

United States  
Department of  
Agriculture

Forest Service

Engineering Staff

Washington, DC



# National Forest Road System and Use

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DRAFT  
1-30-98

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# National Forest Road System and Use

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## Overview

This report summarizes current National Forest land allocation, transportation system and road use information; discusses information availability and reliability; and suggests some preliminary observations and interpretations. A final section on Further Data Considered is included for possible additional investigation and analyses.

## Current Land Allocation

### Forest Plans

In the mid-1970's, concerns for formally designated Wilderness and potential Wilderness led to the inventory of National Forest roadless areas 5,000 acres and larger. The January 4, 1977, Roadless Area Review and Evaluation (RARE II) EIS Record of Decision proposed:

Recommended Wilderness	15,089,000 acres
NonWilderness Uses	36,152,000 acres
Further Planning	10,796,000 acres
Total RARE II	62,037,000 acres

All Forests were directed to evaluate and include management alternatives for the remaining RARE II areas as part of the Forest Planning process. Table A shows the status by Region of Forest Plan land allocations following NEPA and public involvement as of a 1993 assessment prepared for Chief and Staff.

There is high confidence in these data as only nine Forest Plans have been revised since 1993.

Wilderness	34 million acres
Remaining RARE II	
Recommended Wilderness	6 million acres
NonWilderness-Developed	34 million acres
General Forest & Grasslands	117 million acres
Total	191 million acres

NonWilderness-Developed lands are available for multiple uses other than wilderness, e.g., timber and mineral production, developed recreation, dispersed recreation, etc., consistent with specific Forest Plan Area Guidelines and Standards. Of the 34 million acres, 9 million are suitable for timber harvest. To date, approximately 1 million acres have been entered for timber harvest.

The September 1995 Land Areas of the National Forest System further identifies National Primitive Areas, National Scenic-Research Areas, National Scenic Areas, and National Wild and Scenic Rivers, totaling

863,000 acres. These areas have prescriptions that may also constrain road development and use.

Table A-b shows the land determined by the Forest Plans to be suitable for timber harvest:

General Forest and Grasslands	45 million acres
RARE II	9 million acres

Information on land allocation by Forest has not been tabulated, but should be available from Forests.

Table A-b also shows municipal watersheds. Municipal watersheds are those areas that serve a public water system as defined by Public Law 93-523 (Safe Drinking Water Act) or as defined in State safe drinking water regulations. Forest Service regulations require that these areas be shown as special management areas in forest plans, and the forest plan identifies guidelines for protection, management, use, and development of the area together with coordinating requirements for other uses and activities, including roads, within the watershed.

**Table A. National Forest Land Areas by Region (C&S 1993 Assessment)**

	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	Total
<b>a. Land Areas</b>										
Wilderness	5,072,030	4,266,800	2,829,448	5,420,409	4,145,387	4,773,861	700,294	1,242,829	5,753,211	34,204,266
Remaining RARE II Recommended Wilderness	1,139,639	401,700	113,930	1,830,216	621,428	0 <sup>a</sup>	200,236	131,935	1,703,000	6,142,084
Nonwild/Developed	4,862,526	7,422,900	2,368,489	10,185,075	2,238,969	1,733,947	320,401	243,730	4,726,472	34,102,509
General Forest	14,321,182	10,006,265	15,392,203	14,478,835	13,026,825	18,130,389	11,689,699	10,362,117	9,788,562	117,196,077
Total	25,395,377	22,097,665	20,704,070	31,914,535	20,032,606	24,638,197	12,910,630	11,980,611	21,971,245	191,644,936
<b>b. Land Uses</b>										
Land Suitable for Timber										
General	6,429,400	3,700,600	3,465,991	2,799,279	4,664,603	9,438,295	7,734,687	6,187,348	761,072	45,181,275
Inventoried Roadless	2,273,600	1,317,400	63,009	1,597,721	394,397	1,700,705	332,313	84,652	1,273,928	9,037,725
Total	8,703,000	5,018,000	3,529,000	4,397,000	5,059,000	11,139,000	8,067,000	6,272,000	2,035,000	54,219,000
Inventoried Roadless										
Entered	164,700	212,100	804	64,489	67,800	76,643	30,193	1,000	455,570	1,073,299
Not Entered	2,108,900	1,105,300	62,205	1,533,232	326,597	1,624,062	302,120	83,652	818,358	7,964,426
Total	2,273,600	1,317,400	63,009	1,597,721	394,397	1,700,705	332,313	84,652	1,273,928	9,037,725
NFS Municipal Watershed <sup>b</sup>	1,631,893	11,928,467	121,775	2,252,440	13,300,004	9,308,033	936,882	2,473,190	73,197	42,025,881

<sup>a</sup> 1984 Oregon and Washington Wilderness Act did not allow additional areas to be recommended for wilderness until forest plan revisions were completed.

<sup>b</sup> Watershed acres are generated from old records and may not reflect the most current land allocation information.

## Road System Information

### Roads

Figure 1 summarizes the legal basis and definitions relative to Forest Roads used throughout this report. This figure shows that there are a variety of road standards and road jurisdictions within the National Forests.

Forest Development Roads are roads under the jurisdiction of the Forest Service and necessary for protection, administration and use of the National Forests. These roads, commonly referred to as “system roads” or “permanent roads,” are inventoried, maintained and managed by the Forests.

Figure 2 provides a historical look at the growth of the Forest Development Road system. Data is based on *Reports of the Forest Service* since 1967. This data has been extrapolated back to 1950 to compare miles with use. Extrapolation is based on comparable road construction and harvest rates from 1967–1975 and 1985–1995.

A dramatic increase in road miles occurred between 1977 and 1987. There are two principal reasons. First, an Interim Directive was issued directing forests to inventory all wheel tracks on national forest land, regardless of how they were developed, and to decide whether to include them on the FDR system or not. Many forests chose to add these road miles to their road systems. A second reason for the increase was the change from use of temporary roads to permanent roads.

Temporary roads are proposed where one-time access is needed as part of a single timber sale. They have lower initial development costs than permanent roads, but their long-term management implications are more significant. Regulations (36 CFR 223.37) require temporary road revegetation within 10 years.

Temporary roads are generally short and are usually open for one season. The costs of temporary roads currently being constructed range from \$7,000 to \$11,000 per mile in gentle to mountainous terrain. These road costs cannot be compared to engineered roads placed on permanent locations as they generally do not provide sufficient long-term resource protection.

