The National Forests

A great national asset is poorly managed and unproductive.

Marion Clawson

The national forests of the United States are a great national asset, include 8 percent of the national land area, have a value estimated at $42 billion, and in recent years produce cash revenues of $400 million to $500 million annually. Their output and use affect everyone in the United States, directly or indirectly (*1*).

The national forests are owned by the people of the United States and are managed by the federal government, more explicitly, by the Forest Service. The forests are managed on multiple use principles, with due regard for outputs of timber, outdoor recreation, wilderness, wildlife, and water (*2*). They are used by private individuals and companies. Other extensive forests in the United States are owned by the federal government and managed by other agencies, by state and local governments, by forest industry firms, or by an ownership class usually labeled "other" because it includes a great variety of owners. The national forests include 18 percent of the commercial forest land of the country but now include slightly more than half of the standing softwood timber, and a smaller proportion of the hardwood timber (*3*).

The national forests are located largely in the West because they were established by the reservation of public domain for permanent public ownership. By 1891 when such reservations began, most of the suitable public domain was in the West (*4*). However, under legislation passed in 1911, considerable acreage was purchased from private landowners, primarily in the South, the Northern Lake States, and the East. Half of the national forests are classed as commerical forests; the rest of their area is above timberline, is covered with shrubs and grasses, or has forests too sparse to be considered "commercial." The commercial stands of the national forests are primarily softwood species and much of the timber is old growth, or "virgin" (*5*). Such stands typically show little net growth annually and cannot be made to grow much more wood until the old stand has been harvested and replaced by new, more economical, faster-growing stands. Some of the most difficult problems of forest management involve this conversion of old growth to younger stands. There exists a good deal of popular confusion about the use of virgin timber stands. While the cutting of timber cannot indefinitely exceed annual growth because timber inventory would eventually be exhausted, neither can growth indefinitely exceed cutting because fully mature, uncut stands show little or no growth. Any cutting of old growth means cutting more timber than is growing until the annual net growth on the previously cut areas equals the volume cut annually from the old growth stands.

National forests, like all other forests, differ substantially in site productivity, often within rather short distances (*1*, *6*). The average per acre growth potential of the national forests (for fully stocked natural stands not subject to intensive management) is slightly below the average for all forests and considerably below the average of forest industry forests. However, these differences are much less if the Site Class V lands, which are of dubious value in their timber growing potentialities, are omitted. The actual amount of timber growth on national forest land is low, both in volume of wood per acre annually and in relation to potential growth, primarily because the virgin stands are growing slowly or not at all (Table 1). In 1970, actual net growth of wood on national forest lands was only 39 percent of potential growth for fully stocked but not intensively managed natural stands, while in the forest industry forests net growth was 59 percent of the potential.

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Past Trends in National Forest Use

Over the past 40 years, the use of every kind of forest output from the national forests increased by varying but substantial amounts (Table 2) (*7–9*). This comparison omits grazing on national forest land, much of which occurs on noncommercial forest areas, and mineral production. Since the use of each output of commercial forest lands increased, the sum usage of all outputs also increased. This conclusion is possible without calculating an index of combined output. Although each of the various uses of the national forests may, and sometimes does, impinge adversely on other uses at particular times and places, all uses have increased in the long run.

The increased harvest of timber from national forests was accompanied by major increases in the price of "stumpage" or standing trees. Whereas the annual average price of all timber sales from national forests varied only between $2 and $3 per 1000 board feet from 1924 to 1942, by 1972 the average price had risen to nearly $40, while prime logs in good locations were two to five times higher in price. This rise in average prices understates the extent of the increase in price for logs of the same quality in comparable locations, because the recent price includes logs of a quality or location (or both) which would have been valueless at one time. The other outputs of the national forests are free or negligible in price.

Potential Output from National Forests

The output of every kind of good and service from national forests could be increased (Table 3). In considering potential, at least two questions arise: (i) whether the potential is purely biological or whether it is also economic; and (ii) whether the potential for each kind of output should be considered separately, without regard for competing outputs, or whether all outputs should be considered at the same time. Table 3 shows a combination of the extremes of these considerations; that is, biological output of each good and service managed for its maximum output with other outputs in a subordinate but often significant role; and an economically defensible output with the use of each kind of good or service adjusted to the demands for the other services. While these estimates are approximate, they demonstrate the potential for substantially increased output of each major kind of good or service.

