Implementation of Recreation Fees by the U.S. Forest Service: 1996-2002

Molly Espey
Clemson University
Applied Economics and Statistics
Clemson, South Carolina 29634
864-656-6401
mespey@clemson.edu

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Abstract:

In recognition of the potential for recreational use fees to contribute to the operation, maintenance, and enhancement of public lands, Congress passed the Recreation Fee Demonstration Program in 1996, authorizing federal land management agencies to charge recreational use fees and retain the revenue. This study analyzes the response of federal land managers to this authority through estimation of the factors that influenced the fee setting decision by the U.S. Forest Service (USFS) between 1996 and 2003. Both forest size and the availability of substitutes are estimated to delay fee implementation, while a large local population has a positive influence on the fee setting decision.

Key words:

Federal land management
Public land management
Recreation demand
Recreation Fee Demonstration Program
User fees
U.S. Forest Service

Introduction

In 1996, Congress passed the Recreation Fee Demonstration Program (RFDP), providing an incentive to federal land management agencies to charge for recreational access and use of public lands. Prior to this, revenue generated from user or entrance fees was put into a general fund of the U.S. Treasury, providing little incentive for fee collection by federal land management agencies. Growing visitation and minimal fee collection had combined to create an increasing disparity between the costs associated with providing recreational services on national lands and revenue generated from recreation. In 1995, for example, receipts from national park recreation fees amounted to only about 7.5% of the total cost of park operations, equating to average revenue of $0.30 per visitor (Leal and Fretwell 1997). This gap between user fee revenues and expenditures on public land management was a major impetus for Congress to pass the RFDP in 1996.

The RFDP expanded the authority of public land management agencies to charge for recreational access and use of public lands and allowed most of the new fee revenue to be retained in the areas where it was collected. While the initial authorization was for a limited time period, the general authority has recently been extended indefinitely. The focus of this research is to determine what factors influence the decision of whether or not to implement recreation fees. The analysis begins with the statutory background of the RFDP and the recently passed Federal Lands Recreation Enhancement Act (PL 108-447), followed by a summary of information regarding the implementation of fees, collection costs, and revenues generated by the four primary federal land management agencies: the National Park Service (NPS), the U.S. Forest Service (FS), the Bureau of Land Management (BLM), and the U.S. Fish and Wildlife Service (FWS). Relevant theory related to fee setting for use of public lands is then outlined and

linked to the decision faced by the FS under the authority of the RFDP. The empirical analysis examines the factors that influenced the fee setting decision by the FS from the beginning of the RFDP in 1996 through 2003.

Recreation Fee Demonstration Program

Mount Rainier National Park became the first to charge for automobile access in 1908, assessing an annual fee of $5 per vehicle. In 1918, however, Congress changed the law that placed NPS fee revenues in a special fund for NPS use, instead requiring revenue generated from user fees to be put into a general fund of the U.S. Treasury, significantly diminishing the incentive for the NPS to collect fees.

The FS and BLM were not even explicitly authorized to charge campground or entrance fees until 1964, but since these proceeds were also designated to go into the Treasury General Fund, there was little effort at that time to institute fee collection programs (O'Toole 1995). In 1973, President Nixon actually issued an executive order prohibiting fees from being charged at most federal forests unless certain capital improvements were provided (Geores 1996).

By the early 1990s, a growing disparity between user fee revenues and federal expenditures related to recreational use of public land provided an impetus for Congress to pass the RFDP in 1996 (Public Law 104-134). Under this program, the NPS, FWS, BLM and FS are authorized to charge admission and recreation use fees and retain the revenues collected. This law was extended and amended several times, with the final extension expiring in September 2004. Fee demonstration revenue was to remain available for expenditure through September 2007. In December of 2004, however, Congress passed the Federal Lands Recreation

Enhancement Act (PL 108-447) indefinitely extending the authority for these agencies to charge certain recreation fees and retain the revenues.

The expressed purpose of the RFDP was "to demonstrate the feasibility of use-generated cost-recovery for the operation and maintenance of recreation areas or sites and habitat enhancement on federal lands" (Public Law 104-134). By 2003, over 500 demonstration programs had been created, generating $176.4 million, compared to $93.3 million in the year prior to passage of the RFDP. Figure 1 shows the change in total recreation fee revenues for each of the agencies between 1994 and 2003. Costs of fee collection comprise twenty percent of gross fee revenues generated across all four agencies (US DOI and USDA 2004). Other major uses of the revenues include visitor services and operations, maintenance, interpretation and signing, facility enhancement, and resource preservation and enhancement.