Permanent roads are proposed where long-term management access is foreseen or where resource concerns are high enough that additional control of the road construction activity is determined necessary.

During the early 70's through the 80's the value of timber started to fluctuate. In an attempt to reduce roading costs, road access was frequently provided through temporary roads rather than the more costly permanent roads. The reliance on temporary roads, as opposed to permanent, created some unwanted impacts.

It was clear that potential negative impacts had to be mitigated and that permanent roads provided a better way to control those impacts.

In an effort to reduce road costs, the Forest Service established road standards that minimized the resource impacts of roads and at the same time provided the needed control over route location and construction, operation, and maintenance impacts. These minimum standards were included in a national Low Volume Road specification to be used where appropriate to the terrain and environmental values.

Forest Development Roads, or system roads, are categorized by functional class (arterial, collector, or local), and by maintenance level. These relate to use in the following manner:

Use	Functional Class	Maintenance Level	Miles
Passenger Cars	Arterial/Collector	3-5	86,022 mi. (23.0%)
High Clearance Vehicles	Local-Open	2	210,535 mi. (56.5%)
High Clearance Vehicles	Local-Closed	1	76,348 mi. (20.5%)
Total			372,956 mi. (100%)

While 23 percent of the system roads are maintenance level 3-5, and are maintained for passenger cars, only about 7 percent of all system roads are two lane or asphalt surfaced. The balance of system roads are single lane, aggregate or native soil surfaced roads.

Maintenance level 2 roads are administrative and public use roads maintained for pickup trucks and other high clearance vehicles. Passenger cars are not prohibited from using these roads but surface conditions usually discourage prudent passenger car drivers.

Maintenance level 1 roads are physically closed to motor vehicle use. These roads provide for long-term management access, but in the near term, motor vehicle use isn't necessary. Controlling motor vehicle use provides a number of advantages including:

- Reducing road maintenance costs
- Providing opportunities for non-motorized recreation activities
- Minimizing future reconstruction costs
- Minimizing future environmental impacts from reconstruction
- Protecting wildlife habitat

New roads are added to the system where long-term access is needed for management, protection, and public use. Various tools are used to develop these access roads—for example, appropriated funds, timber and mineral operations, and cost-share agreements with neighbors. New roads also are acquired as a result of land acquisition—for example, more than 200 miles with the Joliett Arsenal (Medewin unit).

Other Forest Roads, or “non-System” roads, include public roads (state, county, and local jurisdiction), private roads, and uninventoried roads. Public roads include roads within the gross Forest proclamation boundary as well as within actually National Forest System lands. Particularly in



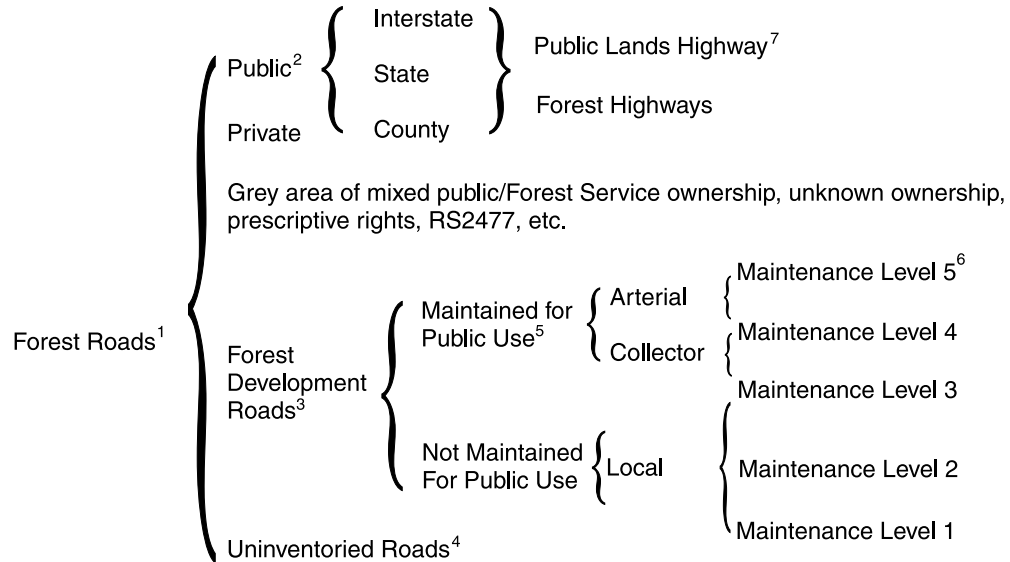
eastern forests, this can be a predominant proportion. Uninventoried roads are a complex mixture of unengineered travelways not claimed by a public road agency and not needed for forest management. These include remnants of short-term roads associated with fire suppression, timber harvest, and oil, gas or mineral activities, as well as travelways resulting from off-road vehicle use. Miles shown for uninventoried roads reflects incomplete local estimates and is probably low. Although not claimed by a public road agency, some of these uninventoried roads are subject to claims as public roads under prescriptive rights and Revised Statute 2477. These authorities address public access rights over travelways existing prior to establishment of the national forest and grasslands. Prescriptive rights apply to acquired lands, and Revised Statute 2477 applies to lands reserved from the public domain.

Figure 3 shows the distribution of Forest Roads by Region. Forest Development Roads, or system roads, are to the right of the vertical axis. Nonsystem roads are to the left.

Table B shows miles of road by maintenance level for each region for the years 1997 and 1991.

System road miles are inventoried by forests and have a very high level of confidence for FY 1997. Non-system miles are generally not inventoried by many forests and have a low level of confidence for most regions.

