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Supply-side recreation

IN JANUARY 1959 Marion Clawson presented a paper at the University of Wisconsin entitled "Methods of Measuring the Demand for and Value of Outdoor Recreation." Published with no fanfare as Number 10 in RFF's fledgling reprint series, Clawson's paper trickled out to academe and a small fraternity of outdoor recreation professionals and policy analysts.

Demand for Reprint Number 10 surprised everybody, perhaps especially the author, who calls it "crude, simplistic, and based on poor data." Successive reprintings seemed only to whet the appetite of a growing number of persons interested in the burgeoning pace of outdoor recreation in the United States, and the paper was reprinted for a fifth time in 1981. Not coincidentally, it was honored that year by the American Agricultural Economics Association with its Publication of Enduring Quality Award. It is indeed a seminal piece of work that set a pattern for all succeeding efforts on the demand side of the outdoor recreation equation.

In "Effective Acreage for Outdoor Recreation," the lead article in this issue of *Resources,* Clawson offers a parallel insight on the supply side. The problem he addresses is pervasive and long standing: what you see in outdoor recreation is not what you get. That is, a lot of land that is devoted ostensibly to recreational purposes may be off limits to most people for a variety of reasons. The great western parks are not easily available, for example, to the majority of U.S. citizens, who live in the East. Millions of acres of parkland in Alaska will go unvisited by all but the most avid and affluent recreationists.

What Clawson does is to provide a method and a measure—Effective Acreage Equivalent—that convert surface acres *apparently* available for outdoor recreation into a meaningful number of acres that are *effectively* available for that purpose. He cautions that he is not advancing the concept as a finished tool ready for use but rather as an experimental idea, and he invites criticism, comments, and suggestions from *Resources* readers.

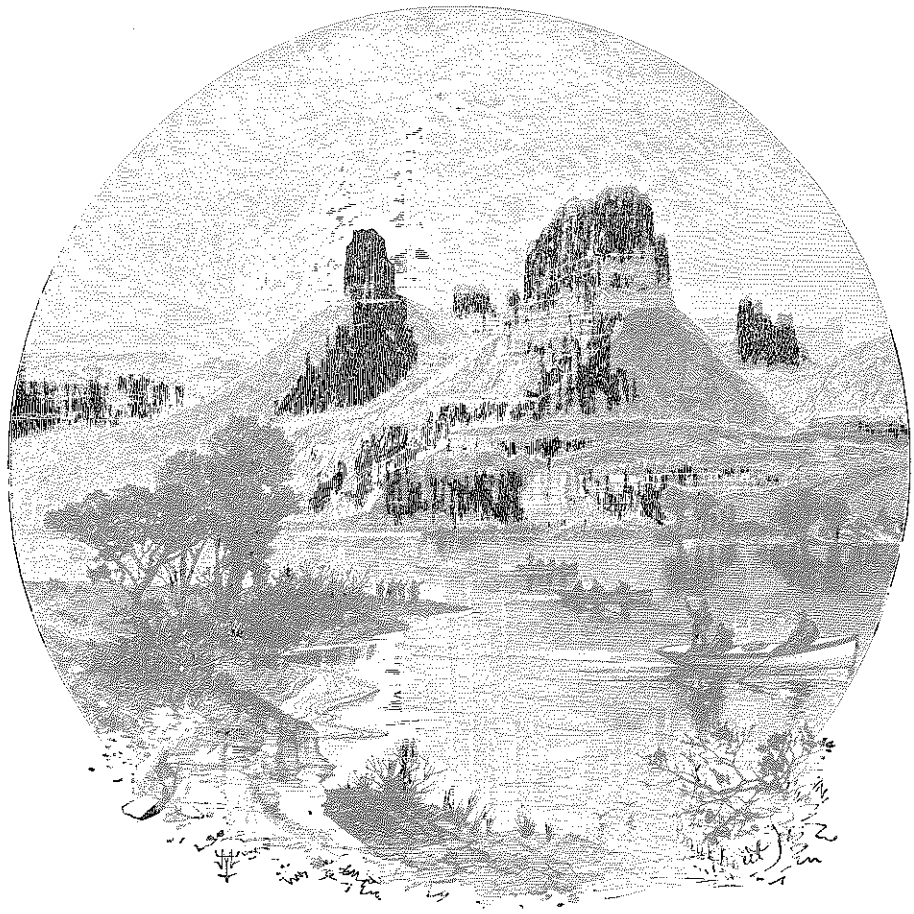
The other two articles in this issue also concern the supply of critical resources. The University of Oregon's Raymond F. Mikesell examines oil exploration and development in those developing countries not lucky enough to be sitting on vast petroleum reserves. And RFF's Allen V. Kneese takes a look at the implications of falling water tables in the Ogallala Aquifer, once thought limitless.

Finally, we offer reviews of three new books, each of which happens to be of particular interest to those concerned about the lands and resources of the American West. Marion Clawson provides an appreciative, if mixed, appraisal of William C. Everhart's *The National Park Service*. Frank J. Popper writes a lively and mostly positive review of *Western Public Lands*, edited by John G. Francis and Richard Ganzel. And Winston Harrington says that *Sacred Cows at the Public Trough*, by Denzel and Nancy Ferguson, is angry and utterly without objectivity, but well worth reading.

Effective acreage for outdoor recreation

IN 1962 THE Outdoor Recreation Resources Review Commission, in its report to the Congress and to the nation, noted:

> The most striking aspect of the supply of outdoor recreation resources in America is one of paradox. Public areas designated for outdoor recreation include one-eighth of the total land of the country. Millions of other acres, private as well as public, are also used for recreation. But this apparent abundance in many ways fails to provide an adequate supply of outdoor recreation opportunities for the public. The problem is not one of number of acres but of effective acres—acres of land and water available to the public and usable for specific types of recreation. For reasons of location or management, much of the vast acreage nominally designated for recreation is not now available for general public use. Most of this land is in the mountains of the West and Alaska, while a large percentage of the people are in the East. This kind of imbalance often is duplicated within states. Michigan has a vast recreation resource in public ownership, but most of it is located just beyond the range of mass recreation use for the people of Detroit. The pattern is repeated elsewhere.[1]



Since gross or surface acres are a poor measure of land area actually usable for outdoor recreation, some unit that measures or approximates effective acres would be very useful for analyzing outdoor recreation problems and opportunities. The purpose of this article is to outline such a measure—Effective Acreage Equivalent—that is, in a sense, analogous to British thermal units, barrels of oil, tons of coal, or other measures by which different kinds of energy are calculated on a common base. Such an overall base helps greatly in summarizing disparate kinds of information but, of course, it cannot reflect all the nuances and different attributes of the items that enter into the summary measure.

Demand for the outdoor recreation experience

An analysis of Effective Acreage Equivalent can best begin with a consideration of the demand for the whole recreation experience, which consists of five phases: anticipation, travel to site, on site, travel back, and recollection. And each phase has three dimensions: physical, economic, and psychological. One can thus imagine a matrix, with the five phases running vertically down the stub of the table and the three dimensions as columns across the table. In the first box are the physical aspects of anticipation: securing and testing gear, purchasing supplies, planning routes, packing of the gear and supplies into the station wagon, and so forth. The second phase of the physical dimension includes the actual transportation process, including refueling of the vehicle, meals en route, overnight accommodations for longer excursions, and perhaps cursing at traffic jams. On-site activities are numerous and varied, of course, and travel back is similar to travel to, in the physical sense. Recollection may be aided by souvenirs or other artifacts, including color slides.

The attitudes with which persons contemplate the recreation activity, both before and after it, and with which they view the travel dimension and the on-site activities determine the net balance, emotionally, of the whole experience. Attitudes need not conform to reality—larger fish may be caught in the living room than on the lake! Some of the attitudes may be simple dreaming—hopes or fears that reality will reveal as not soundly based—but their effects are nonetheless real at the time.

Each of the physical activities has its economic counterpart—spending for various goods and services, with the usual concern for getting the best value for the money and the usual relationship of wants exceeding available funds. Since deriving the Effective Acreage Equivalent depends on these economic relationships, the rest of this article concerns only economic factors and relationships. The reader should realize, however, that the physical and psychological dimensions also exist and that, indeed, they can be extremely important.

A hypothetical demand curve

Assume an outdoor recreation area—park, lake, forest, or whatever—of the intermediate type, meaning one suitable for

[1] Outdoor Recreation Resources Review Commission, *Outdoor Recreation for America* (Washington, D.C., Government Printing Office, 1962) p. 49.

day use but too far away to be used after work or after school, and not attractive enough for most people to wish to spend a vacation there. One good example of this kind of area would be an artificial reservoir, of no great attractiveness but with good fishing, located some miles from the nearest town or city.

Studying the actual use of such areas yields a demand curve or relationship for the whole recreation experience (see table 1 and figure 1). For people living within 10 miles of the reservoir, the cost per recreation experience is $10, assuming no admission charge is made and no user charge is collected. This $10 includes the cost of operating the automobile, the cost of fishing and other gear, the cost of food, and other miscellaneous costs, but no allowance for the value of the time of the recreationist (probably most people would regard the travel time and inconvenience as a cost, but some might enjoy the travel as much as the on-site activity). Those who live close to the reservoir might make perhaps 70 fishing visits per 1,000 population during the year. This number would depend on many factors, including climate, income of the population, interest in fishing, and the attractiveness of other recreation possibilities.

Residents of the next zone outward from the hypothetical reservoir recreation area average the same in age, sex, income, interest in fishing, and other personal characteristics as do their counterparts in the closest zone. The only difference is that now it costs $20 per recreation visit for the same items. With this higher cost, the number of visits per 1,000 population falls off to 44. For persons in the third zone—21 to 30 miles away, and subject to all the foregoing assumptions—the number of visits would be 28 per 1,000 population, at an average cost of $30 per visit. And so on down the first column of table 1 and on the line in figure 1. When the one-way distance exceeds 50 miles and the cost of the recreation visit is $60 or more, no one will find it worthwhile to visit such an area. Under the assumption of no user charges, the total number of recreation visits in a year would be 165 per 1,000 population.

