The activities of the German-trained forester Bernard Fernow and the politically astute Gifford Pinchot took the movement out of the hands of concerned amateurs and laid the foundation for forestry as a profession. In *Professional Forestry in the United States* Clepper traces the rise of forestry from its feeble beginnings in the late 19th century to the important position it occupies today. He notes the contributions that professional foresters have made to improved management techniques and fire fighting. Particularly significant has been the role they have played in developing a public policy of planned use of the nation's timber resources and the slow winning over of private timber interests to the idea of sustained yield. The professional forester acted as the agent through which former antagonists were transformed into cooperative partners. Today nearly all lumber companies in the United States use the services of professional foresters.

The rise of the professional forester, however, had a homogenizing effect, which Clepper implicitly demonstrates but passes over without comment. As private interests moved closer to acceptance of public policy toward use of the nation's timber supply, the Forest Service altered public policy to accommodate private interests. Though Clepper tells us a great deal about the contributions of professional forestry to state, federal, and private forestry practices, he tells us little about the profession itself. This became significant as professional foresters came to dominate both private and public forest policy. Clepper notes the increase in number of forestry schools and students, but seldom discusses the nature of the curricula. Whereas early forestry students imbibed a good deal of missionary zeal along with technical and scientific courses in silviculture, later students received instruction in the engineering and economics of forestry. The growing demand for professional foresters in the lumber industry after World War II might account for the shift. Professional schools tend to accommodate to the needs of potential employers. It is perhaps not surprising that forestry schools changed their emphasis from timber growing to timber harvesting.

The professionalizing of forestry created a community of interest between private and public policy makers. Today private lumber interests have again raised the specter of a timber famine as a rationale for increased harvesting in the national forests. The Forest Service has generally endorsed the lumber industry's demands. In the last decade the Forest Service has abandoned its historic policy of multiple use of the national forests in favor of the privately inspired idea of dominate use, the dominate use inevitably being accelerated timber harvesting. The concept of multiple use has once again found its major spokesmen outside the forestry profession.

In spite of not giving sufficient attention to these issues, Clepper's book makes a welcome contribution to our knowledge of the policy conflicts that characterized the conservation movement and the role of the professional forester in that movement. It suffers, on the other hand, from a stiff writing style and a topical organization which gives the story an episodic quality, blurring the relations between events and confusing the chronology. A sequential arrangement might have brought more clarity to an important story.

Michael Frome is the conservation editor of *Field and Stream* and a longtime friend of the Forest Service. His account of the Service is one of a series of books on government departments and agencies. It will rank as one of the best of the series. A lively writing style contributes to a brief description of the history of the Forest Service and its attempts to educate Congress and the public to the need for planned use of the nation's resources. Frome uses a discussion of the work of the Forest Service to lament the shift in public forest policy from a multiple purpose to a dominate use program. He interprets the Forest Service's loss of zeal for traditional conservation and its narrow economic approach to forestry as an abandonment of its historic mission. The Forest Service's endorsement of clear-cutting in the national forests and its lack of concern for the total ecology of an area raise important questions about professional forestry. Frome notes that professionals in the Forest Service have become protective of their decision-making prerogatives and unreceptive to recent attempts by conservation groups to share in policy formation. Where the Forest Service once found its most articulate allies among conservation groups the two have in recent years become antagonists. Frome places equal blame for this development on the archaic committee system of Congress. He states that western congressmen, more concerned with representing powerful interests than public need, dominate the committees of Congress that deal with natural resource policy. Frome writes as an informed advocate of a sound ecological approach to natural resource policy. His book deserves a wide audience.

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Polluters and Regulators

Water Wasteland. Ralph Nader's Study Group Report on Water Pollution. DAVID ZWICK and MARCY BENSTOCK. Grossman, New York, 1971. xviii, 494 pp. $7.95.

Not surprisingly, the theme of *Water Wasteland* is that the quality of our rivers, lakes, and coastal waters is getting worse; large industrial polluters, in particular, are making a shambles and a mockery of efforts to clean up the water; and governmental agencies responsible for controlling pollution are doing little to reverse this disturbing trend. Citing present and proposed legislation, testimony before the Congress, governmental reports, and newspaper articles, the Nader "task force" suggests a number of the reasons for this failure: the inadequacies of the Federal Water Pollution Control Act of 1956 and its subsequent amendments; failure to recognize and deal properly with "non-point sources" of pollution; the lethargy of federal and state bureaucracies; the inadequacies of the technologies employed; but above all "the vast economic and political power of large polluters." The report treats these subjects in meticulous detail, and the indictment cannot be dismissed easily. Despite some unevenness in style, repetition of stories, and a few technical errors, *Water Wasteland* is a compelling book and a unique contribution to the

proliferating literature on environmental problems.