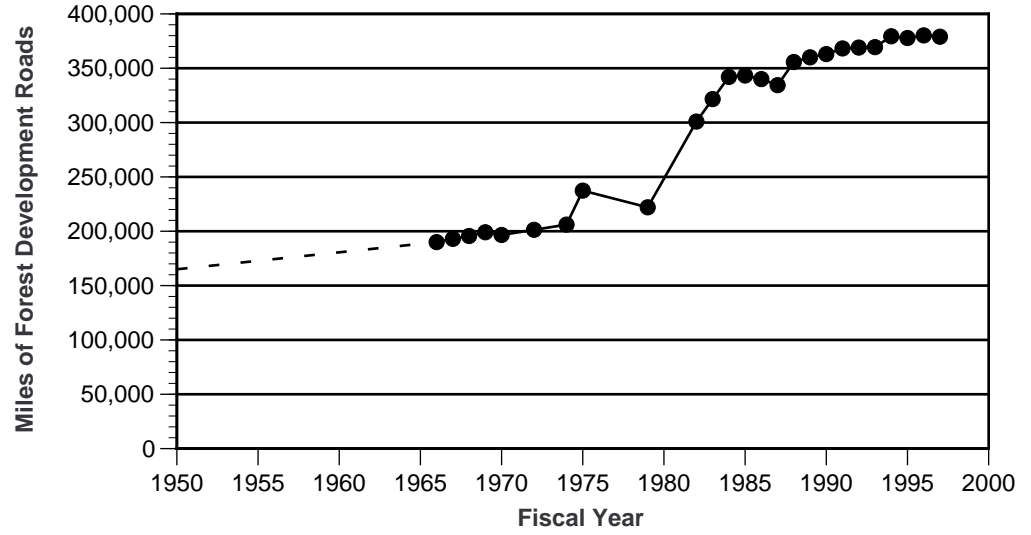
Table B indicates several trends: (1) The change in miles between FY 97 and 91 reflects the construction of new roads and the effort by forests to update road inventories, resulting in an overall increase in road miles. (2) An overall decrease in service level, that is, maintenance levels 3/4/5 roads reduced to maintenance level 2, and maintenance level 2 roads reduced to maintenance level 1. This has resulted largely from progressive deterioration of roads from growing use and insufficient maintenance and reconstruction funds, as well as from decreased needs for timber haul. (3) Growing awareness of the need to inventory and consider non-System roads as well as system roads.



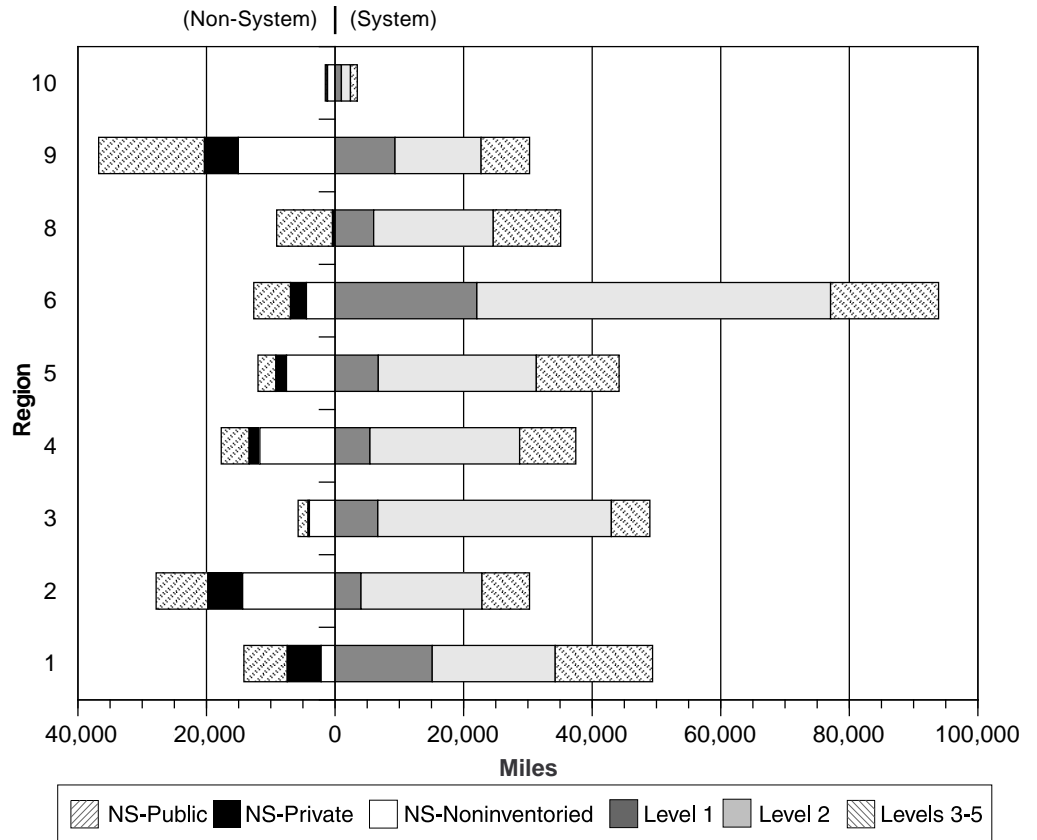
Notes:

- 1. Forest Roads:** Roads wholly or partially within, or adjacent to, and serving the National Forest System and necessary to the protection, administration, and use of the National Forest System and the use and development of its resource (23 USC 101).
- 2. Public Roads:** Roads under the jurisdiction of, and maintained by, a public authority that are open to public travel. (23 USC 101(a)).
- 3. Forest Development Roads (FDR):** Forest roads under the jurisdiction of the Forest Service (23 USC 101).
- 4. Uninventoried Roads:** Short term roads associated with fire suppression, oil, gas or mineral exploration or development, or timber harvest not intended to be a part of the forest development transportation system and not necessary for resource management. Regulations (36 CFR 223.37) require revegetation within 10 years.
- 5. Maintained for Public Use:** An MOU with FHWA defines FDR's managed as open to the public as those roads open to unrestricted use by the general public in standard passenger cars, including those closed on a seasonal basis or for emergencies.
- 6. Maintenance Level 5:** Roads that provide a high degree of user comfort and convenience. Normally double lane, paved facilities, or aggregate surface with dust abatement. This is the highest standard of maintenance.  
**Maintenance Level 4:** Roads that provide a moderate degree of user comfort and convenience at moderate speeds. Most are double lane, and aggregate surfaced. Some may be single lane. Some may be dust abated.  
**Maintenance Level 3:** Roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Typically low speed, single lane with turnouts and native or aggregate surfacing.  
**Maintenance Level 2:** Roads open for use by high-clearance vehicles. Passenger car traffic is discouraged. Traffic is minor administrative, permitted or dispersed recreation. Non traffic generated maintenance is minimal.  
**Maintenance Level 1:** These roads are closed. Some intermittent use may be authorized. When closed, they must be physically closed with barricades, berms, gates, or other closure devices. Closures must exceed one year. When open, it may be maintained at any other level. When closed to vehicular traffic, they may be suitable and used for nonmotorized uses, with custodial maintenance.
- 7. Public Lands Highways, Forest Highways:** A coordinated Federal Lands Highway Program includes Forest Highways, Public Lands Highways, Park Roads, Parkways and Indian Reservation Roads. These are roads under the jurisdiction of and maintained by a public road authority other than the Forest Service and open to public travel (23 USC 101).