The second type of potential output

(economic) in Table 3 could be achieved only by the application of new technology and usually only by greater investment of capital or greater expenditures for current operation or both. For wood, this would include (i) prompt planting with improved species in order to achieve a good new stand within a year instead of a hit-or-miss stand from natural reseeding in an average period of 7 years; (ii) planting at the optimum spacing to take full advantage of the sun, water, and fertility of the site; (iii) periodic thinnings as the stand grew in order to harvest and use wood which would otherwise rot in the forest; (iv) fertilization at appropriate times; and (v) complete harvest when the trees reach economic maturity. For other outputs, roughly similar intensification measures would be needed. Even wilderness areas could be managed intensively to provide more trails at appropriate locations, to space out visitor parties to avoid conflicts, and to otherwise allow more users in a given wilderness area without loss of quality in the wilderness experience.

In the 1920's there was much unused potential output from the national forests. While this fact was realized at the time by Forest Service managers, the extent of that unused potential is more readily apparent now than it was then. Given today's technology, there still exists much unused potential output from the national forests. The unused potential now is not as great in percentage terms as it was in the 1920's, but is greater in absolute amounts. Forty years from now our descendants may have achieved increased output in ways that are not now apparent. The best trade-offs between one kind of output and another and the optimum intensity of production are complex and detailed questions beyond the scope of this article.

Economics of National Forest Management

The national forests are big business in the modern American sense of that term. Had they been an industrial enterprise, their cash income alone would have ranked them about halfway up on *Fortune*'s list of the 500 largest industrial firms in the United States during each of the past 20 years or more, and their total income and total assets would have ranked them still higher. Yet they have never been studied and analyzed as business enterprises, a failure which has serious consequences for their management for social purposes.

The national forests, as public enterprises, are not managed for profit in the way private business is. However, costs, output, and efficiency are no less important for public than for private enterprises. Economizing, the use of scarce resources and productive factors to produce desired outputs (whether sold for cash or not), is as applicable to public as to private enterprises. Wilderness, recreation, wildlife, water, and some other outputs of national forests are available to the public free or at prices substantially below their economic value, but this is also true for the same outputs of privately owned forests. The problem of securing a direct financial return comparable with the economic value of these outputs is a persistent and nearly ubiquitous one in forestry.

Table 1. Growth of sawtimber in board feet per acre of commercial forest, national forests and timber industry forests, 1970 (*1*).

Growth	National forests	Forest industry forests
Gross	176	220
Mortality loss	68	35
Net	107	185

A financial balance sheet can be constructed for the national forests (Table 4). This is a simplified version of a typical business balance sheet, constructed from the best data available (but data which were never intended for this purpose). Several aspects of this balance sheet are worthy of particular attention. First, cash receipts are less than half of the total income. Second, cash receipts nearly equal cash expenditures. Third, capital charges that are reasonable in comparison with the immense value of the national forests dominate the cost side of the balance sheet. If the facts are interpreted on this basis, the national forests incurred a deficit of nearly $2 billion in total or about $9 per capita of the whole population. Since the deficit is a bookkeeping one, another and perhaps more reasonable way of describing the overall result is to say that national forests earned less than 0.5 percent on their investment, even when all noncash outputs are valued generously.

The regional pattern of national forest expenditures is economically unsound. During the 5 years 1970–74 there was only a limited relation between cash expenditures for management purposes and cash receipts, by national forest regions (Fig. 1). It seems to cost $20 million to $30 million to manage a national forest region even when cash receipts are very low, and expenditures do not rise in proportion to revenues. The situation is more extreme for cash investment expenditures (Fig. 2). There is very little relation between the amount of cash receipts and the amount of cash investments.

If all outputs and costs, including capital charges, were calculated at their full mar-

Table 2. Average annual harvest of timber and wildlife and use of recreational opportunity, and water from national forests, 1925–29 and 1968–72.

Item	Annual average		1968–72 as multiple of 1925–29
	1925–29*	1968–72†	
Timber cut	1.35‡	11.54‡	8.6
Wildlife	216§	582§	2.7
Recreation visits	6.3‖	188¶	30
Water#			Probably 2.0

*Data from (*8*). †Data from (*9*). ‡Amount given in billions of board feet. §Thousand big game killed by hunters. ‖Million recreation visits. ¶Million visitor days, 1973. #No data are available on use of water flowing off national forests. With the volume of public and private dam building, use in the latter period can hardly be less than double the former, even if total streamflow is unchanged.

Table 3. Current and potential outputs of national forests. Potential output is given on a biological basis with each use considered dominant, other uses subordinate, and no concern for economic efficiency, and on an economic basis with each use adjusted to other uses.