Since most federal land is located in the western part of the country, most RFDP sites are also in the West, including all BLM projects, three quarter of FS projects, and 57 percent of NPS projects, but only 38 percent of FWS projects. Although the majority of FS fee demonstration projects are in the western United States, every state east of the Mississippi with a national forest has a fee demonstration program with the exception of New York, Vermont, and Maine. Demonstration fees range from day use and entry fees, to fees for use of developed campgrounds and visitor's centers, to fees for special tours and Nordic skiing.

Theory of Recreational Use Fees on Public Lands

Previous research of recreational fees has primarily concentrated on issues of equity and the appropriateness of fees, the attitudes of visitors to public lands, the use of new fee revenues, or development of demand models for valuation of recreational sites or attributes. Three articles

focusing on the economics of recreational price setting are relevant to the analysis of the price setting behavior of public land managers under the RFDP, Rosenthal, Loomis, and Peterson (RLP, 1984), Turner (2000), and Espey (2002).

RLP examined the economic theory of efficient pricing for recreational use of public lands. Turner developed a social welfare maximization model including fee setting but focused strictly on National Parks and did not consider the impact of the RFDP. Espey presented a social welfare maximization model in which federal land managers are assumed to make fee setting decisions rather than visitation level decisions as in Turner. Espey's model also incorporates consideration of publicity campaigns waged by public land management agencies that are intended to both assuage negative public attitudes and boost support by highlighting improvements in the recreational experience made possible by the RFDP.

RLP approached the issue from the perspective of efficient price setting for the use of public land. If recreational use of federal land is a pure public good, the marginal cost of an additional user would be zero and pricing for access would not be economically efficient. However, congestion, ecological damage, and operating costs all might increase with increased recreational visitation, implying a positive marginal cost of an additional user. If the marginal cost of an additional visitor is positive as a result of any or all of these factors, charging a price equal to these marginal costs would be efficient. RLP also consider that high fixed costs of administering a pricing system may preclude implementation of recreation fees.

Turner derives efficiency conditions for management of areas with multiple excludable activities as well as pure public good wilderness. The number of visits, the amount of each activity for each individual, and the amount of wilderness are chosen to maximize social welfare. Turner assumes that "activities", not visits, create costs, hence given efficient activity fees the

efficient entrance fee is zero. However, entrance itself can add to both congestion and ecological damage (e.g. air pollution), suggesting that entrance fees may be efficient.

Espey builds upon these models with an explicit focus on the RFDP, presenting a model of social utility maximization that reflects that site managers choose fees rather than visitation levels and that their decisions are influenced by negative public sentiment about fees. It is hypothesized that federal recreation managers attempt to maximize visitor utility subject to the budget constraint of the recreation site by setting fees for entrance (P_v) and activities (P_j) and spending money (I) to inform visitors about the use of fee revenue as follows:

$$(1) \qquad \begin{aligned} &\text{Max} \sum_i \text{Ui}(V_i(v_i(P_v)), A_{ij}(a_{ij}(P_j)), I, X) \\ &\textit{subject to } B + \sum_i P_v v_i(P_v) + \sum_j \sum_i P_j\, a_{ij}(P_j) = C(\sum_i v_i(P_v), \sum_j \sum_i a_{ij}(P_j), I, F, O) \end{aligned}$$

where V_i is a quality adjusted measure of visits (v_i) by person i and A_{ij} is a quality adjusted measure of participation in activity j by person i (a_{ij}), where quality is a function of the number of other visitors and activity participants, and X is all other goods. B is the federal budget allocation to the site, C is cost which is a function of visitation (v_i), activity participation (a_{ij}), provision of information (I), and fixed costs of implementation of a fee system (F), and other costs independent of visitation (O).

This model includes the possibility of positive marginal costs of recreational visitation as suggested by RLP but adds expenditures by federal agencies on public information campaigns highlighting the site benefits of recreation fees, reflecting actual agency behavior. This model also extends RLP by assuming federal agencies have monopoly power, defining marginal revenue as a function of both prices and visitation, implying that site managers will be sensitive to the elasticity of demand for visitation. The analysis presented here builds upon Espey's model

to empirically estimate the extent to which cost and demand side factors influenced USFS site managers' decisions of whether or not to implement entrance fees under the RFDP.