**Figure 1. Legal Basis and Definitions for Roads in the National Forests**



**Figure 2. Mileage History of Forest Development Roads**



**Figure 3. Road System Miles by Region**

**Table B. Road System Information by Region**

Road System Information	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	Total
1997 System Miles	49,400	30,300	49,000	37,500	44,200	93,900	35,100	30,300	3,460	373,000
Level 3-5	15,100	7,390	5,990	8,740	12,900	16,800	10,500	7,540	1,060	86,000
Level 2	19,100	18,800	36,300	23,300	24,600	55,000	18,600	13,400	1,410	211,000
Level 1	15,100	4,040	6,650	5,430	6,730	22,100	6,010	9,330	987	76,300
1991 System Miles	46,800	31,300	48,600	36,600	<b>43,900</b>	97,000	34,600	29,400	3,040	<b>371,000</b>
Level 3-5	15,800	7,670	6,930	10,800	<b>13,700</b>	19,800	10,100	8,090	740	<b>93,600</b>
Level 2	20,200	18,100	36,700	21,500	<b>25,800</b>	60,800	19,200	14,100	1,150	<b>218,000</b>
Level 1	10,700	5,520	5,040	4,310	<b>4,410</b>	16,400	5,320	7,240	1,150	<b>60,200</b>
1997 Non-System Miles	14,200	27,800	5,740	17,700	4,430	12,600	9,060	36,800	1,520	130,000
Public	6,750	8,050	1,540	4,350	2,790	5,720	8,690	16,500	269	54,600
Private	5,280	5,410	210	1,670	1,650	2,470	369	5,270	85	22,400
Non-inventoried	2,160	14,400	3,990	11,700	<b>7,560</b>	4,450	<b>25</b>	15,000	1,160	<b>60,500</b>
1991 Non-System Miles	—	30,900	7,580	17,900	—	—	6,620	34,500	1,300	—
Public	—	7,570	1,280	4,220	—	—	6,180	15,300	244	—
Private	—	6,570	146	1,580	—	—	442	5,390	78	—
Non-Inventoried	—	16,700	6,150	12,100	—	—	<b>50</b>	13,800	981	—

Data from Regional replies to September 24, 1997, call letter.

Highlighted figures reflect estimated data.

Blanks reflect no basis for estimating data.

## Bridges

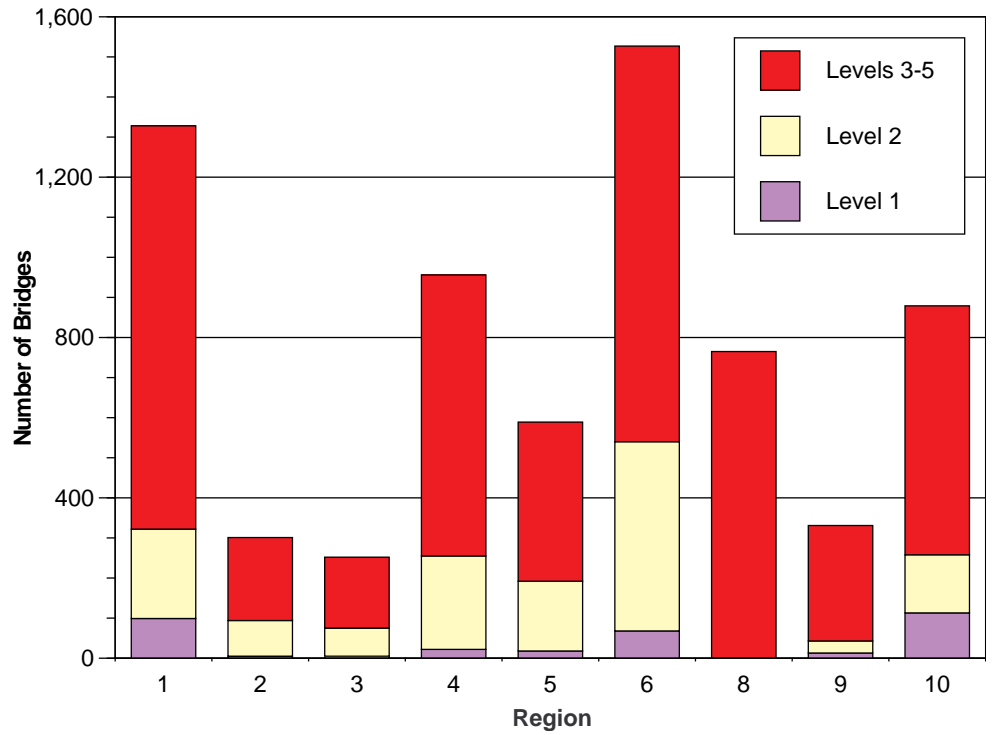
Figure 4 displays bridges by Region by Maintenance Level.

Figure 4 shows that about 75 percent of the bridges are on the arterial/collector (maintenance levels 3–5) roads, or on about 23 percent of the system. This results from a variety of reasons—for example, location of arterial/collector roads determined more by user convenience and overall system efficiency than by landform, and the primary road system frequently being carried beyond critical features like bridges before distributing use onto local roads.