Kind of output	Present output*	Potential output†	
		Biological basis	Economic basis
Wood grown annually (billion cubic feet)	2.6	10.5	6 to 7
Wilderness area‡ (million acres)	11.6	55	40
Outdoor recreation (million visitor days)	188	1000	400
Water yield (volume)	Not measured	25 percent more	10 percent more
Wildlife, all kinds	Not measured	Many more	Slightly more

*1970 for wood, some more recent year or average of years for others. †My estimates, see text for basis. ‡Formally designated wilderness areas, excluding de facto wilderness. Assumes no major relaxation in definition of wilderness with regard to size of tracts or degree of nonwilderness use tolerated.

ket value, the old test of marginal value equaling marginal cost would be applicable in the management of national forests, whose great size makes them a major factor in all markets for their outputs. In the absence of the necessary data for such a comprehensive analysis, a comparison of cash receipts and cash expenditures by regions may serve as a reasonable indicator of the relation between value and cost.

The unsound regional pattern of national forest expenditures extends to timber management (Fig. 3). Expenditures for timber management, reforestation, and timber stand improvement are higher per 1000 board feet in regions where values per 1000 board feet of the timber sold are low than where they are high. The situation was more marked in 1972 when stumpage values were comparatively low than in 1973 when the sale price of stumpage was high. In some regions costs equal or exceed values of timber sold. These costs do not include general administrative costs, fire fighting, insect and disease control, and some other national forest expenditures, some parts of which are properly chargeable to timber management. If these other costs could have been included in the analysis, the picture would have been worse.

A comparison of cash expenditures for all purposes with all cash receipts by individual national forests reveals a similar lack of rationale (Fig. 4). It seems to cost $1 million to $3.5 million to manage a national forest, regardless of the amount of cash receipts, whereas relatively little more is spent in the management of those national forests with large cash receipts. An analysis of typical forests in the Southwest, where timber values are comparatively low, shows that as much or more is spent per acre as in the Pacific Northwest where timber values are very high.

A complete accounting of the economic value of all national forest outputs, including those provided essentially without charge to their users, would change the income situation of all regions and forests. However, a complete accounting of all costs, including reasonable capital charges for the large amounts of capital tied up in the national forests, would also change our view of the cost situation of all regions and forests. It is by no means clear that the relative relation of costs and income would be changed thereby. The regions with high timber values, such as California, are also regions of high watershed, recreation, and wilderness values.

The data in Figs. 1–4 do not relate explicitly to expenditures by productivity classifications of sites in the national forests. Given the difficulty of allocating expenditures by specific locations, such data would be hard to obtain in any case. However, all the indications are that too much money is spent in management of low productivity sites and too little on high productivity sites. The pattern of expenditures by regions and by forests and the general disregard of economic considerations that underlie this pattern strongly suggest that allocations by productivity site class are also uneconomic. These statements about site class apply equally well whether one considers only timber production or whether one also considers wilderness, recreation, wildlife, and water, although the site specifications would differ for each.

The national forests are wasteful in their use of capital. Forestry always involves heavy use of capital, for land, for standing timber, for roads and other improvements, and for other purposes. The capital in standing timber is peculiar in the sense that the same tree is called capital if allowed to stand for further production but is called output when cut. If the national forests are judged by the standard of forest industry forests or by the standards of economically optimum rotations for which Forest Service research has provided the necessary basic data, there is at present $12 billion in excess timber inventory on national forests (*10*). The mature forests, where net growth is low, sometimes even negative, and where rot takes a large annual toll, are examples of extremely large amounts of nearly idle capital. At modest interest rates, a $12 billion excess inventory in standing timber means an annual cost of $600 million in total or about $3 per capita of population. One can readily imagine the reaction if every citizen of the United States was asked to contribute $3 annually toward the maintenance of an excess inventory of old trees

Table 4. Financial statement for national forests, circa 1974.

Account item	Total national forest system (million $)	Per acre of		
		Entire acreage ($)	Commercial forest acreage	
			Classes I–V ($)	Classes I–IV ($)
Capital structure:				
Value of standing timber*	20,000	107	217	324
Value of forest land†	20,000	107	217	324
Undepreciated value of man-made improvements‡	2,000	11	22	32
Total assets	42,000	225	456	680
Cash investment§	196	1.05	2.13	3.08
Investment in kind‖	120	0.64	1.30	1.94
Value of increased timber inventory, 1970 volume, 1974 prices¶	42	0.22	0.46	0.68
Income:				
In cash#	486	2.60	5.28	7.88
In kind**	220	1.18	2.39	3.56
Additional value of products and services provided at less than full market prices††	490	2.62	5.32	7.93
Total annual output‡‡	1,238	6.63	13.45	20.05
Expenditures:				
In cash, all purposes	488	2.62	5.31	7.91
In kind§§	220	1.18	2.39	3.56
Depreciation of man-made assets, 10 percent	200	1.07	2.17	3.24
Payments to states and counties	79	0.42	0.86	1.28
Interest on all assets, 5 percent	2,100	11.23	22.80	34.00
Total	3,087	16.51	33.53	49.99
Net annual income, cash and noncash	(1,849)	(9.87)	(20.08)	(29.94)