It needs to be said, however, that this castigation of industry and its regulators, however well deserved, leaves largely untouched the other principal sinners, the municipalities. There is no question that the industrial contribution to the total pollutional load pouring into the nation's waters is overwhelmingly greater than the municipal contribution, regardless of how it is measured. And it is easy to become cynical regarding industry's motivation when we compare the size of its available resources with the scale of its efforts to abate pollution (and its exploitation of these efforts in self-advertising). But many of the more serious water pollution problems in this country are inherently municipal in source, and these more directly affect the immediate environments in which people live. And it is easier to overlook these faults because the modes of taxation and municipal finance usually relied upon to fund pollution abatement programs must also support the correction of other urban ills, such as poverty and poor housing, which often deservedly receive higher priority.

The authors suggest that we must abandon the narrow view that water pollution is a waste-carrying pipeline the end of which is in need of a sewage treatment plant. What they describe as "non-point sources" of pollution—agricultural drainage, feedlots, urban runoff, highway and building construction, real estate development, hydroelectric projects, and mining operations—in many cases present much more insidious and less soluble problems than point sources, whether industrial or municipal. For example, the nearly 700 million farm animals in this country are a source of pollution equivalent to that from 2 billion humans or approximately ten times the present population of the United States. Although the report presents a fairly clear definition of these problems, it suggests few solutions and those few are disappointing.

Regarding the point sources, our preoccupation in past years, the authors argue that we have failed to provide adequate sewage treatment plants for our burgeoning population—that one-third of our population is not sewered and the efficiency of treatment for the remaining two-thirds is only about 50 percent, as measured by the removal of biochemical oxygen demand (BOD). In considering this argument, it should be noted that for the last several decades the growth of sewers and sewage treatment plants has been greater than population growth, even than urban population growth (*1*). A more noteworthy indication of our failure is our inability to recognize fully the limitations of our reliance on BOD as a criterion of the impact of a waste on a stream or lake. A significant fraction of both municipal and industrial discharges is composed of inorganic and organic chemicals that cannot be measured in terms of BOD. Such pollutants as arsenates, cyanide, phenol, pesticides, and even urea would normally not be reflected in a BOD determination, either for kinetic reasons or because they are not oxidizable by microorganisms. Certain inorganic nutrients, such as nitrates and phosphates, can lead to algal growth in receiving waters with subsequent oxygen demands far greater than would arise if no BOD were removed in the waste treatment plant. Although secondary sewage treatment plants usually remove only a small fraction of these contaminants, the authors are incorrect in assuming that tertiary (advanced) treatment cannot remove "pesticides, radioisotopes, certain poisons, or bacteria." Although the expense may favor removal at the source rather than at the sewage treatment plant, existing technology can cope with most of these contaminants in liquid waste streams. That these contaminants may be much more important than those readily translated in terms of BOD is evidenced by the fact that many of our rivers and lakes that do contain adequate amounts of dissolved oxygen are almost devoid of life and harbor significant pollution measurable by almost any other criteria.

Almost everyone agrees that, to deal adequately with the array of organic and inorganic contaminants entering our natural waters, more is needed in most cases than just secondary waste treatment, however improved in efficiency. The authors point out that federally sponsored research has not been very helpful in developing new treatment technologies. Despite the expenditure of over $240 million in the last ten years, "the research effort at FWQA [Federal Water Quality Administration] has failed to provide a single significant technological innovation that has been widely implemented and is now being used to control water pollution." Such processes as phosphate removal by chemical precipitation, rapid sand filtration, ammonia stripping, ion exchange, and carbon adsorption, which have occupied a large part of the "advanced" waste treatment research efforts, for the most part were technologies available long before the beginning of the R & D program, some dating back to the 19th century. Therefore, what the R & D effort has lacked, according to the authors, is innovation. But what is meant by "innovation"? Is it new gadgetry that the FWQA and the Environmental Protection Agency (EPA) have failed to introduce to the sewage treatment fraternity? For if this is the fault for which the authors criticize the research effort, then this Nader study group has itself fallen victim to a familiar syndrome: namely a preoccupation with sewage and what new things we can do with it. We believe that the failure of the R & D effort is not so much that it has not provided innovative technologies for treating wastes, but rather that it has made little contribution to our understanding of the causal relationships between pollutants and deteriorated water quality and the appropriate parameters for measuring the impact of these pollutants. Collective parameters such as BOD have failed and will continue to fail in this effort.

On the administrative side, the most important legislation for federal involvement in efforts to abate water pollution was the Federal Water Pollution Control Act of 1956, in which the keystone of federal authority is the "enforcement conference." The Nader group finds that "enforcement" has become a euphemism for "consensus" or "partnership" government. A federal enforcement conference may be called only when water pollution crosses state lines, and whether it should be called then is left primarily to the discretion of the Administrator of the EPA, being mandatory only if a direct request is made for it by the governor of one of the affected states. Because the EPA has discretionary power it is subject to political pressure from powerful and influential industrial interests; and, say the authors, more often than not it succumbs. The resulting mood of cooperation and consensus in disputes over pollution abatement has tempered the effort of EPA (and before it FWQA) and compromised its effectiveness as an advocate of cleaner water.