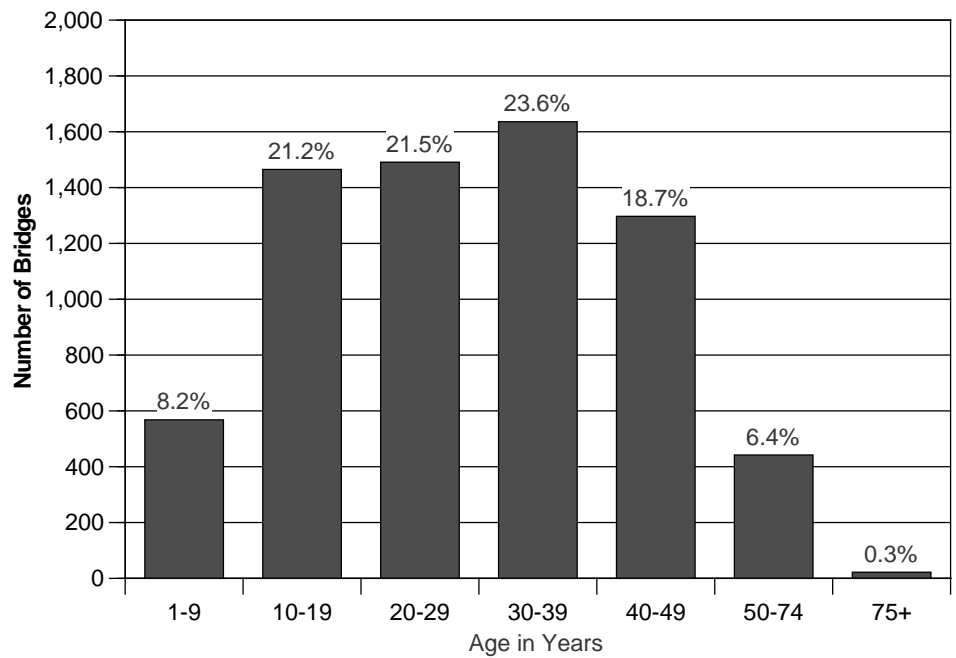
Figure 5 shows the overall age distribution of bridges. Timber bridges are generally designed for a 30-year structural life, while concrete and steel bridges more typically have a 50-year structural life. Limited maintenance can reduce the effective structural life of bridges.

Because of evolving standards, functional life may be less than the structural life. For example, 75 percent of FS bridges will not conform to currently proposed guardrail standards.

All bridges are inventoried and inspected. Bridges on maintenance level 3–5 roads are reported to the Federal Highway Administration. Confidence in this inventory is high, although details of age, construction materials and condition are somewhat less reliable.



**Figure 4. Bridges by Region and Maintenance Level**



**Figure 5. Age Distribution of Bridges**

## Road Density

A great deal of discussion and debate about forest roads centers around "road density." Unfortunately, these discussions usually wind up comparing, by way of analogy, leaves with branches with trees. Forest roads are to leaves as State highways might be to trees.

For example, the single lane dirt and gravel Forest Development Roads are more akin to a farmer's lane accessing the "back 40" than they are to an urban paved alley or driveway. However, a survey of rural road densities would likely not consider private farm lanes; a survey of urban road densities would likely not consider alleys and driveways.

Further confusing comparison of road densities are factors like gated roads, uninventoried roads and Wilderness areas.

Forest plans typically addressed Forest Development Road densities on a management area basis. Road densities excluded Wilderness and proposed Wilderness areas. While uninventoried nonsystem roads were often mapped, they are most typically dealt with as resource problems to be corrected rather than as part of road density. Some Forests in the Northern Region recognized a difference between open and gated roads in setting road density standards for wildlife management. In the Southern Region, some Forests have kept roads on the system but gated to provide maintainable wildlife openings.

The May 8, 1997, Price Waterhouse study "Financing Roads on the National Forest" reported road densities on private forest lands of 5 to 8 miles per square mile. These compare to National Forest road densities of:

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Total	191.6 million acres and 373,000 miles	=	1.25 miles per square mile gross
Less	34.2 million acres of Wilderness = 157.4 million acres and 373,000 miles	=	1.52 miles per square mile without wilderness

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## Road Funding Information

### Construction and Reconstruction

Figure 6 shows miles of road constructed and reconstructed since 1967.

There has been significant reduction in the overall road program, and particularly reduction in new construction. Figure 7 shows the miles of construction, reconstruction and decommissioning by Region for FY97. Table C shows funds and miles by appropriated and purchaser construction and reconstruction for FY95, 96, and 97. Funding information for construction and reconstruction are difficult to obtain since current reporting requirements do not require that FDR funds be separated between construction and reconstruction. Accounting for the purchaser credit program is required, and costs shown for these activities are more accurate.

In general, new road construction is predominately for local roads. Reconstruction includes collector and local roads.

Temporary roads are constructed when permanent roads are not required as part of the transportation system for the forest. Temporary road construction costs are included as part of an appraisal item in the timber sale contract. Costs are estimated and not tracked as a dollar per mile expense but rather as a cost per thousand board foot.

### Maintenance

Table D shows historic road maintenance funding.

Field estimates, as shown in the budget explanatory notes, are that current funding is sufficient to maintain about 40 percent of the roads to planned service levels. The balance of the roads are maintained according to priority safety and environmental needs. As noted in the Roads section above and in Table B, there is an inventory migration toward lower maintenance levels as forests adjust service expectations.

Commercial users, for example minerals or timber haulers, are responsible for traffic-generated maintenance commensurate with their use. Users may perform maintenance, e.g., surface grading and dust control, or may contribute to a cooperative fund for maintenance by the Forest Service, e.g., grading and surface replacement. The FS is responsible for maintenance for administrative and public traffic, and for non-traffic generated maintenance, e.g., roadside brushing and drainage repair. Commercial use maintenance has decreased proportional to the decrease in timber harvest.

Table E shows Regional road maintenance by road class for FY95, 96, and 97 (estimated). This information is not currently accounted for by maintenance level. Most Regions track this data, but some had to estimate the information.

The funding in Table E does not reflect the value of commercial user maintenance. Broadly, appropriated annual maintenance ranges from \$300-\$600/mile for maintenance level 3-5 roads, \$60-\$100/mile for maintenance level 2 roads, and \$20-\$40/mile for maintenance level 1 roads.



For comparison, a survey conducted by the Illinois Institute for Rural Affairs (IIRA) in 1994 identified average annual costs of maintaining a mile of gravel or loose aggregate road at \$7,986 for all counties, and \$1,995 for all townships. Paved road maintenance for all counties was reported at \$16,579 and \$10,752 for all townships. While county roads are public roads and generally maintained to a higher standard than Forest Development Roads, this information provides a perspective on the serious deterioration of FDR's and resultant growth of the reconstruction backlog.

Road maintenance on FDR's varies by maintenance level. For maintenance levels 3-5 the traffic-generated maintenance is the same. The road surface is maintained to provide for the passage of low-clearance vehicles, passenger cars. Surface blading and dust abatement are traffic-generated maintenance activities. Increased maintenance levels address non-traffic maintenance such as brush control for sight distance, ditch cleaning, sign maintenance, and litter pickup.

