed, Carson herself pointed out that unless we address both we will fail as a species in the global ecosystem and are doomed.

1.5 Why Do We Need to Manage the Environment? From the Tragedy of the Commons to the 90/10 Rule

While our global ecosystem has been unbalanced by natural forces like epidemics, earthquakes, volcanoes, droughts, and other geologic events, today it is often human activities that cause this imbalance (Rockström et al. 2009; Steffen, Richardson et al. 2015; Steffen et al. 2018). Of course, one can argue that humans as an indigenous species of our planet are also natural. Nonetheless, Garrett Hardin (1968) in his seminal article “The Tragedy of the Commons” illustrates a simple but critical point regarding humans: without regulation there are humans that will take advantage of “the commons” and exploit them to ruin. The commons from our perspective are those resources such as air, water, and land that are held by all such that all can benefit. Common law such as the “Public Trust Doctrine” was first addressed in Roman law for navigable waters to be preserved for the benefit of all (WEF 2020). There are even contemporary movements to establish common law for air (Nevitt and Percival 2018).

From my (M.L.) clinical perspective – that of one who has conducted, studied, and taught environmental law enforcement for more than three decades – this comes down to the realization that 90 percent of people will do the right thing if they know what it is and they have or are given the means to do it, while 10 percent will not because they are either greedy, crazy, or both.¹ Whether it is individuals, communities, companies, or nations, there is an

¹ The 90/10 figure, a general rule of thumb for various organizations, regulatory schemes, etc., does have evidence to support it, even though the exact ratio is variable in every context. For example, the number of polluters included in the Toxic Release Inventory, managed by the EPA, that exceed their permitted amount usually hovers roughly around 10 percent (US EPA 2020a, 2020b). Obviously, despite being a small percentage of the whole, they have a big impact on ecosystems.

unequal distribution of pollution responsibility, with a small percentage of polluters responsible for most of the accumulated pollution in the US and the pollution shaping the global ecosystem today (EPI 2018; Fuller, Sandilya, and Hanrahan 2019; Hickel 2020b). For example, the top 1 percent of wealthy individuals in the world today emit twice the amount of greenhouse gases that the bottom 50 percent of people combined emit (UNEP 2020).

The consequences of this “tragedy” as witnessed by John Muir were the steady degradation of public lands by the late 1800s, the linkage of septic pollution to cholera in the mid-1850s (Snow 1849), and subsequent US public health water regulations in the early 1900s. After World War II, when belching smokestacks signified returning prosperity and coal heating was common in most homes in the West, cities in America and Europe experienced their first air quality emergencies killing tens of thousands. A single pollution event in the UK between December 5 and 9, 1952, now called the Great Smog of London, caused by a combination of frigid temperatures driving increased rates of coal use, high atmospheric pressure, and windless conditions, led to the death of an estimated 10,000–12,000 people (Stone 2002). A similar event, though causing fewer deaths, occurred in New York City in 1966, just before the advent of the Air Quality Act of 1967 and subsequently the Clean Air Act of 1970 (Barnes et al. 2021).

During the same period, with the advent of synthetic agrochemicals and an attitude of “better living through chemistry,” industrial agriculture produced what Carson described as a “silent spring” (Carson 1962). Carson illustrated that the public’s environment was so degraded by the indiscriminate use of pesticides that nature (particularly birds) was silenced. And until it happened, no US citizen would have believed a river would catch fire as the Cuyahoga River did in Cleveland in 1969. The list of historical examples goes on and on, impacting our “common” reliance on air, water, and biodiversity for our well-being and our desire to appreciate nature. As we will address in this text, the causes of these tragedies are basically twofold: the 90/10 rule described above and disregarding the public’s right to know.

Environmental management professionals of today and of the future hopefully will be ready, willing and able to correct past administrative abuse and neglect with an increased acknowledgment of management concepts and skills that can result in success. They will have to deal with more contemporary tragedies including the facts that at least 7 million of the world’s population die annually from ambient air pollution (Burnett et al. 2018), while at least 9 million die of some form of toxic pollution (Fuller, Sandilya, and Hanrahan 2019; Landrigan et al. 2017); 80 percent of all human wastewater is discharged back into the ecosystem untreated, causing cholera, dysentery, and a host of other enteric diseases, especially to children (UNESCO 2017); and the frequency and cost of “natural” disasters, from heatwaves to tropical cyclones, have been increasing since 2000, in the US causing a record US\$300 billion worth of damage in 2017 (IPCC 2018; NOAA 2020b). And disproportionately it is disenfranchised communities that are exposed to these risks (EPI 2018; Konisky 2015; Landrigan et al. 2018; ND-GAIN 2019; Watts et al. 2019). One can continue listing these tragedies, whether due to mining operations, agrochemical abuse, or the myriad other ways humans are reshaping the global ecosystem.

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Why do we manage the environment? Because the policy and implementation decisions of environmental managers are life-and-death decisions.