The data in table 1 and figure 1 are for visits, not for visitors; that is, each person is counted each time he or she visits the area. Most people do not visit this area at all, as the data clearly show: the total number of persons visiting the area could not exceed 165 and probably falls far short of this maximum number.

Some of the visitors, for at least some of their visits, would accept considerably higher costs per visit rather than forego the recreation experience. For example, while 70 visits are made from the near zone when the total cost is $10, if the cost per visit were doubled to $20 through an entrance fee or user charge or for any other reason, the number of visits would fall off to 44—the same as when total costs are $20 without any admission or user charge. The effect of different charges on numbers of visits from different zones of origin is shown in table 1.

Table 1. Number and Cost of Visits to a Hypothetical Recreation Area

Distance from recreation area (miles)	Cost of whole recreation experience with no admission charge	Number of visits annually per 1,000 population in area of origin and with specified admission charges					
		Zero	$5	$10	$20	$30	$40
Up to 10	$10	70	56	44	28	16	7
11 to 20	20	44	36	28	16	7	0
21 to 30	30	28	21	16	7	0	0
31 to 40	40	16	11	7	0	0	0
41 to 50	50	7	3	0	0	0	0
51 and over	60	0	0	0	0	0	0
Total visits	n.a.	165	127	95	51	23	7
Total revenue from admissions	n.a.	$0	$635	$950	$1,020	$690	$280

Note: n.a., data not available.

If every visit could somehow be charged an amount exactly equal to its value to the user, a total revenue of about $2,200 would be possible. This sum measures the consumer surplus for all users for all visits when the user charge is set at zero. The supplier of the recreation area may incur some costs in making the area available but, when user charges are administratively set at zero, all these costs must be borne by the supplier and all the consumer surplus accrues to the consumers.

If user charges were imposed, the number of visits would decline, as we have seen in table 1. The amount of revenue that would be raised by different charges—but equal charges for all visits—is shown in figure 2. If a single price is charged for all visits, then a charge of about $14 would yield the maximum revenue. Up to that charge, increased revenue per visit more than offsets decreased numbers of visits, and total revenue rises; above that charge, on the other hand, decreased numbers of visits reduce revenue more than increased charge per visit increases it. At this maximum revenue charge, there would be about 82 visits, which at $14 per visit would yield about $1,150, or only slightly more than half of the revenue generated if every visit paid its maximum value (as estimated

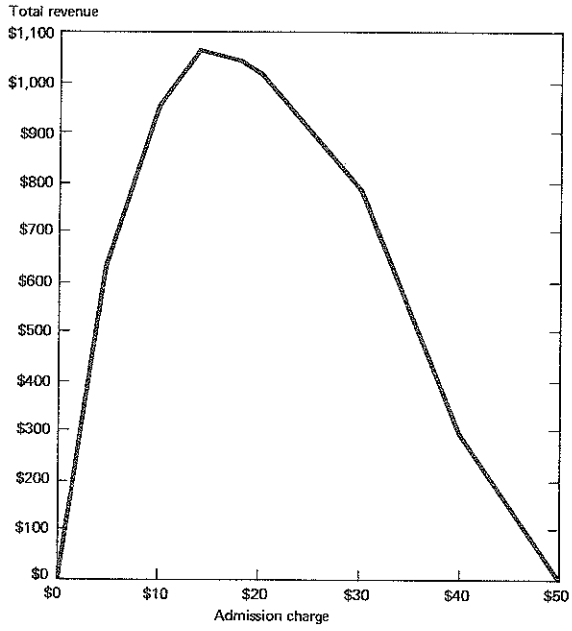


Figure 1. Number and cost of visits to a hypothetical recreation area.

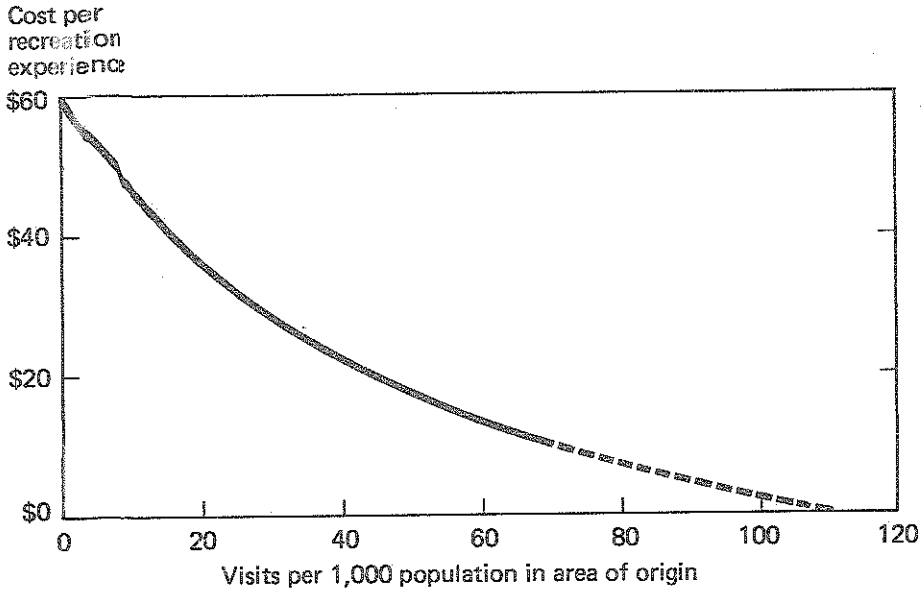


Figure 2. Total revenue from varying admissions charges to a hypothetical recreation area (single price system).

previously). Some form of a two- or three-price system might yield a little more revenue. For instance, higher charges might be imposed on weekends than on weekdays.

The data in table 1 and the figures 1 and 2 include no consideration of the costs of supplying the recreation opportunity, hence they do not indicate the level of charges and visits that would yield the maximum profit (or the minimum loss) to the owner/manager of the area, whether private or public.

Using alternative areas

The demand analysis outlined above shows how persons in different locations use an outdoor recreation area that is fixed in location and has defined characteristics. Now let us turn that analysis around and consider how persons in one location—perhaps a small city and its suburbs—use several such areas of essentially similar character but in different locations. Again, we assume that the residents have defined social and personal characteristics that remain constant.

For purposes of this example we posit a string of small artificial reservoirs, of perhaps 200 acres in size, all substantially the same in terms of innate attractiveness, but each located 10 miles farther from the city than the last. The main attraction of these reservoirs is fishing, with perhaps a picnic lunch on shore, but they have no overnight facilities. We can readily envisage a "demand curve in reverse" for these areas. That is, because it is quicker and cheaper to get to, more people will visit the nearby area than will go to the more distant areas. Indeed, if all the areas are essentially similar in size and character, why should anyone go to any other area? Several reasons come easily to mind: the nearest area may become so crowded that it is less pleasurable to visit; heavy fishing may have reduced the prospects for a good catch in the nearer areas; facts or rumors may point to better fishing in more distant ones; and some people simply like different experiences and variety, including solitude.

Thus, some visits will be made to the more distant areas, but the number of visits will fall off with distance and hence with increased cost per visit. In fact, it is reasonable to expect that the demand curve for the alternative sites will decline just as did the demand curve for users in different locations. A relatively large number of visits will be made to the nearest area and fewer to each successively more distant area until no one will go to areas more than 50 miles away. The same curve that depicted use of one area by users located at different distances from the site now becomes the curve for use of different areas by persons located in one area.