*A 1970 inventory of 1021 billion board feet of sawtimber on national forests is given in (*1*). On the basis of $40 per 1000 board feet, which is an approximate recent average for timber sold from national forests, the value of the standing sawtimber (ignoring values for growing stock of less than sawtimber size) would be slightly in excess of $40 billion. This value has been cut in half to reflect a reasonably early (10 to 20 year) liquidation value. †Excludes timber values; averages about $110 per acre for all national forest land; also assumes reasonably early liquidation value. ‡Clawson (*8*, p. 54) reports $1160 million in 1963; estimated to have risen to $2000 million by 1974. §Data from Forest Service; roads, trails, other construction, and purchase of land (*14*). ‖Road building allowance in timber sales contracts; 12 billion board feet, assumed $10 per 1000 board feet road building allowance in sale price. ¶In 1970 harvest slightly exceeded growth for softwood growing stock but growth exceeded harvest by about 450 million cubic feet for hardwood growing stock (*1*). Converted to board feet, this is 6 board feet per cubic foot; $80 per 1000 board feet for softwood, $30 per 1000 board feet for hardwood. #Includes receipts from mineral leases on national forest lands acquired by purchase from private owners; excludes them from national forest lands reserved from public domain. **All of road building allowance plus $100 million in working funds, cooperative agreements, and the like where the national forest user agrees or is required as a condition of timber harvest or other use to undertake certain restoration or other activities. ††Estimated on basis of 170 million recreation visits other than wilderness at an average value of $2 each, 10 million wilderness area visits at an average value of $10 each, and water supply at $50 million. Wildlife values assumed included in recreation and wilderness values. States may benefit from wildlife values, for instance in sale of hunting licenses. No allowance is made for the possibility that wood and forage are sold at less than a full value. ‡‡Increased timber inventory, cash and kind receipts, and values of products not sold for cash. §§These are the same items described in **; they appear both as income and as outlay.

that he might never see. This calculation of excess timber inventory has nothing to do with wilderness areas; even if they were to be reserved generously the excess timber issue would still remain.

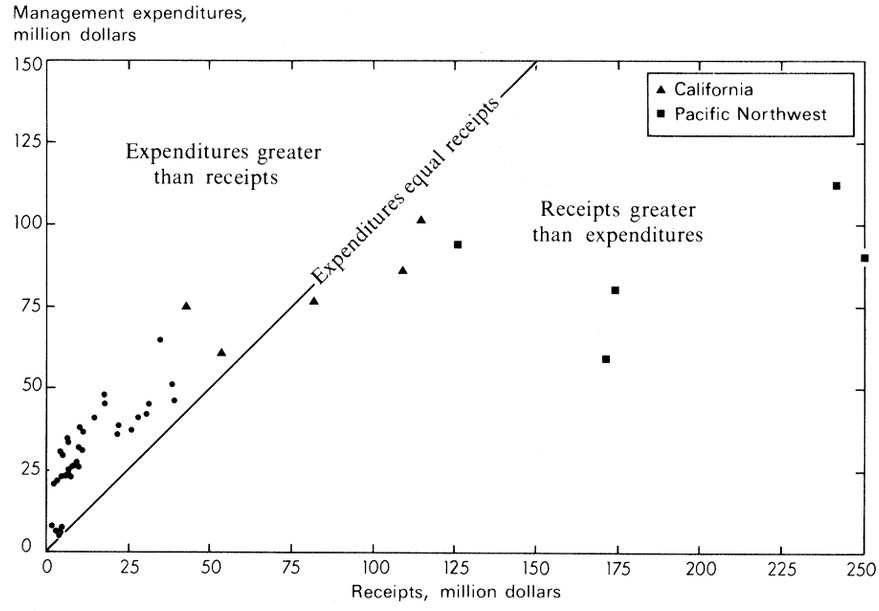
The data strongly suggest that the national forests are functionally inefficient also. In particular, expenditures for timber management are being made in regions, on forests, and on sites where timber values are so low that the areas should be abandoned for timber growing purposes. Other outputs of these forests may be worth managing, and existing stands of trees may be valuable for this purpose, but the growing of more timber is not economically sound.