Empirical Model

Fees established under the RFDP have ranged from charges for parking, entrance, backcountry camping, developed site camping, and a variety of activities and have been set per vehicle, per person, and per family with some charges per day, some per week, and others per year. This wide array of fees makes analysis of the choice of price levels across sites virtually impossible. Instead, this study uses the theoretical framework developed by Espey to analyze the decision of whether or not to implement a new fee for a given recreational site. In order to eliminate variation related to different bureaucratic structure, administrative mandate, and agency mission, the analysis is confined to USFS sites and accounts for implementation of day use or entrance fees only. The decision unit is assumed to be at the forest level[1].

Two different models are estimated. First, a logit model is estimated using maximum likelihood to analyze the contribution of cost and demand factors to the existence of a fee at a particular forest by 2003, seven years after authorization of the RFDP. For the logit model, the probability that a given forest had a fee by the end of 2002 takes the form:

$$P_j = \frac{e^{\beta' X}}{1 + e^{\beta' X}} \tag{2}$$

where β is the vector of slope parameters, and $\mathbf{X}$ is the vector of explanatory variables. While useful to estimate the impact of $\mathbf{X}$ on the likelihood of a given forest having a fee, the logit model is limited in that the length of time before a fee program was implemented by a given forest is not accounted for, only whether or not a fee program existed at a given point in time. In

order to take fuller advantage of existing information regarding when fees were first authorized by each forest, a duration model is also estimated.

The duration model is used to analyze the length of time that elapsed from Congressional authorization of the RFDP until authorization of each forest's fee program. The time at which a given forest authorizes a fee demonstration program is assumed to be a random variable (T) with a continuous probability distribution *f(t)*, where t is the time to authorization of a fee program for a particular forest. The cumulative probability is

$$F(t) = \int_0^t f(s)\, ds = \text{Prob}(T \leq t) \tag{3}$$

The "survival function", representing the time a given forest continues without a fee program, is given by S(t) = 1 - F(t) = Prob(T ≥ t). The probability that a given forest will implement a fee program in the next short interval of time (Δ) after the authorization of the RFDP, given that it has gone *t* years without implementing a fee is $l(t, \Delta) = \text{Prob}(t \leq T \leq t + \Delta \mid T \geq t)$. The limit of this function as Δ approaches zero,

$$\lambda(t) = \frac{f(t)}{S(t)}, \tag{4}$$

is generally referred to as the "hazard rate".

Many different models are used to estimate these functions, depending on the assumed distribution of the data. For example, the hazard function for the exponential distribution is constant over time, while the Weibull distribution can be monotonically increasing or decreasing depending on the value of one of the parameters. For the RFDP data, a model assuming a Weibull distribution is found to have a significantly higher log-likelihood in comparison to the exponential distribution which is a special case of the Weibull. Thus for this analysis, a Weibull distribution is assumed for the length of time before a forest implements a fee.

Independent Variables

The fact that agencies have flexibility regarding whether or not to impose fees, at what level to set fees, and are providing a differentiated product suggests site managers have some monopoly power hence might be expected to consider visitation demand along with direct costs of collecting and enforcing fees in the fee setting decision.

Data regarding the actual marginal cost of imposing fees is not available. Assuming that collection costs are relatively constant across sites for people entering at the main collection location, relevant differences in marginal costs across forests will be related to monitoring of entrance when there are a variety of entrance points. As detailed analysis of all possible access points to each USFS site is not possible, three measures of forest size are calculated to serve as proxies for the portion of the marginal costs of fee administration that varies across sites. These measures of size are total acreage, forest perimeter, and perimeter divided by acreage. These variables might also reflect differences across forests in fixed costs of implementing a fee program, hence would be expected to be relevant factors in the decision of whether or not to start a new fee program in the first place. The first two variables (acreage and perimeter) are highly correlated (0.957)**,** but acreage and "perimeter divided by acreage" are not (-0.174), so both of these variables are used to measure the difficulty of administering recreational use fees. It is expected that large forests and forests with more possible area of access relative to their size (large perimeter per unit area) would be more difficult to monitor, hence less likely to impose fees.