Maintenance activities on level 2 roads are focused on preventing resource damage and providing access for high-clearance vehicles. Brushing is performed to allow passage on the road but not for site distance. Surface maintenance is performed to control drainage and to allow high-clearance vehicle passage but not for user comfort.

Maintenance activities on level 1 roads are oriented to preventing resource damage. No surface maintenance is done other than that necessary to control drainage and minimize erosion. Motor vehicle use on level 1 roads is not a consideration for maintenance, although trail use may generate some maintenance.

## Decommissioning

There are many uninventoried roads still visible on the landscape, most dramatically in old timber sale areas of outdated logging technologies and standards. These were unengineered roads never intended for permanent highway vehicle access. Additionally, there are some existing Forest Development Roads (primarily maintenance level 1 and 2) no longer needed for permanent access as the result of evolving forest land allocation and current access needs. System road gating or decommissioning requires appropriate NEPA and public involvement.

Prior to 1991 forests were actively decommissioning roads, but we do not have adequate records to document their efforts. They used timber sales and sources of funding other than roads construction and maintenance funds.

In 1991, authority was provided to use up to \$5 million/year of road maintenance funds for road decommissioning. Until that time, to decommission, or stabilize and treat unneeded travelways, funding had to come from the benefiting function. It was not legal to use road funds for road decommissioning.

Decommissioning includes treatments that range from blocking the entrance, scattering boughs on the roadbed, revegetating, and water barring; to removing fills and culverts, reestablishing drainage-ways, and

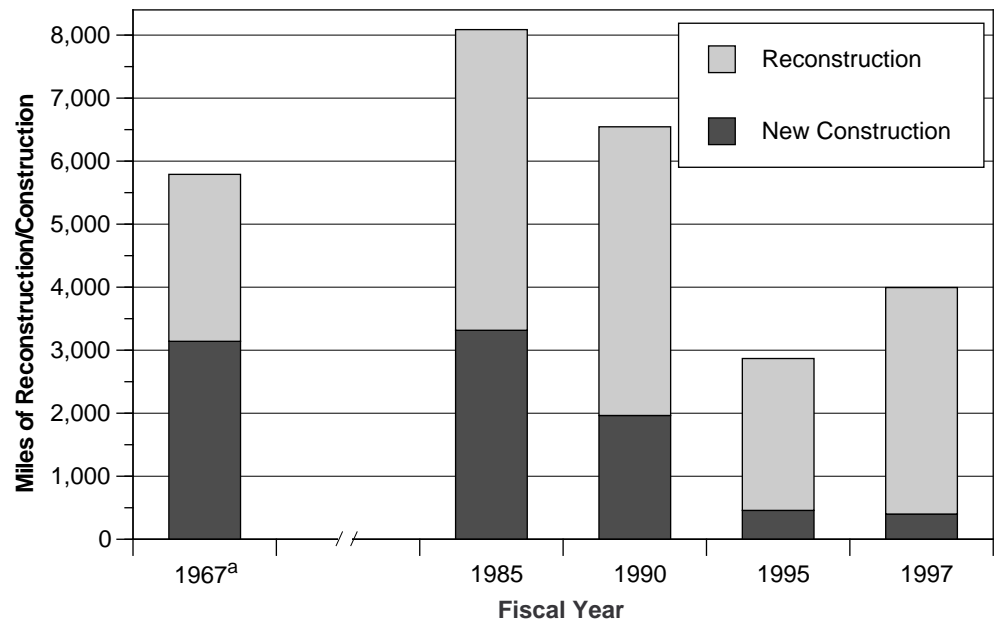
pulling back unstable road shoulders; to full obliteration by recontouring slopes.

The following shows the miles of road decommissioned since 1991.

Year	System Miles	Non-System Miles	Total Miles	Cumulative Miles
1991	3,400	1,570	4,980	
1992	3,400	1,180	4,570	9,550
1993	1,270	859	2,130	11,700
1994	1,580	709	2,290	14,000
1995	1,370	754	2,130	16,100
1996	848	591	1,440	17,500
1997	621	917	1,538	19,100

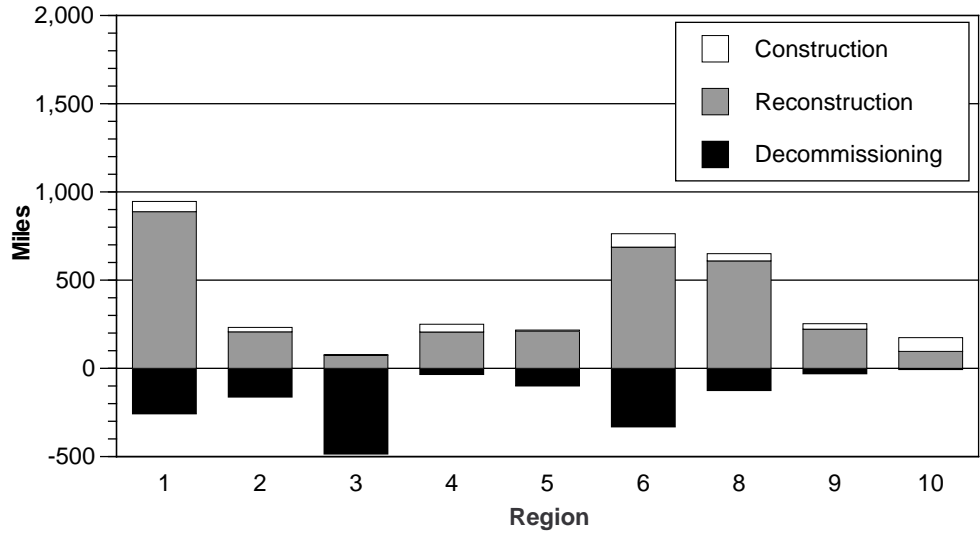
Miles of road decommissioning per year have decreased steadily as regular maintenance needs began to outweigh other priorities for the limited road maintenance funds and as controversy over closing roads increased. There are still many miles of road closure, stabilization, and decommissioning needed.

Table F shows road decommissioning by Regions and by funding source for 1997. The use of NFRD (road maintenance) funds has added significantly in leveraging other funds for decommissioning—for example, watershed and timber.