Some forest practices are almost surely economically inefficient also. Substantial sums are spent in timber surveys, appraisals, and sales (*11*). The stumpage (standing trees) is sold to private buyers. Although there is sometimes active competition for the stumpage, sometimes there is not, and to prevent the stumpage from being bid in at unreasonably low prices, the Forest Service makes elaborate timber appraisals. Where there is active competition, the bid prices often greatly exceed the appraisals since a processor may be better off to pay more than the timber is worth than to risk having his mill inoperative for lack of logs. If standing timber were cut by independent contractors or employees paid by the Forest Service and the logs transported to a central log yard, graded, and auctioned off, more money could be realized from the logs and substantial savings in management costs could be achieved. Other Forest Service practices might also be questioned on grounds of economic efficiency—for example, it may not be economical to fight fires or to control insects everywhere they appear.

A careful analysis of the best available data on timber management expenditures by large forest industry firms suggests that the Forest Service has available for expenditure on timber management somewhat less money (perhaps a fourth less) per acre of commercial forest than these private firms spend (*12*). The overall amount of expenditures for timber management in national forests is not too high and may well be too low; the geographic distribution and functional and practical allocation is uneconomic. Unfortunately, similar comparisons for outputs of the national forests other than wood cannot be made on the basis of the available data.

In any economic evaluation of national forest management, the free or nearly free services of wilderness, recreation, wildlife, and water are mischief-makers. Their price, arbitrarily established at well below market value, encourages wasteful use in the following ways: (i) services priced as if they are free are treated as if they are valueless; (ii) the Forest Service and the various other decision-makers in the federal budgeting and appropriation process lack clear guides to rational amounts of expenditures; and (iii) some parties gain substantially while others gain not at all or lose—an income redistribution that is not explicit but nevertheless may be considerable. The use of the best available shadow prices would solve the second of these problems.

The capital used by the Forest Service is available without specific interest or other charge. The value of the timber and land in the national forests is very large and any reasonable interest rate results in an annual charge that dominates the whole cost side of the national forest business sheet. Yet no charge is made for this capital—in fact, only rarely is its existence acknowledged. The Forest Service operates as if this capital were free. Even the capital invested in roads, reforestation, and other improvements does not bear a specific annual charge. The Forest Service may have great difficulty getting appropriations for such investments, but the difficulty is political and not in economic accounting. Capital which seems to be free is an irresistible temptation to its wasteful use.



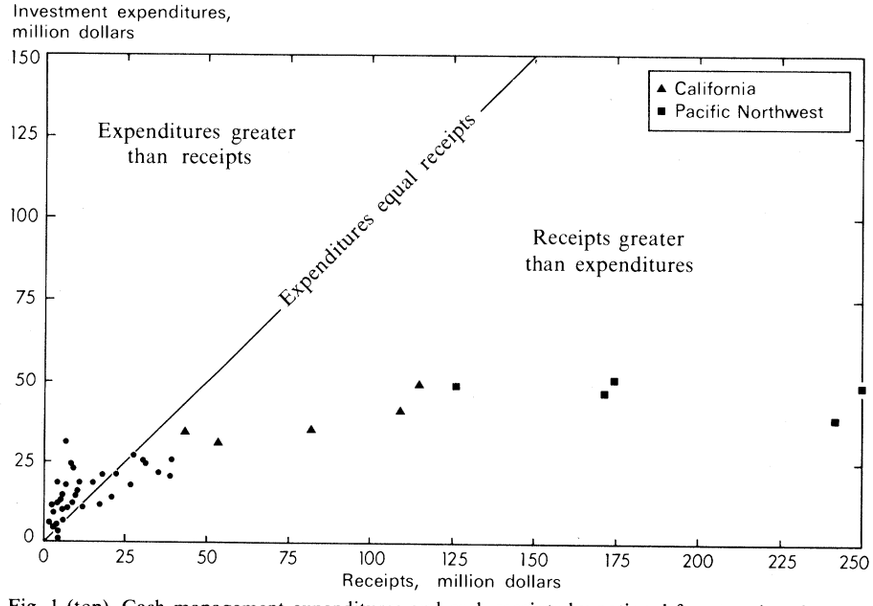


Fig. 1 (top). Cash management expenditures and cash receipts by national forest regions by year, fiscal 1970 to fiscal 1974. Fig. 2 (bottom). Cash investment expenditures and cash receipts by national forest regions by year, fiscal 1970 to fiscal 1974.