Defining Effective Acreage Equivalent

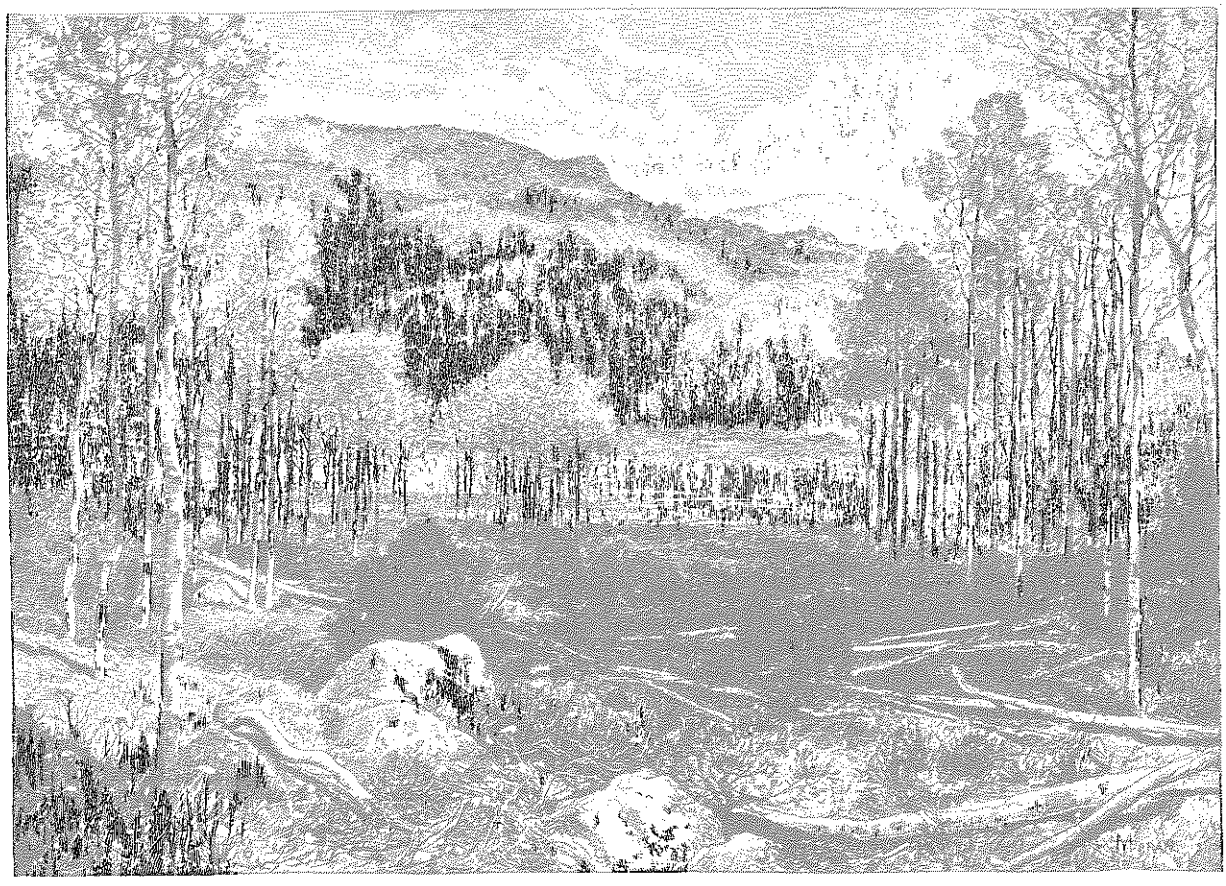
For this chain of artificial lakes, let us assume that the closest area becomes the standard for defining effective acreage, and reduce the others to an Effective Acreage Equivalent in terms of their relationship to the nearest area. Thus, the 200-acre reservoir within 10 miles of users is equal to 200 acres of effective outdoor recreation area. The next 200-acre reservoir, 10 miles farther away, is equivalent to 126 effective acres. That is, the nearest area had 70 visits, the next most distant one had 44 visits from the same residential area; 44 divided by 70 equals a coefficient of .63 which, applied to a gross area of 200 acres, equals the 126 effective acres. On the same basis, the third reservoir has 80 effective acres (28 divided by 70, multiplied by 200); the fourth has 46 effective acres; the fifth, 20 effective acres; and the sixth and more distant reservoirs (if any), an effective acreage of zero. The total *effective* acreage for this string of reservoirs thus is 472 acres (200 + 126 + 80 + 46 + 20), while the *gross* acreage is at least 1,000 (it might be much more if there are still more distant reservoirs).

Like the demand analysis for one area visited by people from different locations, this analysis of the effective acreage of a chain of essentially similar reservoirs is easier to state, under many simplifying assumptions, than it is to apply in particular real life situations. A chain of areas is unlikely to be so neatly located at regular distances from the user, the recreation areas probably would differ in various ways and hence in attractiveness, and one can imagine many other complicating situations. Nevertheless, just as the distance-travel analysis of the demand for the whole recreation experience has proved basic to all the recreation demand studies of the past two decades, so can the Effective Acreage Equivalent analysis be basic to all attempts to convert different outdoor recreation areas to a common denominator.

How might this basic concept be applied to some major types of outdoor recreation situations? We provide below a simplistic application to some of the public recreation areas of the United States.

Applying Effective Acreage Equivalents

The simplest situation in which the concept might be applied is a real life situa-



tion more or less corresponding to the hypothetical one outlined above—residents of one city and its suburbs traveling to recreation areas of closely similar characteristics and attractiveness at different distances from the city. These areas are primarily suitable for single-day use—too far away for after-work visits and not attractive enough for vacations. This sort of situation might arise if the city or the county proposed to acquire one or more day-use areas and was trying to decide which area offered the best bargain—the most recreation opportunity for the money. Close-in areas are more useful, but also are usually more costly. Is a close-in area at a high cost a better or a poorer bargain than a more distant area at a lower price? Since the various sites probably would differ, at least somewhat, in innate attractiveness, research in generally similar areas around this or other cities might establish, perhaps by correlations among variables or by a Delphic process involving some of the community's leading citizens, the importance of various factors in addition to or including distance. Thus, necessary coefficients for converting surface acres to Effective Acreage Equivalents could be calculated or estimated. By this process, the various possible alternative tracts could be reduced to an acreage equivalency. But while this might greatly assist the decision process, it clearly would not solve all the problems: difficult and essentially political choices would remain.

Something of the same problem, but more difficult, would arise if the decision-making body were a state agency that planned to establish the new day-use parks. The problem in this situation would be complicated by the existence of many towns, cities, and suburbs, which would form an intricate and irregular network of demand from which users would travel varying distances to a network of parks, perhaps equally irregularly scattered over the state. The computational problems in coping with this situation would be greater—perhaps very much so—but the same general principles would apply. That is, state parks closer to large numbers of city residents would be more valuable than parks farther away. Differences in innate attractiveness probably would be a more serious problem here, but not an insurmountable one. Again, many difficult decisions of an essentially political nature would need to be made, but if the state agency, the governor, or the legislature wanted an objective and quantitative measure of the relative adequacy of parks in different parts of the state, then the Effective Acreage Equivalent would be the best measure. For this problem, as for the immediately foregoing one, coefficients per unit of surface area would have to be estimated by some means. It seems probable, if the other aspects of this definition are as we have defined them, that the same coefficients can be used for each problem and for the state as a whole.

A generally similar but still more complex situation would arise in an attempt to estimate an Effective Acreage Equivalent for all states and regions, but still confined to intermediate type day-use areas. This was one of the concerns of the original Outdoor Recreation Resources Review Commission—how to compare park adequacy in different parts of the country. The problem is complicated not only by the extraordinarily complex pattern of city, town, and suburban locations and by the existing pattern of day-use areas, but also by the fact that different climates permit different use patterns of essentially similar areas, that people living in different parts of the country have different average incomes and different tastes for outdoor recreation, and by other factors. Still, if the Land and Water Conservation Fund or any other source of federal funds attempted to distribute funds on some measure of need, then a reliable Effective Acreage Equivalent would be extremely useful. Even if no such provision were written into law, it may well be assumed that members of the Congress from different parts of the country would use the concept to assert their greater need and stronger claim to more federal funds.

The problem of estimating Effective Acreage Equivalents for all parts of the country—even for just the day-use areas—while difficult, is not as formidable as estimating them for different kinds of areas. The methodology of the latter, discussed in the next few paragraphs, is equally applicable to national areas of a similar kind.

Comparing apples and oranges

By far the most difficult estimation problem arises when many kinds of areas differ not only physically and in attractiveness, but also in use patterns, from those close enough to users to permit visits after work and after school, to intermediate areas primarily for day use, to distant areas used mostly for vacations. All the enormous physical and cultural variability and richness of the United States compound this problem. Clearly, no measure can capture all the variations and subtleties, but a reliable general measure would have much value.

Solving this complex problem will require several steps. First, reasonably reliable demand curves for each kind of area in each major location or region of the country are necessary, either by field work and statistical analysis or by the Delphic approach suggested earlier. From these could be calculated coefficients for converting surface acres into Effective Acreage Equivalents for each major kind of area in each region. The bigger problem arises in comparing one kind of area with another. But, if demand curves existed for each kind of area, conversion factors from one coefficient to another could be calculated. One might compare the surface area–recreation use ratio on the various demand curves at any one and preferably all three of the following points:

- At the median relation between maximum and zero use for each, if the demand curves measured such points
- At the maximum use rates where rent was zero, or where no further use occurred because costs of getting to the area and using it fully consumed all the values of the experience, leaving nothing for rent of the site[2]
- At some slightly higher point on the demand curve, where rent or the surplus of value above zero was at, say, 10 percent of the maximum—this latter to avoid undue reliance on the extreme end of the frequency distribution, which is always less accurately measured than is one defined position within the frequency.

The rationale for this process is as follows. Every person visits each kind of site until the site rent for him or her is zero. This obviously depends in large part on the interests, the income, and the location of each potential user. Costs are incurred for the whole recreation experience, and in some cases this may include modest charges for use of the area—as admission charges and user fees for parking, boat launching, camping, and the like. But for most publicly provided outdoor recreation areas the charges are zero or relatively low. The costs for the whole experience may be high for the user—perhaps significantly so in time and energy—but the rent for the marginal visit will be zero or the small amount actually charged for use of the area. It is reasonable to conclude that the rate of visitation for each area will increase until the rent for the site is zero (or the amount actually charged for its use), regardless of the costs of the whole recreation experience.

The ratio of visits to areas at the zero-rent margin provides one basis for the conversion of surface areas to Effective Acreage Equivalents for areas of different kinds.

Approximating equivalents for the United States

Applying this method to the whole United States on a fully quantified and empirically sound basis would be an immensely challenging process, requiring a large amount of data, some of which is not readily available, and also conversion coefficients, none of which have yet been estimated with detail and accuracy. But very rough approximations can be calculated for some major kinds of outdoor recreation areas that will at least illustrate how this method of analysis would work (table 2).