1.6 Who Manages the Environment?

Theoretically, we all manage the environment, as a matter of societal good and maintaining commonwealth. At the individual level we manage the environment by voting, running for office, and knowing about and participating in public processes at the federal, state, and local levels. There are professions that environmental agencies, the private sector and non-profit organizations value whether they be policy- or science-based: the law, politicians (yes, even them), financial management, accounting, communication, policy analysis, medicine, natural sciences (the whole gamut from agriculture through zoology), and engineering, to name a few. At this point, advanced thought related to understanding “complex and volatile issues and trends,” co-production and implementation could also include historians, economists, sociologists, and anthropologists, to understand the how and why of human impact and behavior. In the end, all humans are environmental managers, albeit at radically varying scales, because we all put things into the environment: from cooking fires, to vehicle exhaust, to the water and chemicals that leave our body when we excrete, all humans contribute substances to the ecosystem. But in regulating these actions certain credentials are favored in the environmental management arena, with a healthy mix of environmental and social science and policy training usually being the best bet for success.

In the US, our three branches of government (executive, legislature, and judiciary) manage the environment at all levels. Executive agencies meant to enact laws, rules, and regulations have different jurisdictional authorities and responsibilities. Each agency acts in accordance with its mission. Some, like the EPA, regulate to protect human health and the environment, whereas the US Department of Agriculture (USDA) is tasked with the mission to protect and promote American agribusiness. Both missions can overlap whereas, depending on the contexts of the issue at hand, the EPA would typically have “primacy” and USDA might act in a “consultant” capacity in an environmental management problem; though agencies do not always play nice with each other despite often having similar goals.

Agencies that have primacy with regard to natural resource management, such as the US Fish and Wildlife Service in the Department of the Interior (DoI), would take the lead in a natural resource management issue while the EPA would then act as a consultant. At the same time many of the executive agencies also manage the environment in terms of their own pollution emissions, as required by the National Environmental Policy Act of 1970 (which we will discuss further in Chapter 4). One such is the Department of Defense (DoD), which is the largest source of pollution in the federal government and the single largest consumer of oil in the world (Crawford 2019). These are just examples of how complex the management of the environment is at the executive level.

Of course, it is the legislative bodies (e.g., Congress) that produce the laws under which the executive branch operates. As well, it is this branch of government that generally determines the fiscal resources required for executive enactment, i.e., they make the budget. Finally, it is the judicial branch (the courts) that interprets if the laws, rules, and regulations being enacted by the executive branch are constitutional. Further, one can argue that this branch can also conduct enforcement when an executive agency is not fulfilling its mandate per the law. For example, in 2007 Massachusetts and 11 other US states sued the EPA for not regulating carbon dioxide and other greenhouse gases, claiming that the Clean Air Act required the EPA to regulate any air pollutant from a motor vehicle that could endanger public health and welfare. Often it is the courts when forced by environmental activist organizations and sometimes by government (states suing the feds or other states) that ultimately manage the environment. Interestingly, while the US Supreme Court ruled in favor of Massachusetts et al. and declared that the EPA must regulate greenhouse gases, the EPA has yet to develop and implement such regulations.

1.7 Private and Non-profit Sector Management of the Environment

Aside from government (the public sector), management of the environment is also conducted by the private sector in terms of how lawful they are but also in terms of their participation in the policymaking process (lobbying) and their ability to serve as models and “peer enforcers” for achieving or degrading environmental standards. As mentioned above, often it is the not-for-profit (sometimes called non-governmental organizations – NGOs) sector’s environmental activist organizations that practice environmental management by monitoring how well the public and private sectors are protecting human health and the environment. Perhaps most important it is these organizations that manage the environment by suing both government and private-sector entities to fulfill their mandates and holding them accountable for their actions (or sometimes inaction). We will discuss this management of the legal impacts of enforcement and public participation more throughout this text.

1.8 What Are Some Special Skills Required for the Professional Environmental Manager? Or What Skills Can Get You Hired and Promoted?

While the professional environmental manager must practice the three objectives O’Leary et al. (1999) outline for success (understanding, co-producing, and delivering), they themselves must develop certain skills or strategies for this “adaptive” or “high-level” management. This section provides a short introduction to each skill and the foundational knowledge required of the successful environmental manager. Importantly, none stands

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alone, and each can be considered a discipline of its own. Skills unlike concepts take practice. Whether it be in heart surgery, karate, tennis, cooking, or management, one only obtains expertise through repetition.

The following skills (in bold text below) and knowledge, and corresponding short summary, are skills that are critical to the practice of environmental management. These skills are laid out and evaluated in detail in different chapters throughout the book but collectively they are the essential tools in the environmental manager's toolkit for operating in the tri-sectoral environmental management arena.

Situational Analysis – The professional environmental manager must be able to “paint a picture” for any environmental situation, for two basic reasons: to properly address the situation, and to make it understandable to superiors, peers, and subordinates. Executive memos or briefing papers are sometimes used as terms for this situational analysis; however, brevity is the key. Situations in terms of issues, legal trends, authorities (laws), jurisdiction, communication barriers, and policy impact with the recommended specific management actions should be included in this analysis. Another skill closely associated with situational analysis is being able to prioritize such that the environmental manager **operates with their “ducks in a row” and can identify threats and opportunities** for efficient and effective environmental management.