Among the factors likely to influence the potential demand for recreation at a given forest is the size of the local population, income in the local area, and the number of substitute

recreation sites available to the local population[2]. A greater population could be a source of more revenue, suggesting a positive influence of implementation of fees, but it could also be a source of greater outcry over implementation of fees and greater public pressure against beginning a new fee program, suggesting an ambiguous overall impact. If recreation is a normal good, income would be expected to have a positive impact on the demand for recreation, leading to greater likelihood of beginning a new fee program. The greater the availability of substitutes, the more elastic the demand at a given site would be, decreasing the likelihood that new fees would be implemented.

Finally, fees may be considered as a means of reducing congestion and ecological damage, costs that are correlated with the level of visitation relative to forest size and ecological sensitivity. However, in general, historic forest visitation records are not very reliable. If visitation relative to population is constant across sites, local population could also reflect existing congestion and/or ecological damage at sites, both increasing the likelihood of fees as efficient fees would reflect these marginal costs.

Data

Table 1 shows the percentage of forests adopting day use or entrance fees each year from 1996-2002 as reported by the USFS (2003). Figure 2 illustrates this data in terms of the percentage of forests persisting without fees over this same time frame. Nearly thirty percent of forests implemented fee programs in the first two years of the RFDP, another thirty percent authorized programs in the succeeding three years, while just over forty percent still had not authorized entrance or day use fees by 2002[3]. Early fee adopters, later fee adopters, and non-adopters are fairly evenly distributed across the country.

Geographical information system (GIS) data indicating all USFS forest locations and boundaries was derived from the U.S. Geological Survey's "Map Layers Warehouse". This data was combined with the data on authorization date of fee demonstration programs by each forest for the spatial analysis. The USGS data was also used to calculate forest size in acres and perimeter in miles.

The 2000 U.S. Census provided population and median household income data. GIS was used to create a 150 mile buffer zone around each forest to represent the potential zone of day use visitors. Within this zone, a market potential index was calculated as:

(4) $$\mathrm{PI}_j = \sum_{i=1}^{n} \frac{Pop_i}{D_{ij}^2}$$

where PI_j is the population index for forest j, Pop_i is the population of city i, and D_{ij} is the distance from city i to forest j. N is the number of cities within the 150 mile buffer around the forest with a population greater than 50,000 people.

A weighted index of other USFS forests within 150 miles of each population of greater than 50,000 was calculated to represent the availability of similar recreational substitutes consumers have for each forest. The substitute index was calculated as:

(5) $$SI_j = \sum_{i=1}^{n} \frac{Sub_{ij} * Pop_i}{TotPop}$$

where SI_j is the index of substitutes for forest j, Sub_{ij} is the number of alternative USFS forests within 150 miles of city i, and TotPop is the total population within the 150 mile buffer of forest j. Hence the index of substitutes for a given forest is calculated by weighting the number of substitutes available to each city by the percentage of the total potential day use market for that forest that the city represents. While FS forests are certainly not the only available substitutes, in order to keep the analysis manageable, the substitution index was limited to these sites only.

Summary statistics for all the variables used in the analysis are presented in Table 2.

Empirical Results

All model results are presented in Table 3. In addition to the logit results for 2003, two additional logit models are estimated to determine if there are differences between early and late fee adopters. The early adopters model includes forests that authorized fees in 1996 or 1997 in comparison to all others, while the late adopters model includes forests that authorized fees in 1998 or later in comparison to all non-adopters. While only a few variables are significant in these latter two models, the results are presented for comparison to the full logit and duration models.

The logit results suggest that forests with greater perimeter per acre and those with more substitute recreational sites nearby were less likely to have established fees by 2002. Early adopters appear to be most strongly influenced by the market potential of a larger local population or the desire to reduce congestion and/or ecological impacts of use, while non-adopters appear to be deterred by the monitoring costs likely associated with their large size and perimeter when compared to late adopters. The number of available substitutes appears to be a small deterrent to the establishment of fees among the non-adopters as well.

The Weibull duration model takes advantage of more information than the logit models by taking into consideration how long after passage of the RFDP a forest continues without having a fee program. The Weibull duration model is estimated using this length of time a forest continues without a fee as the dependent variable. The results support the logit results suggesting that a greater perimeter per unit area and more substitute sites nearby delay new fee authorization. Population is also significant but negative, implying that forests with greater

potential demand nearby instituted fees earlier than those with smaller local populations. Whether this is to capitalize on the potential high demand or to control congestion and ecological impacts produced by greater use, or some combination of the two, cannot be determined by this model. Nonetheless, this result suggests Forest Service managers making fee setting decisions were not significantly deterred by potential public backlash from large local populations. Acreage was of the expected sign but not significant and median income in the local area was not significant in any of the models.