Table 2. Attendance, Surface Acres, and Effective Acreage Equivalent for State Parks, the National Park System, National Forests, and County and Municipal Parks, Circa 1980

Kind of area	Regional location	Visits (million)[a]	Surface acres (million)	Effective Acreage Equivalent (million)[b]
State parks	Outside of Alaska	614.9	5.98	5.98
	In Alaska	3.2	2.98	.031
National Park System[c]	Outside of Alaska	238.15	24.3	4.64
	In Alaska	.44	52.5	.0086
National forests	Outside of Alaska	230.6	164.9	3.38
	In Alaska	2.9	19.9	.042
County and city parks	All	2,000.0[d]	1.5[e]	4.75
Total of enumerated areas		3,090.00	272.00	18.80

[a] Or visitor-days
[b] See text for basis of estimate
[c] Includes entire national park system
[d] Author's estimate
[e] 1965

The point of departure is the average acre of state parks outside of Alaska; this is the effective acre standard to which other areas will be compared. In the period around 1980, this average state park acre had 103 visits. Using this as the zero-rent margin of use, the more than 3 million acres of state parks in Alaska shrink by a factor of nearly 100. The average acre of the National Park System outside of Alaska had nearly 10 visits per acre; adjusting its surface acres to an effective acreage basis in comparison with the zero-rent state park acre, but allowing for the fact that the average visit to a national park might have averaged twice as long as did the average visit to the state park system, results in an Effective Acreage Equivalent for the National Park System outside of Alaska of 4.64 million acres—somewhat less than for the state parks. By a similar process of adjustment, the effective acreage of the National Park System in Alaska shrinks greatly, to fewer than 10,000 acres. By similar calculations, the National Forests outside of Alaska have about three-fourths as many effective acres as does the National Park System outside of Alaska and somewhat more than half the effective acreage of the state parks outside of Alaska.

In contrast, the city and municipal parks—about which our information is seriously lacking and for which a reason-

[2] Economic rents are created in the exploitation of land and many other natural resources. Because of superior quality, including locational aspects, some resources may be exploitable at a cost well below that of other otherwise similar resources that also are in the market. Economists call the difference the economic rent of the resource—the amount by which costs of exploitation could rise without making it unprofitable to continue the operation.

able estimate of use may be in large error—have more than three times as many effective acres as they have surface acres. This is despite the fact that visits to such areas are estimated to be only a fourth as long, on the average, as are the visits to the state parks.

In spite of the lack of detailed analysis, both geographically and by kinds of areas, and in spite of the necessarily rather arbitrary assumptions on which the calculations thus had to rest, the results both illustrate the method and provide some estimates that intuitively seem reasonable. The vast acreages in Alaska are shrunk by a factor of 100, more or less; the rest of the National Park System is shrunk by a factor of about 5; the national forests outside of Alaska are shrunk by a factor of about 50; but the city and county parks are increased by a factor of about 3.

In a 1958 publication, reissued this year along with current data on many of the same topics, I wrote that "the difficulties of summarizing statistics on recreation in different areas are apparent for land—the one factor, one might think, for which a common denominator could most easily be obtained."[3] It took more than a quarter century, and there are many reasons for the public to hold land, including wilderness, watershed, timber production, and wildlife habitat, but for outdoor recreation purposes the concept of Effective Acreage Equivalents at last offers hope of carving some order out of confusion.

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[3] Marion Clawson and Carlton Van Doren, eds., *Statistics on Outdoor Recreation* (Washington, D.C., Resources for the Future, 1984).

High Plains, low water

ONE OF THE PREMIER U.S. grain-producing regions—the area watered by pumping from the enormous Ogallala aquifer—is depleting its groundwater. This threat to agriculture, plus the depletion of the area's major petroleum resources, prompted a study of associated potential economic, social, and environmental changes—the *Six-State High Plains–Ogallala Aquifer Regional Resources Study*.[1] For understandable reasons, it commonly is referred to as the High Plains Study.

High Plains history

As the frontier was pushed westward in the nineteenth century, the High Plains was the pathway to the undeveloped West. As time passed, three major technological developments—barbed wire, windmills, and the repeating handgun—permitted settlement of the High Plains and a ranching and farming culture began to develop. Settlement and agriculture flourished—for a while: unusually propitious moisture conditions during the 1880s produced bumper crops from the fertile soil, and many farmers moved in from the East. When more usual rainfall conditions returned in the succeeding decades, many farms and settlements were ruined.

In the late nineteenth century, A. M. Simons wrote in the *American Farmer*: "From the 98th meridian west to the Rocky Mountains there is a stretch of country whose history is filled with more tragedy and whose future is pregnant with greater promise than perhaps any other equal expanse of territory within the confines of the Western Hemisphere."[2] As implied, the region was characterized by periods of boom and bust. The nadir came in the 1930s, when drought coincided with the Great Depression. This is the time when the term "Okies" was coined to characterize those economically displaced from the plains—unwilling, tragic vagabonds, searching for opportunity elsewhere, mainly in California.

But the late 1930s saw other technological developments of great portent for the future: improved well-drilling equipment, advanced pumping technology, and cheap energy opened the area to large-scale irrigation from deep wells and permitted tapping of the Ogallala, regarded at the time as a "vast underground river"

[1] High Plains Associates, *Six-State High Plains–Ogallala Aquifer Regional Resources Study*, A Report to the U.S. Department of Commerce and the High Plains Council (Austin, Texas, March 1982).

[2] *High Plains Study*, p. xxxv.

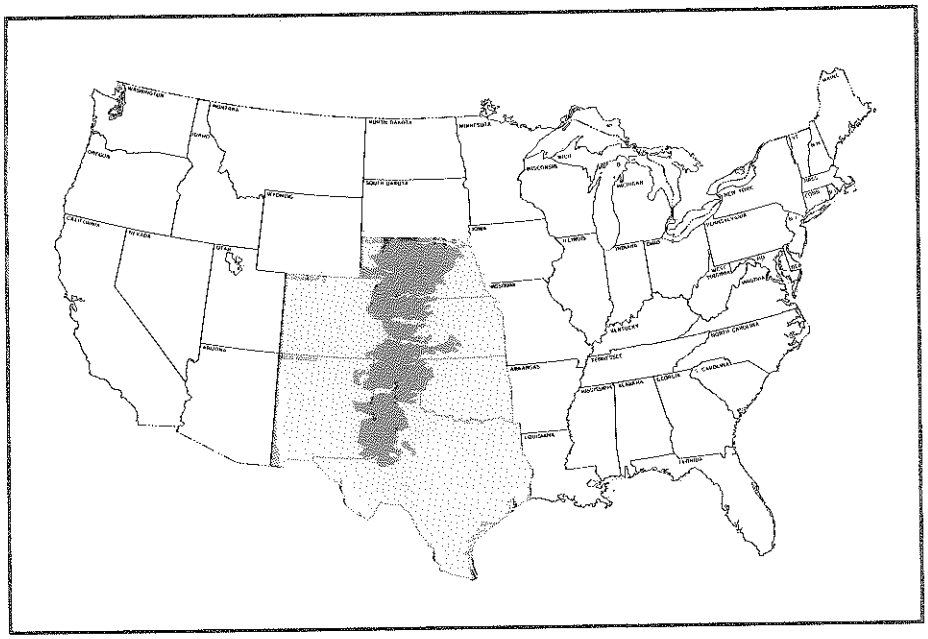


Figure 1. The High Plains Region–Ogallala Aquifer. *Source*: High Plains Associates, *Six-State High Plains–Ogallala Aquifer Regional Resources Study*, A Report to the U.S. Department of Commerce and the High Plains Study Council, March 1982.

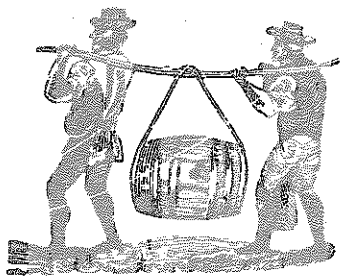
and an "inexhaustible resource." The demands of World War II stilled development of the underground water resource, but soon massive development took place, initially in the southern part of the aquifer.

Some 15 million acres of land now are watered from the Ogallala. Development on such a scale soon revealed not an inexhaustible resource, but a depleting one. By the 1970s some areas were falling into decline, especially in Texas, where the earliest development occurred. At the same time and in some of the same areas, oil and gas production also was falling off. In the northerly parts of the aquifer, especially in Colorado, Kansas, and Nebraska, where the aquifer lies deeper under the surface, development came later and has continued. Also, in contrast with the situation in the south, parts of the northern aquifer receive significant recharge from the surface.

Nevertheless, at the behest of the states, principally Texas, Congress in 1976 passed section 3 of Public Law 94-586. It provided for a comprehensive survey of alternatives for the region, including the possible importation of supplemental water—a dream with a long history in Texas. (In the 1960s, a scheme to import 10 million acre-feet per year from the Mississippi failed twice in public referendum.)

The mandated study, begun in 1978, was carried out by Camp Dresser and McKee in joint venture with Arthur D. Little as prime contractor, and with Black and Veatch as subcontractor. In addition, each of the states and the U.S. Army Corps of Engineers were involved. I was the principal economics consultant to the prime contractors and participated actively in all stages of the detailed design and execution of the study.

Before discussing the study and its results, it may be useful to say a little more about the Ogallala and its development. This huge area of about 220,000 square miles is the unconsolidated remnant of large deposits of gravel, sand, and silt eroded from the Rockies over the eons. Much of the water in the aquifer is fossil water, especially, as noted, in the southern portions. Development in recent decades has been both rapid and on an extremely large scale: in 1950 about 7 million acre-feet of water were pumped to irrigate some 3.5 million acres and by 1980, about 21 million acre-feet were used to water roughly 15 million acres. About 40 percent of the nation's fed beef is supported by grain grown on the High Plains. A complex regional infrastructure has developed based on this agricultural development and, in some cases, also on oil and gas, and such substantial cities as Lubbock and Amarillo have grown up.



Management strategies

To project how irrigated agriculture might evolve, the High Plains Study examined several plausible management strategies and compared them to a baseline projection that assumed gradual spreading of best irrigation practice but no new policies. The management strategies used in the analysis are:

1. Stimulate voluntary conservation practice using education, research, demonstration, and economic incentives.
2. Add some regulatory programs.
3. Augment local water supply by cloud seeding, groundwater recharge, and the like.
4. Transfer surface water from basin to basin within a state.
5. Allow interbasin transfers from outside a state.

Numbers 1 and 5, in my judgment, are the most interesting. Given the history and traditions of the area plus the costliness of some of the other alternatives, number 1 is notable because it seems to me most likely to happen. And 5 is interesting because it takes a hard look at the dream of imported water so long cherished by some interests on the High Plains.