Navigating Government or Co-producing Solutions with Your Stakeholders – The professional environmental manager must learn how to navigate who has responsibility for achieving goals related to environmental management, who determines the goals and resources in terms of laws, rules, and regulations and who interprets and ultimately enforces environmental laws and their mandates. Critical to co-production of ethical environmental solutions is the implementation of **communication skills** particularly those associated with **public participation and crisis management**.

Skills critical to being able to deliver or implement co-produced solutions would be **leadership skills** to provide reality, expectations and give inspiration. **Strategic Planning** – The professional environmental manager must be able to develop a logical plan to solve problems, otherwise they will fail to achieve their goal or, at best, squander valuable resources. Strategic planning is a skill which when obtained allows the manager to “see the route and produce a roadmap.” Other skills critical to mission-oriented management are those associated with **compliance assurance, quality control and assurance, and continuous improvement**.

Diffusion of Innovations – The professional environmental manager must be able to affect the behavior of communities needing to adopt innovations for protecting human health and the environment. Having established that it is human behavior and subsequent activities that unbalance the ecosystem, how can those behaviors be changed? There are management techniques related to communication science that can do so.

Policy Formulation – The professional environmental manager must be able to understand the process and participants that are critical to policy formulation, for two basic reasons: first, so they may wrap their head around what is being asked of them (their mission) and, second, because they often know what needs to be done and how to do it, so must influence the process such that the mission is achievable.

1.9 Conclusion

Environmental management is the practice of a range of skills, from strategic planning to program implementation, in a tri-sectoral world that is bound and shaped by multiscalar environmental laws, policies, and norms. In short, it is complex and ever-evolving. While the science of environmental hazards is a critical component of any environmental management issue, in this text we focus on the production, integration, communication, and full-spectrum management of people, programs, resources, and politics for effective environmental management practice at the local to national scale and in the public, private, and non-profit arenas.

1.10 End of Chapter Questions

1. Why were environmental regulatory agencies created?
2. What is the stated mission of the US EPA?
3. Name the author of each of, and describe, the three dominant American environmental ethics.
4. In terms of what you are managing, how is environmental management different than natural resource management?
5. Define ecosystem.
6. Diagram the “scientific continuum.”
7. In what two ways are the “courts” responsible for managing the environment?
8. Describe the three elements O’Leary thinks are required to successfully deal with issues of environmental management.
9. What is Carson’s overriding consideration regarding humans and the environment?

INTERVIEW FROM THE FIELD 1.1 The tri-sectoral landscape

Tom Neltner, a tri-sectoral environmental manager

Tom, the reason I asked to interview you is because you are the only person that I’ve worked with that I believe has worked in all three sectors. As a chemical engineer you did some environmental management with Lilly, and after you earned your law degree you were in senior management with IDEM and then you advocated for environmental health with a number of different NGOs. So, what do you see are the major differences in environmental management between the three sectors?

The state agency regulates, but they are effectively subsidiary to the federal government. So everybody’s got somebody else in charge. Here at the state you’ve got the

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INTERVIEW FROM THE FIELD 1.1 (cont.)

federal EPA in charge. And if you're at EPA, you've got Congress involved and the White House involved. And even at the state, you've got the governor and EPA involved.

In industry I answered to somebody at the company who's doing the actual environmental management, running the wastewater treatment plant, overseeing the air pollution control device, or making sure the permits are in order and the paperwork is filed. Or you may be the one that's trying to do the higher-level corporate compliance instead of just the facility compliance – the internal regulator if you will. So everywhere there's a hierarchy.

In the advocacy groups there is also a hierarchy, and you're accountable often to your funders who want to see results, whatever that may be. And while you are also independent, just like the state of Indiana is independent from EPA, you're often looking to the national groups for guidance and support to help understand what to do and understand the details of issues. So everybody's got somebody overseeing them. And that it's important to realize.

And, what do you find the three sectors have in common regarding their management?

First, I've always found that no matter where you're at, there are dedicated people who care deeply about the environment and health. Some of the most strident advocates, the best advocates, work inside of companies because they felt that they could have the biggest impact from within a company. They're not necessarily seen as environmental advocates.

As an NGO, the key is finding those people in the agency and in the companies that are really focused on getting the job done right. There are a lot of people that are doing their job, but they define the job very narrowly and aren't necessarily focused on the outcomes. The goal is to find the people that are focused on outcomes. They're the ones that are really trying to manage and protect the environment. Don't ignore the others. In an NGO, you have some of the same differences. I try to recognize that there are outstanding people in any of those sectors and to work with them and leverage them. That's a big one.

Second, while we all may feel like we're the smartest person in the room, there's usually a lot of smart people there. So I tried to work from the assumption that there were always smarter people in the room. As a result, my approach to environmental management was it's OK to have an opinion but share the idea before you go public with it. Share ideas with people who are more knowledgeable. I still do that when I'm at EDF and I'm working on a blog about packaging and chemicals in packaging. I will try to share it with the agency to get their feedback and with the packaging companies. In essence, I share it with the people who don't like it and say give me your feedback and then listen carefully to it. They all know it's my work, but they often make it better because they have more knowledge