Finally, an attempt was made to determine if there is a relationship between revenues that have been generated under the RFDP and the demand side variables discussed above. The size of the local population overwhelms all other factors in determining the amount of revenue collect. This does not mean, however, that forests further from large population centers can not benefit from fee projects, but the smaller revenue base of a smaller population should be taken into consideration in decisions about fee structure and collection mechanisms.

Conclusions

The objective of this analysis was to determine if public land managers consider market demand and costs in the decision of whether or not to implement an entrance or day use fee under the RFDP. While theoretically similar to analysis of the decision of a producer to adopt some new technology, the same sort of market advantage of early adoption does not necessarily accrue to public land managers and all public land managers are subject to similar agencies regulations and political constraints on their actions, limiting the role of decision-maker variation in the adoption decision. Limiting the analysis to the FS also reduces the variability across decision makers in terms of agency mission and potential user groups. The NPS, for example,

has a potential demand for its product that is national or even international in scope, whereas most users of FS and BLM land live relatively close.

The results of this analysis support the notion that federal land managers are influenced by basic economic incentives of costs and demand in deciding whether or not to implement new recreation fees. The likely difficulty of controlling access as reflected in large perimeter per unit area deters or delays fee setting. FS managers also appear to recognize the potential gains of a large local market and appear to be sensitive to elasticity resulting from a large number of substitute recreational sites nearby.

Not accounted for in this analysis is the potential of spatial correlation across sites in the decision of whether or not to set a fee, where other nearby forests setting fees would positively influence a forest without a fee to introduce one. However, given other limitations in the data, particularly in identifying the precise geographical coverage of each fee project, accounting for spatial correlation was deemed to be beyond the scope of this study. Another step in improving the understanding of public land recreation fee setting decisions would be to survey the decision makers at each site to determine why they did or did not decide to implement a fee project and compare to this more macro-level analysis of the decision.

When the RFDP was first passed by Congress, many were concerned that federal lands would be commercialized and that public land managers did not have the experience with pricing to make efficient decisions. The RFDP experience taught federal land management agencies many lessons in how to administer fees in a manner that is viewed as fair and beneficial to the public, efficient, and in cooperation with other federal land management agencies for a coordinated and convenient system (USDOI and USDA 2004). Decision makers are well aware of revenue opportunities as well as implementation cost constraints and public and political costs

of unpopular decisions and have acted rationally in fee setting decisions in response to these influences as evidenced by the results of this analysis.

The recent passage of the Federal Lands Recreation Enhancement Act ending the temporary nature of the RFDP suggests Congress was convinced of the feasibility of use generated fees for enhancement operation, maintenance, and enhancement of federal recreational areas, just as the RFDP was enacted to demonstrated (RFDP 1996). The new law retains limits on fees as in the RFDP, explicitly expressing that fees should be commensurate with the benefits and services provided, consistent with management objectives, comparable to similar fees elsewhere, and coordinated across agencies to consider the aggregate impact on users. These legal mandates recognize public concern with equity and return of value to users. The decrease in uncertainty resulting from the more permanent nature of the new fees and the increased use of fees across the country may affect the decision in the future, particularly at forests where fees have not yet been implemented, providing an opportunity for a somewhat different future analysis, and perhaps validation, of the factors influencing fee setting decisions.

Footnotes

1 While not all fee programs are applicable to an entire forest, there is no consistent way to subdivide forests into smaller units to more accurately reflect the area impacted by the fee program.

2 Regional differences in preferences for recreation could be accounted for by using regional dummy variables but these were not found to be significant so are omitted from the discussion.

3 Note that these numbers do not correspond directly to the number of projects since some projects cover more than one forest and some forests have more than one demonstration project.