<sup>a</sup>Estimated based on inventory increase from 1966 Chief's Report of the Forest Service

**Figure 6. Forest Road Program Construction and Reconstruction**



**Figure 7.** Forest Road Program Construction, Reconstruction, and Decommissioning by Region, 1997

**Table C. Road Construction and Reconstruction Funding by Region**

Road Funding	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10
<b>1997 Construction</b>									
FRP\$ (thousands)	—	—	—	955	725	54	—	354.6	—
Miles	—	—	1.2	0.1	1	2	1.4	0.8	0.39
PC\$ (thousands)	1,954.5	379.5	—	610	235	1,509	—	7,528	—
Miles	57.9	25.3	0	44.2	5.5	73.5	40.1	29.74	78.53
<b>1996 Construction</b>									
FRP\$ (thousands)	60.8	—	1,036	739	1,795	75	—	502.7	—
Miles	0.6	—	2.7	3.7	2.4	1	1.2	1.4	0.8
PC\$ (thousands)	2,274.6	268.5	32	517	1,355.8	2,832	—	725.8	—
Miles	67.7	17.9	0	33.8	25.8	89	50.2	26.7	141.2
<b>1995 Construction</b>									
FRP\$ (thousands)	128.7	—	130	727	1,209.7	225	—	360.9	—
Miles	1.8	—	6.4	0.4	6.8	3.4	3.2	2.8	1.2
PC\$ (thousands)	595.4	748.5	37.1	415	1,007.3	1,789	—	779.5	—
Miles	28.3	49.9	2.3	60.4	20.9	75.3	49.6	33.5	123.5
<b>1997 Reconstruction</b>									
FRP\$ (thousands)	1,652	—	5,312	3,607	8,262.7	3,106.1	—	5,704.1	—
Miles	93.7	—	64.2	21	38.6	42.7	31.9	38.95	5.8
PC\$ (thousands)	3,800.5	207.3	326	1,681	4,985	6,162	—	1,788.2	—
Miles	793.8	207.3	11	184.8	170.9	643.9	577	182.79	89.62
<b>1996 Reconstruction</b>									
FRP\$ (thousands)	4,020.6	—	4,830	4,376	6,276.6	2,015	—	5,597.1	—
Miles	88.1	—	26.9	12.6	38.7	127.4	70.8	31.3	31
PC\$ (thousands)	3,427.3	575	40	1,596	8,501	7,490	—	941.1	—
Miles	534.9	57.5	0.1	214.4	292.4	589.8	391.5	158.7	92.4
<b>1995 Reconstruction</b>									
FRP\$(thousands)	5,281.8	—	5,714	3,544	6,239.8	1,850	—	6,422.2	—
Miles	189.2	—	45.9	13.8	51.8	140.7	46	74.1	16.2
PC\$	1,320.4	1,694	93	872	4,549.1	2,061	—	1,277.2	—
Miles	167.3	169.4	32.8	149.6	214.6	351.2	380.9	198.7	124.9

Data from Regional replies to September 24, 1997, call letter.  
Blanks reflect unavailable data.

**Table D. Historical Road Maintenance Funding**

Year	M\$
1998	84,974
1997	81,019
1996	81,000
1995	83,860
1994	79,180
1993	82,198
1992	85,891
1991	91,305
1990	96,886
1989	80,729
1988	83,740
1987	63,073
1986	61,856
1985	64,921

**Table E. Road Maintenance Funding by Maintenance Level and Region**

Road Funding	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	Total
<b>1997 Maintenance</b>										
NFRD\$ (thousands)	4,980	<b>3,660</b>	3,780	4,690	12,400	9,360	<b>5,670</b>	4,790	<b>1,500</b>	<b>50,800</b>
Miles Level 3-5	15,100	<b>7,390</b>	6,650	9,000	12,900	16,800	<b>10,500</b>	7,540	<b>1,060</b>	<b>87,000</b>
NFRD\$ (thousands)	1,530	<b>1,830</b>	2,860	1,590	1,900	5,550	<b>2,080</b>	960	<b>376</b>	<b>18,700</b>
Miles Level 2	19,100	<b>18,800</b>	38,300	23,000	24,600	55,000	<b>18,600</b>	13,400	<b>1,410</b>	<b>212,000</b>
NFRD\$ (thousands)	657	<b>609</b>	365	92	269	2,030	<b>584</b>	141	<b>105</b>	<b>4,860</b>
Miles Level 1	15,100	<b>4,040</b>	8,510	5,030	6,720	22,100	<b>6,000</b>	9,330	<b>987</b>	<b>77,800</b>
<b>1996 Maintenance</b>										
NFRD\$ (thousands)	4,960	<b>3,680</b>	3,490	4,400	12,000	8,590	<b>5,630</b>	4,830	<b>913</b>	<b>48,500</b>
Miles Level 3-5	16,000	<b>7,590</b>	6,660	9,160	12,900	17,000	<b>7,720</b>	7,920	<b>997</b>	<b>85,900</b>
NFRD\$ (thousands)	1,510	<b>1,820</b>	2,290	1,650	2,010	6,650	<b>2,300</b>	960	<b>374</b>	<b>19,600</b>
Miles Level 2	20,400	<b>19,300</b>	38,800	21,800	24,600	56,200	<b>19,700</b>	13,400	<b>1,410</b>	<b>216,000</b>
NFRD\$ (thousands)	652	<b>607</b>	651	84	309	2,010	<b>597</b>	230	<b>97</b>	<b>5,240</b>
Miles Level 1	14,100	<b>5,070</b>	10,900	5,360	6,730	21,100	<b>7,720</b>	9,250	<b>987</b>	<b>81,200</b>
<b>1995 Maintenance</b>										
NFRD\$ (thousands)	5,280	<b>3,390</b>	3,880	3,910	10,600	9,480	<b>5,500</b>	4,620	<b>746</b>	<b>47,400</b>
Miles Level 3-5	15,500	<b>7,710</b>	6,720	9,120	12,900	17,900	<b>7,370</b>	7,940	<b>708</b>	<b>85,900</b>
NFRD\$ (thousands)	1,580	<b>1,690</b>	2,700	1,500	1,620	5,620	<b>2,140</b>	948	<b>290</b>	<b>18,100</b>
Miles Level 2	19,500	<b>19,600</b>	36,600	22,000	24,600	56,600	<b>21,100</b>	16,000	<b>2,020</b>	<b>218,000</b>
NFRD\$ (thousands)	1,190	<b>565</b>	377	75	240	1,900	<b>575</b>	139	<b>78</b>	<b>5,130</b>
Miles Level 1	15,400	<b>5,150</b>	8,460	4,700	6,730	20,100	<b>6,670</b>	8,950	<b>641</b>	<b>75,900</b>

Notes:

1. Estimates are shown in bold italics.
  2. For FY 97, where miles were not provided, inventory miles were used.
  3. For FY 95 and 96 fund breakdown between maintenance levels was estimated using averages of reporting regions.
- Data from Regional replies to September 24, 1997, call letter.