In its conclusions and recommendations, the Nader group argues that in order to restore the environment to

equilibrium (whatever that means), it will be necessary to "(1) structure the laws to make government less susceptible to special interests; (2) place more power in the hands of the people; and (3) strike at the very sources of illegitimate private influence." In elaborating on these three points the group recommends that it be made mandatory upon the EPA to exercise its power to bring enforcement proceedings against polluters. It suggests also that private citizens be allowed to bring their own suits against polluters and nonfeasance suits against recalcitrant public officials who do not carry out their mandate to pursue violators of antipollution laws. In addition, it recommends that executives of firms violating antipollution legislation be held personally responsible for the firms' actions and if found guilty of repeated violations be barred from positions of responsibility in the industry.

There are several other recommendations, concerning the fines for polluters, the potential role of EPA as a source of information for the public on pollution matters, and methods for preventing firms from practicing economic blackmail where environmental restrictions are pressed. All of these recommendations (and more) are designed to lead sometime in the future to a "no dumping" policy—a vague and ambiguous concept and one which they fail to define. While discussing implications of these recommendations and the final objective ("no dumping"), the authors treat the problem of possible economic (or social) dislocations in a rather ambiguous fashion, sometimes implying that they will be slight and at other times discussing elaborate schemes for controlling their effects. Although their treatment of these problems may leave the reader somewhat confused, still their belief is well founded that many a firm may use the environmental issue to screen other problems that may have contributed more to its need to reduce its work force. (Apparently this is what U.S. Steel is doing now in Buffalo, New York.)

To sum up, *Water Wasteland* does present a picture of the failures of the administrative and regulatory agencies in our pluralistic society, the weaknesses of existing and pending legislation, and some callous attempts of industry to subvert abatement efforts. What is missing from the book is any semblance of an ecological framework for analyzing and proposing solutions to environmental problems. One is left with the uncomfortable feeling that: (i) the "no dumping" goal of the Nader group reflects a lack of understanding of trade-offs between water and land or air pollution; (ii) the group believes the people of this country are willing to pay for the level of water quality the group desires; and (iii) its criterion of success is the government's and citizens' willingness and ability to do battle in court with big polluters. The group espouses the view that one of the largest obstacles to realizing clean waters is the present administrative structures of our federal and state bureaucracies. Although the reviewers agree that administrative restructuring is necessary, in no sense is it sufficient. In particular, a lack of understanding of the ecology of our environment will surely lead to administrative decisions that will aggravate water pollution problems; and if "no dumping" becomes the chosen solution, it may only serve to produce totally unacceptable dislocations in our economy and foment greater resistance to the environmentalist movement. This is not meant to suggest that we do nothing until the experts have provided all the answers, but rather that, in redirecting our priorities and reallocating our moneys, we remember that some serious social, economic, and scientific questions remain unanswered.

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Note

1. Growth of population and of sewerage facilities, 1900–1962. Data from L. W. Weinberger, D. G. Stephan, and F. Middleton, *Ann. N.Y. Acad. Sci.* **136**, 134–54 (1966).

Population	Growth per year (%)	Correlation coefficient*
Total	1.35	.997
Urban	2.07	.995
Served by sewers	2.42	.995
Served by sewers and treatment plants	4.64	.968

* For the functional relationship of the type $x_i = \exp r_i t$, where x_i is the population, r_i is the growth rate, and t is time.

Hard Lessons from the Workaday World

New Tools for Urban Management. Studies in Systems and Organizational Analysis. RICHARD S. ROSENBLOOM and JOHN R. RUSSELL, with contributions by Carter F. Bales, Robert P. O'Block, and Mahlon Apgar, IV. Graduate School of Business Administration, Harvard University, Boston, 1971. xiv, 298 pp., illus. $8. Harvard Studies in Technology and Society.

This is not, despite its title, a how-to-do-it book for model building, data analysis, or computer simulation. Instead it is a rather nice compendium of hard lessons learned by several experienced model builders, analysts, and simulators in the workaday world. In a series of case studies in five separate settings where analytic techniques have been brought to bear on significant problems in urban management, they trace out some of the practical difficulties and suggest a few of the prospects for urban policy analysis. The emphases and biases are hardheaded and pragmatic, not theoretical or technical, and the chief strength of the book is the commonsensical character of the sophistication exhibited in the cases.

A fundamental, recurring message is clearly aimed at technically skilled but politically naive analysts searching for ways to cure urban ailments: the major systemic constraints are political, economic, administrative, and operational, not simply methodological.

> . . . the scale and complexity of many urban problems, particularly social problems, are substantially greater than those customarily encountered by defense and space industries . . . [and] the institutions responsible for coping with urban problems are not well suited for the management of change on such a scale [pp. 19–20].

Chapter and verse detail some implications of this thesis.

Russell in his "Demonstrations of systems analysis in two urban jurisdictions" reports first on an attempt to develop an economic model of the "subemployment system" for the city of Dayton, Ohio. The model itself is of slight interest, but the frank discussion of the difficulties in doing the work is quite revealing. The requirements of the problem were relatively clear in abstracto, but practical constraints dominated the problem-solving process in situ. The analysts were faced with making critical, tenuous, and largely unsubstantiated assumptions