I will spare the reader details of the fairly complicated models (mostly linear programming and input–output) used to project results of the strategies to 2020 except to note that they depend critically on assumptions about continuing growth in yields and the adoption of conservation practices. Also, because pump lifts make High Plains agriculture very energy intensive, water conservation may be driven fully as much by energy costs as by the perception of limited water supplies.

Number 1 results. For management strategy 1, every economic indicator is higher (in constant dollars) for 2020 than it is for 1977 (the base year). This is true for both the north (Nebraska, Kansas, Colorado) and the south (Oklahoma, New Mexico, Texas), and for each state the total value of agricultural products for the region as a whole would be up 3.3 percent and employment would increase by 1.1 percent. Under each nonimport strategy some land would go out of cultivation in both the north and the south, but overall this would be more than balanced by the development of new land. However, usable water remaining in storage in the south will be severely depleted by 2020.

The central, interesting, and—given the atmosphere of impending doom when the study was launched—surprising conclusion of the High Plains Study is that the economy based on irrigation from the Ogallala can continue to grow for many years in each state in the area. If these projections are valid, the adjustment to depleting supplies can be gradual and noncatastrophic.

Number 5 results. Let us turn now to a brief consideration of the importation alternative. Under management strategy 5, the objective for purposes of study is to bring enough supplemental water to replace land that would go out of irrigation under management strategy 1. Possible routes that are feasible from an engineering point of view are shown in figure 2. Under this alternative, 4.1 million acre-feet of imported water is brought yearly to terminal storage for use on the High Plains; total water use in 2020 is projected to be 25.4 million acre-feet, about 20 percent above management strategy 1. Since pumping from the aquifer is not reduced under this strategy, the amount of water remaining in storage is unaffected.

Even a cursory look at the economics of imported water starkly reveals what an outlandish idea it is. Based on projected returns to land and water, the absolute maximum ability to pay for imported water would be around $120 per acre-foot.[3] The Army Corps of Engineers, which is unlikely to exaggerate the costs of the project, calculates that the cost of imported water would be $320 to $880 per acre-foot at projected energy prices.[4] But that is just the cost to bring water to a terminal storage reservoir on the High Plains and does not include distribution costs. I do not know what those costs would be, but it does not stretch belief to think that, given the enormous size of the region, average delivered water might cost again as much as terminal storage water.

If the actual willingness to pay, rather than the maximum possible, is, say, $75 per acre-foot (which is probably generous) and the cost of delivered water ranges around $1,000 per acre-foot, the cost would

[3] *High Plains Study,* pp. 6–87.

[4] *High Plains Study,* pp. 6–77.

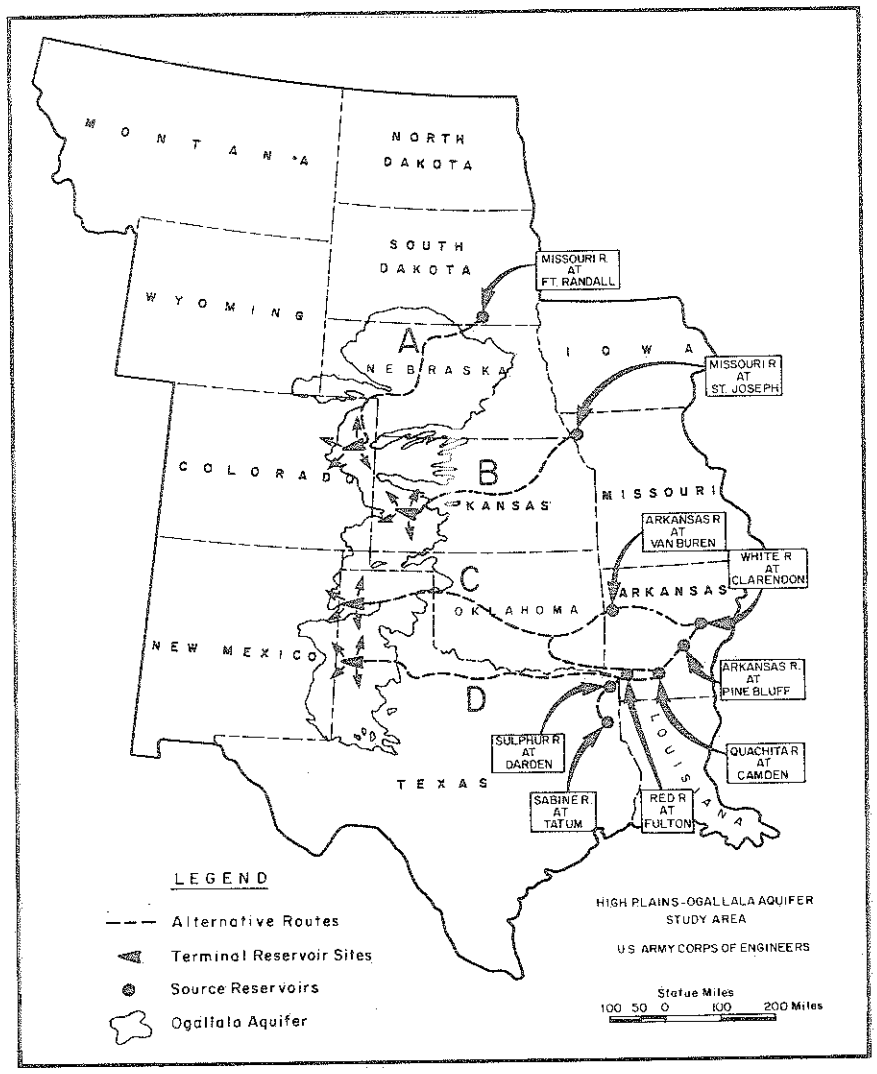


Figure 2. Management Strategy 5: Interstate water transfer route alternatives assessed by the U.S. Army Corps of Engineers. *Source*: Adapted from figure 5, review draft, "Water Transfer Elements of High Plains–Ogallala Aquifer Study," January 1982.

exceed willingness to pay by more than an order of magnitude.

Why would regional interests support what appears to be such an economic disaster—a project whose costs vastly exceed their ability to pay for it? The answer is that they do not expect to pay for it, or at least not much, and the history of distributional politics concerning western water bolsters this expectation. History notwithstanding, however, it seems doubtful that a big enough legislative "Christmas tree" could be put together to support major importation of water to the High Plains. In my judgment, political, economic, and ecological considerations make the future transfer of such huge amounts of water all but impossible.

Conclusions

First, the Ogallala aquifer indeed is depleting, but there is no water crisis on the High Plains. And second, water importation is a thoroughly bad idea, even if just the economics are considered; imagine an environmental impact statement for such a project. But dreams do not die: in its report, the Texas 2000 Commission's first recommendation about water is that a plan be developed with options for interstate and international transfers.[5]

This article is adapted from Allen V. Kneese's address in June to the Conference on the Future of the American Granary: Adjusting to Change in an International Setting, held in Saint Paul, Minnesota. Kneese is a senior fellow in RFF's Quality of the Environment Division.

[5] The Cross Section, April 1982, p. 4.

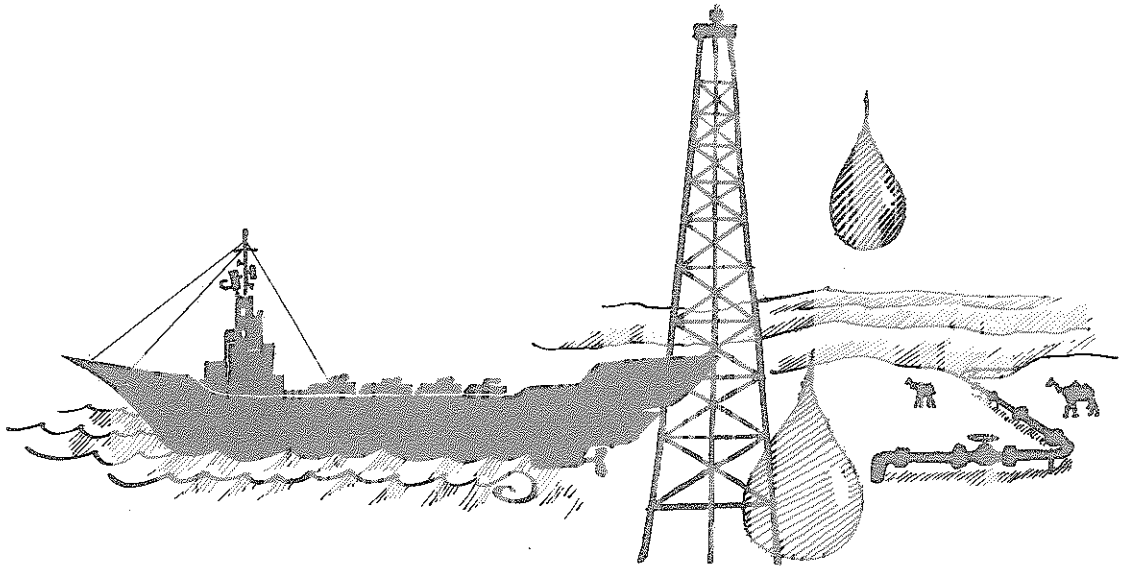
EPRI/RFF energy report

As one portion of a two-part project sponsored by the Electric Power Research Institute, Inc. (EPRI), Irving Hoch and Richard T. Carson, Jr., have produced the report, *An Energy-Oriented Input–Output Model.* The work analyzes the structure of relationships between energy and the general economy by use of an input–output model. The work has three phases: development of a base-year (1972) version of the model; projection of the model to the year 2000; and projections of individual industry outputs for that future year. Copies of this report are available through RFF, without charge, by writing to Box HOC, Resources for the Future, 1755 Massachusetts Avenue, N.W., Washington, D.C. 20036.