Why Are the National Forests So Economically Unproductive?

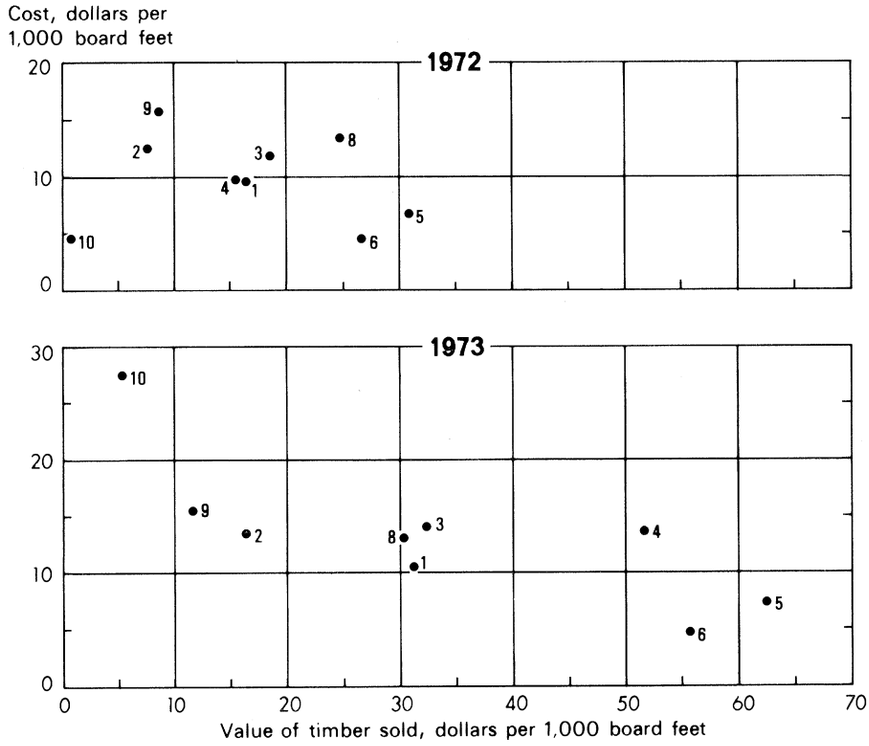
A number of factors, forces, and organizations are responsible for the economically unproductive management of the national forests. Each factor, force, or organization taken alone would be serious; their combination is, to an economist, disastrous.

Responsibility for the management of the national forests is seriously dispersed in the federal government. The Forest Service, the Secretary of Agriculture, the Office of Management and Budget, and the Congress each have a major role, and other units have lesser but sometimes significant roles. Each offers direct constraints on the others, and each may indirectly influence the perceptions of others with regard to the positions of various actors in the process. It is virtually impossible for an outsider to fix responsibility; one suspects that the actors are not always clear as to why decisions are made or not made. In particular, there has been a lack of a clear policy directive for the Forest Service in its on-the-ground management of the national forests. The Multiple Use–Sustained Yield Act of 1960 is vague in its directive, and its very vagueness may have been one reason it was acceptable to the various interest groups.

The free outputs from the national forests, such as wilderness, wildlife, and water, make rational economic planning very difficult. The free capital embodied in the national forests similarly distorts economic management. There has been a notable lack of economic tests for forest practices and management at all levels, from the specific site in the forest, to the ranger district, to the national forest, to the Forest Service region, to the national level. None of the actors in the management process, from forest ranger to President and congressman, have insisted on the careful weighing of costs and benefits which is the essence of economic management.

In any accountability for the results of national forest management, the attitude of professional foresters, or at least those in the public employ, must bear a substantial share of the result. Many foresters have ignored economics, and some have been strongly antieconomic in their philosophy. They have emphasized ecological considerations, multiple use, sustained yield, even flow, community stability, and other concepts which may have had meaning to them, and often were strongly, even emotionally held, yet had little precise meaning to others or in practice. An attitude that costs, benefits, and other economic considerations did not apply to public forests has somehow been common. In practice, multiple use has all too often meant a little of everything everywhere, including timber management on uneconomic sites.

The general public, the conservation organizations, and the information media must also accept some responsibility. Often the focus has been on some relatively small issue, such as a particular clear-cut or a particular potential wilderness area, while at the same time the possibilities of each interest group obtaining most or all of what it seeks by more intensive and skillful national forest management has gone unnoticed or unremarked.