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Table 1: U.S. Forest Service Authorization of New Day Use or Entrance Fees By Year

Year	Number of Forests
1996	9
1997	37
1998	16
1999	14
2000	18
2001	0
2002	0

Source: U.S. Departments of Interior and Agriculture (2003)

Table 2: Summary Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Fee by 2003	0.59	0.49	0	1
Early Fee	0.29	0.45	0	1
Late Fee	0.30	0.46	0	1
Time until fee	4.6	2.24	1	7
Acreage	1,411,200	1,549,500	365	17,628,000
Perimeter/Acreage (miles/acre)	0.40647	0.66978	0.10643	6.1939
Population (thousands)	718.31	1758.8	3.13	17,164
Median Income (2000 dollars)	43,387	5,407	33,281	56,328
Substitutes	7.93	3.8	0	14.2

Table 3: Factors Influencing Implementation of Recreation Fees by the USFS[1]				
Variable	**Logit 2002**	**Early Adopters**	**Late Adopters**	**Duration**
Acreage	-0.13×10^{-6} (-1.05)	0.95×10^{-7} (0.84)	-0.11×10^{-5}*** (-3.02)	0.25×10^{-6} (1.011)
Perimeter/Acreage	-1.46** (-1.82)	-0.78 (-1.01)	-3.40** (-2.21)	0.82** (1.73)
Population	0.00048 (1.35)	0.00048* (1.91)	0.00018 (0.58)	-0.14×10^{-3}*** (-3.56)
Median Income	-0.26×10^{-4} (-0.77)	-0.42×10^{-5} (-0.12)	-0.26×10^{-4} (-0.63)	0.14×10^{-4} (0.50)
Substitutes	-0.12*** (-2.38)	-0.049 (-0.98)	-0.091* (-1.50)	0.09** (2.30)
Constant	2.90** (1.93)	-0.52 (-0.33)	4.17** (2.04)	2.72** (2.21)
Shape parameter				2.3232*** (15.15)
Log Likelihood	-97.264	-88.952	-65.224	-340.42
Percent Right Predictions	0.70	0.74	0.70	

*, **, *** indicates significant at the 10%, 5%, and 1% levels.

[1] N=159 for each model except the late adopters model for which early adopters are excluded so n=112. Two sided t-tests are used for population which a priori has an ambiguous effect while one sided tests are used for the other variables that have strong a priori expectation regarding sign.