Energy discussion papers

Ordering information: A limited number of energy discussion papers is available without charge to interested members of the research and policy communities. Specify the paper desired in a written request to the Center for Energy Policy Research, Resources for the Future, 1755 Massachusetts Avenue, N.W., Washington, D.C. 20036. Discussion papers are tentative presentations only and are not considered to be published material. As such, they are available only as described and may not be ordered from The Johns Hopkins University Press or from RFF's Publications Office.

- Discussion Paper D-82Z. "Policy Responses to Oil Disruption Risks: An Analytical Overview," by Michael A. Toman.
- Discussion Paper D-114. "Determinents of Oil Exploration and Development in Non-OPEC Developing Countries," by Harry G. Broadman.



Petroleum development in oil-importing developing countries

WHILE IT IS UNLIKELY that many of the oil-importing developing countries will become major petroleum exporters, a higher degree of self-sufficiency would reduce their dependence on OPEC producers and improve their balance of payments.

The non-OPEC, less-developed countries differ widely with respect to their current petroleum export-import balances and their likely production potential (table 1). A few countries, including Egypt and Malaysia, are substantial petroleum exporters and are, therefore, highly dependent upon the development of their petroleum resources for their foreign exchange income. Another group of countries is in near balance in petroleum production and consumption, but must expand its output substantially over the next few years if the countries are to avoid becoming large net importers. This latter group includes Argentina (net importer), and Peru and Zaire (net exporters). Still another group, including Brazil, Colombia, and India, has substantial production and good prospects, but is a considerable distance from self-sufficiency. The largest group of less-developed countries has no production, and for most the outlook for significant petroleum discoveries is not promising.

Whatever the level of potential output, an important factor in oil exploration and development is the commitment of the government to petroleum investment, either through a government oil enterprise or incentives that encourage foreign companies to invest in such activities.

Before the sharp rise in world petroleum prices in 1973–74, many oil-importing developing countries had little interest in promoting oil exploration by negotiating contracts with petroleum companies or by providing adequate financial and technical resources for their government oil enterprises. Following the rise in oil prices, some, such as Brazil and India, expanded government exploration and development activities, but did not encourage foreign petroleum investment until recently.

Modern petroleum agreements

The modern minerals agreement negotiated with host governments (whether concerned with petroleum or other minerals) is an anomaly. It is nominally a contract to conduct certain activities under host government supervision, but since the risk and financing are borne by the contractor, it is a foreign equity investment. The foreign investment is basically the contract itself, since in most agreements title to the resources in the ground and even to the equipment and installations is held by the host government or reverts to it at the termination of the contract. Moreover, most host governments do not regard the contracts as covenants to be honored throughout their term, but look on them as a framework for more or less continuous negotiation as the relative bargaining power and opportunities created by new conditions change in favor of the government.

Whether it takes the form of a production-sharing contract, a joint venture, a risk-service contract, or a concession contract, the modern petroleum contract prescribes the activities of the contractor in considerable detail, including the number of exploration wells to be drilled or exploration outlays to be made, the development and production of any discoveries, and frequently the price and other conditions for the sale of the oil.

Since in recent years world oil prices have been quite high relative to the operating and capital costs actually incurred for development and production of successful oil discoveries,[1] the governments of host countries have claimed the bulk of the gross revenues produced. Indeed, the share of net revenues claimed ranges from 85 to 95 percent. A profit share of 10 to 15 percent on the output of a large field may yield a very attractive internal rate of return to the petroleum company if no account is taken of risk. But the economics of investment decision making in a high-risk environment requires an expected or probability-adjusted internal rate of return that takes into account several categories of risk. These include low probabilities of finding large fields and higher probabilities for smaller fields; risks at the development stage (since not every production well drilled in a known field will yield oil that can be produced economically); and a variety of other risks relating to costs and world oil prices, plus the political risk of contract violations. The perception of risk (as well as the degree of risk aversion) differs among petroleum companies, and the companies

[1] The full cost of producing crude oil in the oil-importing developing countries in 1980 was estimated to range from $6 to $15 per barrel in 1980 dollars. See *Energy in Developing Countries* (Washington, D.C., World Bank, August 1980).

and host governments have differing evaluations of risk and compensation for risk. Differing contract terms designed to achieve the same ratio of net returns to the contractor and the host government will yield substantially different *expected* internal rates of return for the same petroleum field, after adjustment for the probability that the returns will be realized. Also, actual rates will differ greatly with the size of the field discovered and other conditions for the same set of contract terms.

Effect of contract terms on petroleum exploration

The initial efforts of oil-importing developing countries to attract foreign petroleum companies have frequently brought relatively little exploration, in considerable part because they have not offered sufficiently attractive terms to private investors. Countries with small proved reserves often pattern their agreements along the lines of those negotiated by countries with substantial reserves and favorable geologic conditions for large discoveries.

High-risk exploration requires generous terms in order to provide substantial rewards for successful ventures. Moreover, since newly discovered fields in regions not producing oil are likely to be relatively small, while exploration and development costs are quite high, the expected present value of petroleum projects before taxes may not be exceptionally high even if contract terms are quite generous. Once important discoveries are made, new contracts more favorable to the government can be negotiated on tracts in the same general area.

The governments of oil-importing developing countries have generally done a poor job in structuring their tax and revenue or production-sharing arrangements for achieving maximum exploration activity and maximum efficiency in the development of discoveries. They have patterned their petroleum laws and model contracts on those of countries with different petroleum characteristics or have been more concerned with maximizing potential government revenues than with attracting petroleum companies to undertake exploration. For example, some governments have sought to extract large signature bonuses for exploration contracts in high-risk areas or have imposed rigid, unrealistic expenditure requirements. Model contracts employed by governments have frequently been formulated with a view to satisfying domestic ideological objections to foreign investment in petroleum production, or to protecting the monopoly status of politically powerful state petroleum enterprises. Both these motivations apply to Argentina, Brazil, and Peru, among others. Although there has been some improvement in contract terms, for example, in Brazil, with a consequent rise in exploration activity, many years of potential production have been lost, at enormous cost to the country.

An analysis of contract terms has shown that most fiscal systems are *regressive,* or at best *proportional* rather than *progressive,* as measured by the relationship between the government's share of net revenues and the quality of the field. A progressive fiscal system is more likely to provide an acceptable internal rate of return on high-cost–low-volume fields than a regressive system. It therefore not only encourages the development of such fields when they are discovered but also raises the risk-corrected internal rate of return of a prospective exploration investment. A fiscal system is made regressive through large signature bonuses, high royalties, and production-sharing arrangements, while progressivity is produced by a heavy reliance on net profits taxes. Not only will a better structuring of fiscal terms in petroleum contracts increase the attractiveness of projects to prospective investors, it will also tend to increase the expected net present value of government revenues as well.

Most contracts provide for lower output or revenue shares for the contractor from higher incremental production in areas under contract. Such arrangements not only reduce the expected net present

Table 1. Estimated Proved Reserves and Crude Oil Production in Non-OPEC Developing Countries, 1982

Country	Production (1,000 barrels per day)	Reserves (billions of barrels)
Africa		
Angola	122	1.63
Cameroon	109	0.53
Congo	87	1.55
Egypt	667	3.32
Ivory Coast	9	0.11
Tunisia	106	1.86
Zaire	22	0.14
Other	2	0.40
Total	1,124	9.54
Asia–Pacific		
Brunei	155	1.24
Burma	32	0.03
India	384	3.42
Malaysia	306	3.32
Pakistan	12	0.02
Philippines	7	0.36
Other	8	0.22
Total	904	8.61
Middle East		
Bahrain	45	0.20
Oman	328	2.73
Syria	175	1.52
Turkey	45	0.28
Other	1	0.10
Total	594	4.83
Western Hemisphere		
Argentina	483	2.59
Bolivia	24	0.18
Brazil	252	1.75
Chile	41	0.76
Colombia	140	0.54
Gautemala	6	0.05
Mexico	2,734	48.30
Peru	198	0.84
Trinidad and Tobago	182	0.58
Other	1	0.01
Total	4,061	55.60

Note: Excludes China and the Soviet bloc countries.
Source: Oil and Gas Journal, December 27, 1982, pp. 78–79.

value from an exploration investment, but also discourage additional production from higher cost fields when they are discovered. Graduated royalties have a similar effect on the efficiency of production.

Do existing agreements give too much to the government?

This question must be answered first of all in terms of the objectives of the host government and the stage of exploration and development of a country's petroleum resources.

Although several factors affect the attractiveness of a country for exploration by foreign companies, including contract provisions not directly related to the sharing of net revenues, there are a number of times when international petroleum companies have shown increased interest following a liberalization of contract terms. It is true that the announcement of significant oil discoveries is powerful bait for attracting petroleum companies, but a combination of few or no discoveries and harsh contract terms elicits little interest in exploration.

Not only is it possible for a government to increase its share of rents from new contracts negotiated after discoveries have been made and interest in exploration has increased, but it is possible, based on geologic knowledge of the area, to structure contracts to establish different terms for individual areas with differing degrees of risk. If no reserves have been proved in certain areas, contracts might be shaped with a view to stimulating maximum interest in exploration, say, in high-risk–high-cost offshore areas, or in jungle areas such as the Amazon and eastern Peru.

The role of goverment oil enterprises

Government oil enterprises are almost universal in developing countries with petroleum production, and their activities include exploration, production and refining, and negotiating contracts with domestic and foreign companies. In many producing countries—including Argentina, Brazil, and India—these produce most of the country's oil and are responsible for most exploration. Although the exploration and production activities of the government enterprises should be continued, governments also should encourage foreign investment to maximize the exploration and development of the country's petroleum reserves, just as they should utilize foreign investment for economic development in all productive sectors of the economy.