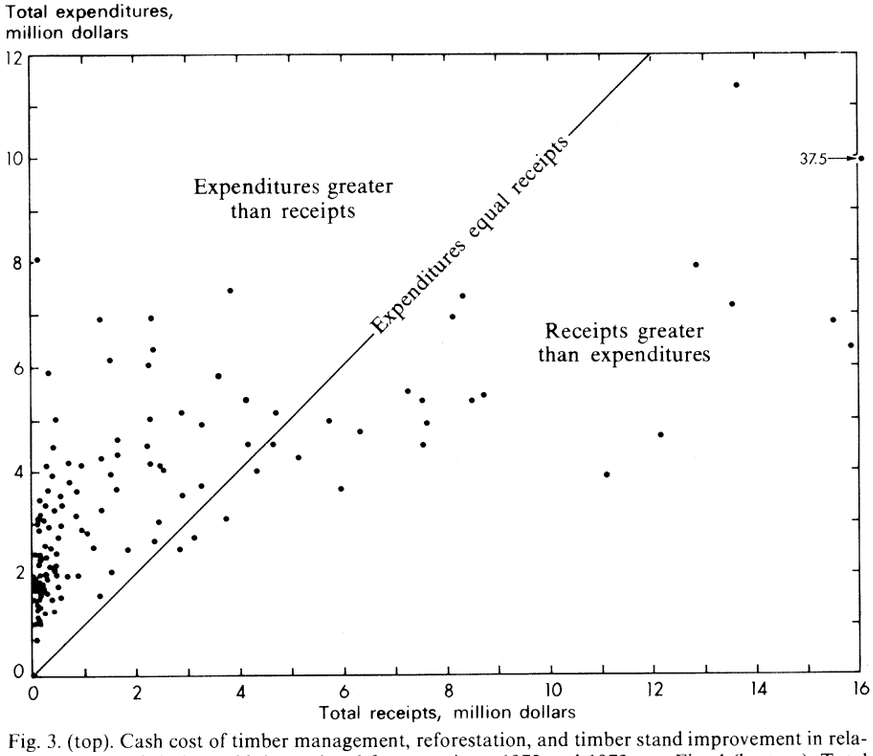


Fig. 3. (top). Cash cost of timber management, reforestation, and timber stand improvement in relation to value of timber sold, by national forest regions, 1972 and 1973. Fig. 4 (bottom). Total cash expenditures and total cash receipts by national forests, fiscal year 1972.

What to Do?

Several steps are necessary if there is to be a national commitment to make the national forests best serve the needs of all the American people. An uneconomic use of capital, an output of national forests significantly below their economic potential, management costs and practices that are not efficient, and other aspects of national forest management described in this article do not serve the American people well. Three major kinds of actions are necessary.

1) There must be an alert, intelligent, and continuous national leadership for good national forest management. In particular, a concerned President, some sympathetic but tough-minded senior staff at the Office of Management and Budget who will remain on the same job for several years, a secretariat in Agriculture that is responsive to national forest possibilities and willing to devote some energy to them, and a Congress which continuously demands answers to the pressing questions about costs and benefits and then backs up its decisions with adequate funds are all essential.

2) There must be new procedures and new analyses to test economic rationality, from small timber sale area to national decisions on expenditure and investment. There are problems in doing this without creating bureaucratic and procedural monstrosities that would defeat the purpose. Nonetheless, past and present methods of management, especially the economics thereof, are no more sacrosanct than are past methods of cutting trees with axes and saws and dragging logs from the woods with the use of horses. Imaginative innovation can surely create means to deal with the problems if there is a will to do so.

3) There must be a massive infusion of new blood into the Forest Service—at least a third of the national forest management staff should be recruited from sources outside the Forest Service. Promotion within the service has many virtues, but in the end the closed society it creates is unable to cope with new problems (*13*). Without enough new people to significantly modify the nature of the Forest Service, progress will be slow, halting, and uncertain. The need today is not for forestry expertise; the Forest Service has that, or knows where it can get it. The need is for new economic and social vision.

Summary

National forests are a valuable national asset. They produce important amounts of wood, recreation, wilderness, wildlife, and water, but good management could produce much more of each kind of output. The national forests are a major business enterprise, with $42 billion of assets and an annual cash revenue of $400 million to $500 million, but they have never been studied as business enterprises. The national forests are capital-intensive, but the capital is used wastefully, in large part because no charge is made for its use. Funds for management and investment are spent in economically unrewarding regions, forests, and sites. The availability of so much of their output at little or no cost to users seriously distorts management decisions. Major reforms in the management of the national forests are needed. If carried out, these could make the national forests much more useful to the American public.