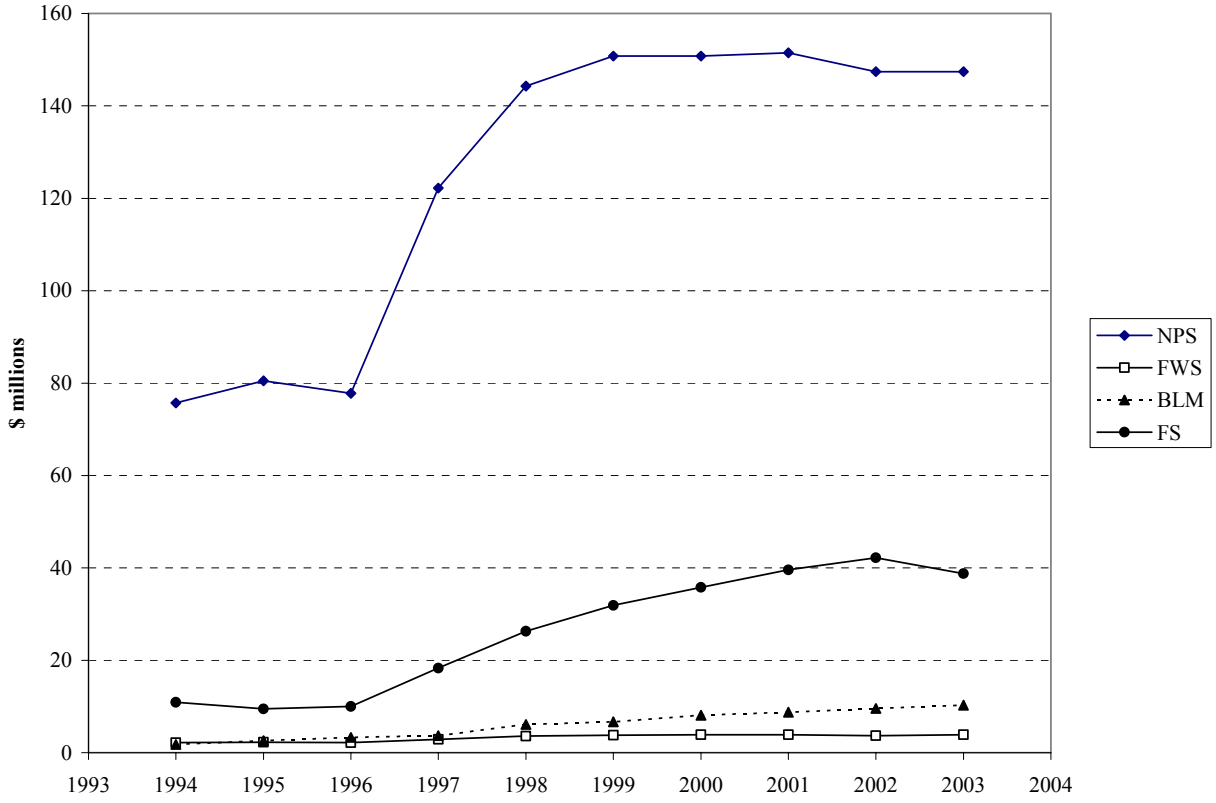

Figure 1: Gross Revenues by Agency

Source: U.S. Department of Interior and U.S. Department of Agriculture

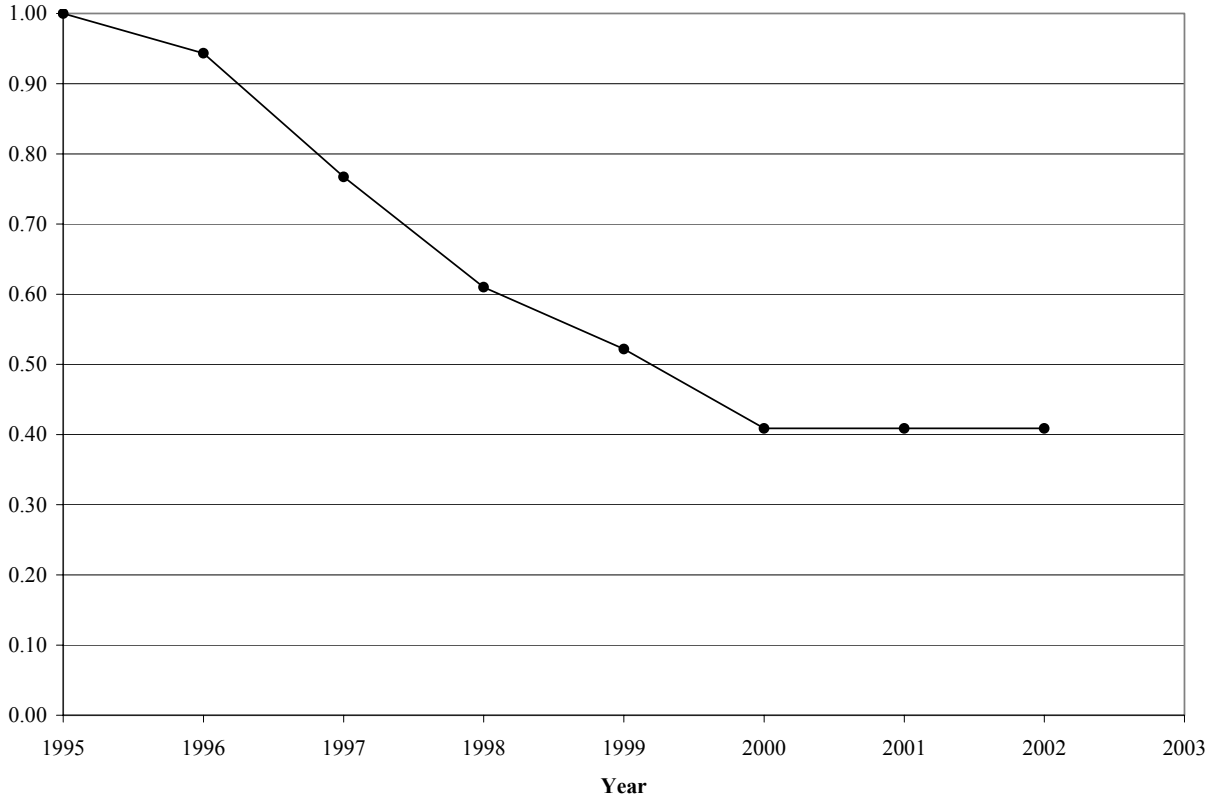

Figure 2: Percentage of USFS forests without fees by year