Of particular importance in a national hydrocarbons program is the creation of a market and transportation for natural gas, which substitutes for petroleum in many uses and can be exported in the form of liquefied natural gas. Since, in many cases, exploratory wells yield gas rather than oil, the possibility of marketing gas at a profitable price is an important factor in attracting petroleum companies and will affect the expected internal rate of return from an investment. This should be an important function of the government oil enterprises.

Government oil enterprises should supplement their own activities by utilizing the technical and financial resources of foreign petroleum companies, and foreign companies are the most important conduit for the transfer of such resources. The external debt crisis experienced by many less-developed countries in 1982–83 has limited the capacity of some government oil enterprises to maintain or expand their exploration and development activities.[2] The efficiency of a government oil enterprise should be judged on the basis of its success in mobilizing external resources for the country's national petroleum and gas programs rather than its own performance in exploration and development.

U.S. government policies and foreign petroleum investment

The single most important U.S. government policy affecting the investment of U.S. petroleum firms in developing countries is tax policy, particularly that relating to crediting taxes paid to foreign governments against U.S. tax liabilities. U.S. tax policy has been substantially tightened since 1977 in terms of the method of calculating taxable income from foreign sources and eligibility for crediting foreign taxes against U.S. tax obligations. The alleged position of the Internal Revenue Service (IRS) is "neutrality" in the sense of neither encouraging nor discouraging U.S. foreign investment by means of the tax system.

A more relevant issue is whether U.S. tax policy should favor U.S. petroleum investment in all or selected non-OPEC, less-developed countries, or even in certain OPEC developing countries outside the Middle East, for example, Indonesia and Ecuador. Tax discrimination in favor of foreign investment not only involves a measure of discrimination against domestic investment, but is in effect a form of tax subsidy that can be justified only in terms of the expected social benefits.

[2] Press reports indicate financial constraints on government oil enterprises in Argentina and Brazil. See *Petroleum Economist,* May 1983, p. 185; and *Oil and Gas Journal,* March 7, 1983, p. 32.

There are changes in IRS regulations within the framework of existing tax law that could remove obstacles to foreign tax creditability arising from the nature of foreign tax laws without compromising the principle of tax neutrality or of providing a tax subsidy. For example, U.S. petroleum companies might be permitted to elect the per country tax limitation for deducting losses against U.S. tax liabilities. This avenue should certainly be sympathetically explored as a means of promoting U.S. petroleum investments in countries where the issue has arisen, such as Guatemala.

The other way in which the U.S. government promotes foreign petroleum investment has to do with Overseas Private Investment Corporation (OPIC) investment guarantees. The practice of insuring high-risk investments by providing compensation limited to the actual unrecovered value of the investment has great limitations as an inducement to such investment. However, there are types of petroleum investment for which OPIC insurance has been attractive and presumably this has a positive influence on investment decisions. OPIC should be given flexibility for shaping insurance programs that will induce petroleum investment in non-OPEC, less-developed countries.

The role of international assistance institutions

The UN has recognized the need for increased exploration in the oil-importing developing countries, but the approach of the UN General Assembly has been to pass resolutions proposing the transfer of large amounts of financial and technical assistance to Third World countries supporting state petroleum enterprises. These resolutions have encouraged an ideological bias against foreign investment in mineral resources by referring to several UN resolutions relating to the sovereignty of Third World countries over their natural resources. This is nonsense. In virtually all Third World countries, the minerals in the subsoil belong to the state, and the governments exercise full control over the exploitation of these resources.

Somehow sovereignty over natural resources has been equated with socialism, that is, the exploitation of resources by state enterprises. It is not surprising that most industrial countries have not been willing to contribute large sums to international agencies for financing investments that could be undertaken by international petroleum companies with large financial resources, including the partially or wholly government-owned petroleum enterprises of Britain, France, and Italy! Moreover, most investments by interna-

tional petroleum companies in the Third World are made in the form of contracts with state petroleum enterprises that provide the latter with ownership of the petroleum and facilities for production and a substantial measure of control over operations.

The World Bank group has made a number of loans for petroleum exploration and development. The World Bank group can play a useful role in promoting petroleum development in two ways: (1) by providing financial and technical assistance to poor countries for geological mapping, limited seismic exploration, evaluating petroleum prospects, and formulating exploration strategies; and (2) by serving as a catalyst for attracting foreign and domestic equity and loan capital for high-risk exploration and development.

encouraged to play a major role in promoting the negotiation of contracts for petroleum exploration and development. The presence of the IFC could be an important factor in safeguarding petroleum companies against serious contract violations or expropriations.

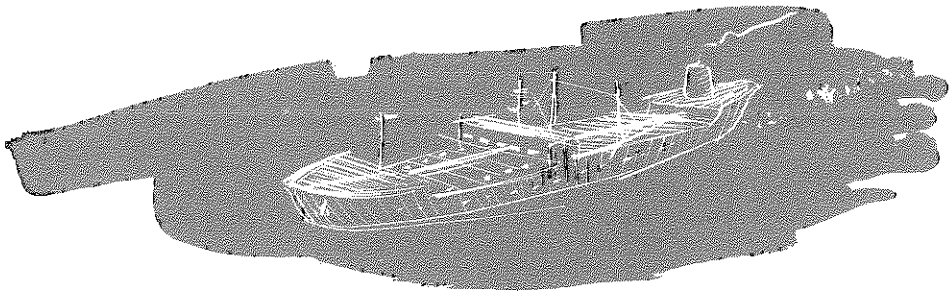
Implications of recent events

Recent events have indicated that non-OPEC, less-developed countries should make greater efforts to attract foreign investment in their petroleum sectors:

- The world price of oil declined in 1982–83 by 15 to 20 percent below the 1981 level, and world oil supplies became more abundant.
- Expectations of a continuous rise in oil prices over the next decade or so have changed substantially so that investors are less confident that, if they make a petroleum investment today, real oil prices will be significantly higher five or ten years hence when the projects come on-stream.
- Exploration budgets of major international petroleum companies have declined as a result of reduced cash flow, and there has been a decrease in their exploration and development expenditures and commitments to the oil-importing developing countries. This means that only the more promising prospects are being considered for investment and companies are unwilling to make large commitments in the form of bonus payments and minimum exploration expenditures for high-risk ventures.
- The 1982–83 debt crisis in many oil-importing countries—including Argentina, Brazil, Chile, Colombia, the Philippines, and Turkey—has affected the need for foreign investment in the petroleum sector.

The bulk of the financing for exploration and development by the government oil enterprises has come directly or indirectly from external sources, and the debt crisis has meant a sharp cutback in net foreign borrowing for many. The lending capacity of the World Bank has been strained by the extraordinary demands of its members for assistance in dealing with structural balance-of-payments problems, and a high level of loans for petroleum exploration and development cannot be expected from this source. This suggests that in the case of those oil-importing developing countries whose government oil enterprises have been responsible for the bulk of the exploration and development activity in the past, there must be a greater reliance on foreign investment if these activities are to be maintained or expanded.

The recent decline in the world dollar price of oil has benefited these countries, but this does not reduce their need to find and develop their petroleum resources. Between 1980 and 1983 the dollar appreciated in terms of other major currencies by about the same percentage as the decline in the dollar oil price, and dollar prices of exports of the oil-importing developing countries declined sharply between 1980 and mid-1982.[3] Moreover, despite the decline in dollar oil prices, the oil deficits of these countries are projected to rise over the next decade.

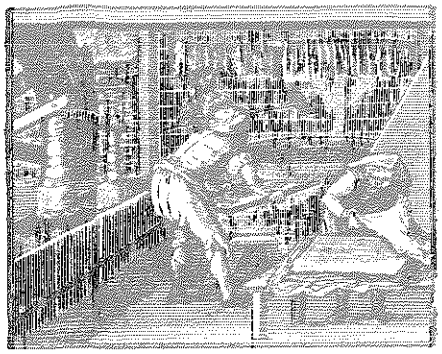


In view of the limited resources of the World Bank and of regional international financial institutions such as the Inter-American Development Bank, it is questionable whether these institutions should be making large loans to state enterprises for their direct operations unless it can be shown that financing for petroleum exploration and development is not available from private international sources. There may be a few cases where this is true, but international petroleum companies deny that they are unwilling to make risk investments in Third World countries, even where there is little prospect of producing more than enough oil to satisfy the domestic market for the foreseeable future.

The catalytic function can be exercised by loan and equity investments which constitute only a small portion of the total investment, but which serve to provide a "presence" of the World Bank group in a contract. Since the International Finance Corporation (IFC) is empowered to make equity investments and has considerable experience in structuring joint private-state ventures, the IFC should be

Author Raymond F. Mikesell is W. E. Miner professor of economics at the University of Oregon. This article is based on his most recent book, Petroleum Company Operations and Agreements in the Developing Countries, *which was published by Resources for the Future in May of this year.*

[3] International Monetary Fund, *International Financial Statistics* (Washington, D.C., June 1982) p. 56.



Book reviews

The National Park Service, William C. Everhart(Boulder, Colo., Westview Press, 1983). 198 pp. $22.50, cloth; $10.95, paper.

The Park Service revisited

This book is a clear description, chattingly and charmingly written, of the National Park Service, including its history, by a man with a long and deep commitment to national parks and to the National Park Service.

This is really a second edition of a book published in 1972, with the same title and the same author, but a different publisher. It is only on the very last page that the publisher makes this clear; the foreword written by the present director of the National Park Service incidentally provides the same information. But nowhere does the author or the publisher discuss the relation of this book to its predecessor: how this differs and why—aside from eleven more years of history—from the earlier book; nor why this book is published by a different publisher than the first one. The two books are similar in content and organization, but differ in more than the account of the recent history. The first book was one of the Praeger series on federal agencies and hence had more discussion of the relationship of the Park Service to other federal agencies and other branches of government, including the Congress, than does this recent book.