References and Notes

1. The source of much of the basic data for this article is *The Outlook for Timber in the United States* (Forest Resource Report No. 20, Forest Service, Department of Agriculture, Washington, D.C., October 1973). This source and many others give relatively detailed data for 1970, hence this is used as the usual base year. Where significant changes have occurred in more recent years or where data for a single year might be misleading, trend data or averages for periods of years are used. The financial data in the latter part of the article refer to various years after 1970; the choice of year depends in part on economic conditions that year and in part on data availability. Consistent use of a single recent year would be highly desirable but is not possible. I hope that using different years does not confuse the reader since the analysis is improved by use of the years chosen.

   It is unfortunate that such anachronistic terms and concepts as "sawtimber" and "board feet" have not been replaced in practice by "wood" and "cunits" (100 cubic feet), respectively, for these are far more relevant to modern forestry. To permit easier comparison with earlier and current writings about forests, I have retained the outmoded terms and concepts in spite of my distaste for them.
2. Books that present an overall view of the national forests and the Forest Service are: D. Barney, *The Last Stand* (Grossman, New York, 1974); M. Frome, *The Forest Service* (Praeger, New York, 1971); G. O. Robinson, *The Forest Service: A Study in Public Land Management* (Johns Hopkins Press, Baltimore, 1975).
3. Basic to all discussions about forests in general and about national forests in particular are two definitions taken from (*1*):

   Forest land: "Land at least 10 percent occupied by forest trees of any size, or formerly having such tree cover, and not currently developed for nonforest use. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width at least 120 feet wide to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas are classed as forests if less than 120 feet in width."

   Commercial timberland: "Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. Areas qualifying as commercial timberland have the capability of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for production of industrial wood in the foreseeable future."
4. J. Cameron, *The Development of Governmental Forest Control in the United States* (Johns Hopkins Press, Baltimore, 1929); S. T. Dana, *Forest and Range Policy: Its Development in the United States* (McGraw-Hill, New York, 1956); P. Gates, *History of Public Land Law Development* (Government Printing Office, Washington, D.C., 1968); W. B. Greeley, *Forests and Men* (Doubleday, Garden City, N.Y., 1951); B. H. Hibbard, *History of Public Land Policies* (Macmillan, New York, 1924); J. Ise, *The United States Forest Policy* (Yale Univ. Press, New Haven, Conn., 1920); E. L. Peffer, *The Closing of the Public Domain* (Stanford Univ. Press, Stanford, Calif., 1951); G. Pinchot, *Breaking New Ground* (Harcourt, Brace, New York, 1947); R. M. Robbins, *Our Landed Heritage* (Princeton Univ. Press, Princeton, N.J., 1942); H. Steen, unpublished history of the Forest Service.
5. The following publications about forests in general and national forests are relevant to my discussion: W. A. Duerr, Ed., *Timber!* (Iowa State Univ. Press, Ames, 1973); G. R. Gregory, *Forest Resource Economics* (Ronald, New York, 1972); D. M. Smith, *The Practice of Silviculture* (Wiley, New York, 1962); S. Spurr and B. Barnes, *Forest Ecology* (Ronald, New York, 1973); A. Worrell, *Principles of Forest Policy* (McGraw-Hill, New York, 1970).
6. *Report of the President's Advisory Panel on Timber and the Environment* (Government Printing Office, Washington, D.C., 1973), p. 35; M. Clawson, Ed., *Forest Policy for the Future: Conflict, Compromise, Consensus* (Resources for the Future, Washington, D.C., 1974).
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8. M. Clawson, *The Federal Lands Since 1956: Recent Trends in Use and Management* (Resources for the Future, Washington, D.C., 1967).
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11. W. J. Mead, *Competition and Oligopsony in the Douglas-Fir Lumber Industry* (Univ. of California Press, Los Angeles, 1966).
12. M. Clawson, in preparation.
13. H. Kaufman, *The Forest Ranger: A Study in Administrative Behavior* (Johns Hopkins Press, Baltimore, 1960).
14. J. R. McGuire, personal communication with enclosures, 17 July 1975.
15. This article draws heavily on (*12*), as well as on (*10*), and (*6*) which I wrote or to which I was a major contributor. My debt to many persons is acknowledged in those sources and need not be repeated here. I am particularly indebted to William F. Hyde of Resources for the Future and to Lawrence W. Libby of Michigan State University for their active involvement in my research and for my use of some of their unpublished facts and ideas.