This new book includes many incidents and anecdotes about the National Park Service which add greatly to the reader's understanding of the character and dedication of National Park Service employees. Everhart does not hesitate to express himself pungently in a way that he would not have chosen had he still been employed by the Service. For instance, on page 3 he says, "Since Carver's outburst was rated on a par with so many of his peevish pronouncements, the mystique was in no danger." Carver, it should be added, for those unfamiliar with Department of the Interior history, was assistant secretary of the department when he made the statements Everhart describes. On page 153, he quotes Horace Albright, the guru of the national park movement, as saying about the newly appointed politically oriented director of the Service (Ronald Walker): "It's impossible not to like the boy but we simply must return the office to the merit system." And elsewhere he tells about Service employees enjoying a good drink of bourbon whiskey—which no doubt they did, but the agency would not have advertised that fact.

Everhart repeatedly, and in my judgment accurately and perceptively, describes the persistent problem of the National Park Service, evident from its earliest beginnings and exacerbated with increased public demands on the parks in recent years: how to preserve the wonders of nature from despoliation while at the same time promoting their mass use by the general public. Everhart discusses openly and, I assume, frankly some parts of the history of the Service which he makes clear he wishes did not exist. For instance, chapter 10 is directed at the politicizing of the Park Service—five directors in eight years, some with no evident qualifications aside from their loyalty to a president who himself would soon be forced to resign. But his discussion of the addition of the urban national parks is, in my opinion, much less forthcoming as to the problems it has created for the agency. He does a good job of describing the pork-barrel politics that have increasingly determined congressional intervention and congressional designation of new park units, many of which would not meet the standards that were once applied to national parks.

This book will be most useful to those who know that national parks exist but know little more, would like to know more, but are unwilling to strain their mental facilities with detailed and incisive analysis. The writing style is clear and straightforward; though Everhart makes no secret of his devotion to the national parks and his admiration for the National Park Service, he is never mushy in his enthusiasms. The book has striking photographs, similar in some ways to those in the first edition, but all different too. I doubt that I shall live to see a book about parks, whether national or local parks, by an admirer and lover which does not include pictures. One picture may be worth a thousand words; I would add, especially when your account is weak.

The reader who wants a more detailed and penetrating analysis of the earlier history of the national parks will find far more rewarding materials in John Ise, *Our National Park Policy: A Critical History* (Johns Hopkins University Press for Resources for the Future, 1961). Those who want a more detailed and analytical treatment of the policy and political problems of the parks and the Service will find much more in Ronald Foresta's *America's National Parks and Their Keepers* (Resources for the Future, 1984). But for many readers, Everhart's book is not only excellent but just the level of analysis they seek.

Reviewer Marion Clawson is senior fellow emeritus at Resources for the Future. His most recent book, The Federal Lands Revisited, *was published by RFF in 1983.*

Western Public Lands: The Management of Natural Resources in a Time of Declining Federalism, John G. Francis and Richard Ganzel, eds. (Totowa, N.J., Rowman & Allanheld, 1984). $34.50, cloth.

The post-Watt West

Before their deserved disappearance, James Watt and the Sagebrush Rebellion did the country a genuine service. They refocused attention on a permanent issue of national development: the use and possible disposal of the vast federal public lands of the American West, rural holdings that comprise 30 percent of the entire United States. The lands—the core of the remnant frontier, the seat of America's cowboy soul—contain prodigious amounts of resources whose consumption poses serious environmental and regulatory difficulties. Watt unsuccessfully tried to sell many of the holdings. In *Western Public Lands,* Francis and Ganzel have produced a useful, though mildly contrived, collection that offers a helpful perspective on the true future of these lands.

The editors—political scientists at the University of Utah and Nevada, respectively—argue that the lands are best understood intergovernmentally, as a joint concern of the federal government that owns (and leases and occasionally sells) them and the states and localities where they are located. The contributors—political scientists, economists, lawyers, and government officials, mostly from western states—provide a diverse collection of essays supporting the editors' contention that the states are increasingly and beneficially asserting themselves in deci-

sions that previously were entirely federal. Most of the contributors seem willing to support a few well-chosen sales. But it is refreshing that they lack the boring conservative idealism that stands for the unprincipled application of free market economics to every acre of the public lands.

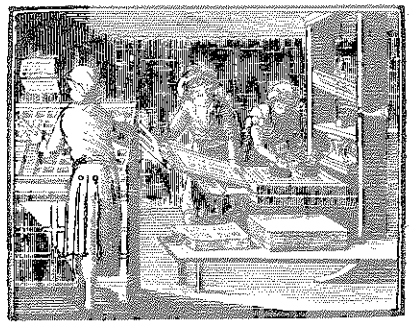
The editors sometimes try to impose equally tedious (but less intellectually rigorous) abstractions from political science—such as areal decision making, various bogus development scenarios, and models of federalism based on different kinds of cake (honest!). The stronger contributions resist this vapidity and still tackle big questions. To my mind, the best of the fourteen pieces were those by Robert Nelson on economic analysis in public rangeland management ("Since each profession professes to have the objective truth, the disputes between economists and range or forestry scientists sometimes look a little like a religious war"); Sally Fairfax on the Interior Department's Bureau of Land Management as an "unconvincing Goliath" ("The [1980] Alaska land settlement, in which over 100 million acres of 'national interest' lands were identified for special management, was such an enormous defeat for the Bureau that many people failed to see the BLM as a contender"); and Christopher Leman on the failure of Watt's sell-it-off initiatives ("Virtually no support emerged beyond the advocacy of a group of committed intellectuals").

Other essays of comparable penetration deal with particular western natural resources. I liked Walter Rosenbaum on nuclear waste disposal ("One problem in interpreting institutional solutions to the waste managment issue is understanding the extent to which the covert purpose is to abet the desire of many state leaders to avoid the responsibility for waste determinations they profess to want"); Henry Caulfield, Jr., on water policy ("Water resource development can no longer be cited as the key national public means of encouraging general economic development"); and James Lopach on the 1981 Supreme Court decision upholding the Montana coal severance tax ("Energy-consuming states are attacking energy-producing states, not just coal states, with theories of federalism as the most convenient weapons of battle").

The book has its flaws. The contributors are not identified beyond their names. At least two, perhaps five, of the pieces ignore the West as a region and the public lands as an issue. They are competent pieces but have no business being in the book and also make it too long (312 very closely printed pages). And if, as the editors maintain, the western states are playing a growing role in managing federal public lands, it would have been illuminating to see a piece on the state governments' management of their own large public and holdings. (At least one-tenth of Alaska, Arizona, and New Mexico is state land.)

On balance, this book is the literary equivalent of another frequent western natural resource, the chicken-fried steak—it is rich and rewarding, but a bit heavy; the cooks put in too many ingredients. The happiest eater will partake selectively and skip the side dishes. As with the steak, the book is not necessarily for the beginning westerner—in this case, the lower level student or general reader just learning about the public lands for the first time. However, it will benefit the veteran westerner—knowledgeable academics, say, or government officials. It is a highly sophisticated examination of the prospects for the land most prevalent in America's most interesting province.

Reviewer Frank J. Popper, a former Gilbert F. White Fellow in RFF's Renewable Resources Division, teaches in the School of Urban and Regional Policy at Rutgers University.



Trampling the federal lands

Sacred Cows at the Public Trough, Denzel and Nancy Ferguson (Bend, Oreg., Maverick Publications, 1983). 250 pp. $8.95, paper.

The thesis of this angry book is that major, even catastrophic ecological damage has been inflicted on the public lands of the West by the livestock (mainly cattle) industry. According to the Fergusons, the federal government has allowed massive overgrazing on fragile deserts and grasslands. These abuses have not only drastically reduced the agricultural productivity of the land, they have also impaired or destroyed habitat important to the survival of native wildlife and caused serious damage to water resources. Moreover, they benefit only 35,000 ranchers, who acccount for only 2 percent of U.S. beef production.

The book's main strength is the authors' clear and convincing explanations of the wide variety of mechanisms by which grazing activities alter the environment. Some of these mechanisms are far from obvious. For example, overuse of riparian habitats has caused gross stream bank erosion, turning hundreds of miles of high-quality fishing streams into wide, shallow ditches no longer capable of supporting trout or other game fish.

The authors are particularly effective in detailing the damage caused by the range management activities of the Bureau of Land Management, including fencing, pesticide use, predator control, and reseeding (often with exotic vegetation). Not only are these activities often environmentally unsound, but their provision amounts to a startlingly large and economically inefficient subsidy for the favored class of ranchers. The damage, the authors claim, extends even to some areas ostensibly given over to preservation, such as wilderness areas and wildlife refuges, where grazing is increasingly permitted.

What the Fergusons do not do very well is give the reader a sense of the overall scope of the problem. The book would be more useful if it offered a summary of how much range has been damaged, by how much, where the worst damage has occurred, and the extent to which it is reversible.

The book's effectiveness is also limited by a lack of references (there is a bibliography but no citations) and the authors' utter lack of objectivity. Their hostility toward ranchers and ranching is almost palpable. This animus is understandable; in the preface the authors report that they suffered physical harassment and even death threats while their research was in progress. The hostility is apparent in the self-righteous tone that pervades the book. In the Fergusons' view, virtually all the problems of public land management are due to greedy ranchers and feckless bureaucrats. Surely reality is more complicated than that. This point of view also leads to a certain selectivity in reporting, as evidenced by the frequent use of such misleading rhetorical tricks as the "as much as" construction and its variants.

Nonetheless, as someone once said, we don't necessarily require balanced books, just balanced libraries. This book is worth reading because its critique of public lands management is so vivid that it may prompt the reader to delve further into this important public policy issue.

Reviewer Winston Harrington is a fellow in RFF's Quality of the Environment Division and author of The Regulatory Approach to Air Quality Management: A Case Study of New Mexico.

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