**Table F. Road Decommissioning Funding by Region**

	R-1	R-2	R-3	R-4	R-5	R-6	R-8	R-9	R-10	Total
<b>1997 Decommissioned</b>										
NFRD\$ (thousands)	23.6	7.8	177	1.0	165.4	550.0	10	0.7	32.1	968
Miles	24.2	48	349	3	15	142	34	1.5	4	621
Other\$ (thousands)	892.7	70.3	96.5	92.0	709.7	1,542.0	183.3	25.3	25.8	3,638
Miles	233.4	115	137	32	85	190	92.1	29.1	3	917

Data from Regional replies to September 24, 1997, call letter.

## Reconstruction Backlog

While there is little historical data, it is commonly recognized that most of the arterial/collector road system has been in place for a long time, with an estimated 75 percent over 50 years old. Due to traffic and environmental deterioration, insufficient maintenance, and increased traffic and design standards, this portion of the system has accrued an enormous need for reconstruction. Additionally, efforts to minimize standards (prudent operator) and costs for purchaser-constructed roads has resulted in planned stage construction, with each stage including only the development needed for a given sale. This has further exacerbated the reconstruction need. Typically, Regions have not quantified this reconstruction backlog because the prospects of funding this need are very dim. Just the top 3-5 priority road projects per forest totaled over \$400 million in 1997, more than four times the available funds.

As part of a Regional infrastructure initiative in FY97, Region 4 inventoried their critical arterial/collector road reconstruction needs. This included 3,900 miles with an estimated reconstruction need of \$1,066 million. Proportioning this critical need for the R-4 total arterial/collector miles against the other Regions arterial/collector miles (Table G) indicates a Service-wide critical need of over \$10 billion. This figure does not include the less critical repairs on arterial/collector roads, or any consideration of local road reconstruction needs. A 20 year sustained program of \$500 million/year would be necessary just to mitigate this critical backlog, much less resolve the rest of the system needs which continue to accumulate.

Bridges are critical road safety features, and also provide critical access gateways to forest lands. The Forest Development Road system includes approximately 7,400 bridges. Assuming a generous design life of 50 years, the replacement rate for bridges would be 150 per year. Figure 5 shows over 400 bridges already over 50 years old. Considering the large proportion of timber bridges, limited maintenance, and evolving design standards, the needed replacement rate is something greater than 150 per year.

The actual bridge replacement rates have been:

	FY 95	96	97	98 (planned)
Appropriate Construction	40	33	21	4
Purchaser Construction	9	22	10	15
Total	49	55	31	19

Clearly, the backlog of bridge replacement is growing dramatically.

Public road construction/reconstruction is largely funded by the user gas tax. These funds are collected into the Highway Trust Fund and expended by multi-year allocation legislation, such as the 1993 Inter-modal Surface Transportation and Efficiency Act (ISTEA). However, gas tax generated while driving on Federal land currently does not fund forest development roads. The Forest Service is working with other Federal agencies to explore funding appropriate Federal roads from the Highway Trust Fund. Because arterial and collector Forest Development Roads are maintained for passenger cars, we propose that these would be appropriate roads.

**Table G. Reconstruction Backlog Estimate**

<b>Region</b>	<b>Total</b>	<b>Maintenance Levels 3-5</b>	<b>Million \$</b>
1	49,393	15,144	<b>1,848</b>
2	30,252	7,392	<b>902</b>
3	48,976	5,993	<b>731</b>
4	37,451	8,738	1,066
5	44,186	12,876	<b>1,571</b>
6	93,886	16,800	<b>2,050</b>
8	35,096	10,484	<b>1,279</b>
9	30,257	7,536	<b>919</b>
10	3,458	1,059	<b>129</b>
		Total	<b>10,495</b>

Estimates shown in bold italics.

## Road Use

Traffic counting, particularly as it might identify the types of vehicles, has not been accomplished on any Forest for many years. Even older studies were primarily focused on needs of a particular road or recreation area, and were not used to characterize the overall transportation system by user and type of road. However, road use can be characterized to some extent within reasonable assumptions.

Figure 8 displays the Forest Service timber harvest and recreation visitor days since 1950. Clearly the timber program increased, leveled off, then dropped off, while recreation traffic has maintained a very steady and significant growth. The draft 1995 RPA program projects that recreation will grow by 64 percent by the year 2045. However, these data do not relate these traffic in common units.

The following assumptions were used to estimate a common unit of vehicles per day to compare administrative traffic, timber harvest traffic, and recreation traffic:

- 1. Management Traffic**—50 percent of employees are field going, being 50 percent of the time in the field during a 100-day field season.
- 2. Timber Harvest**—5 MBF/truck plus one associated support vehicle (crew truck, yarders, loaders) per log truck, with all harvest within a 100-day field season.
- 3. Recreation Traffic**—Two recreation visitor days per vehicle with all recreation within a 100-day season.

Clearly these are broad assumptions. Several employees sometimes occupy one vehicle and Forests may have a longer field season, both of which would reduce the apparent management vehicles per day. Truck capacity and associated support vehicles come from road surfacing design experience. Timber harvest in some areas involves a longer field season, which would reduce the apparent vehicles per day. The recreation visitor days per vehicle comes from staff estimates. Some areas have a longer recreation season, including winter sports, which would reduce the apparent vehicles per day. However, the FY96 recreation use data showed less than 6 percent due to winter sports, and much of this use is limited to the plowed public roads. On the other hand, many recreation visits are less than a day, which might indicate a significantly higher recreation traffic/day. More precise criteria might be developed, but these seem sufficient for order-of-magnitude comparison.

Based on these assumptions, Table H and Figure 9 compare the vehicles per day for timber harvest and recreation on the total forest road system. For example, traffic in 1950 and 1996 were:

	1950	1996
Recreation vehicles/day	137,000	1,706,000
Timber harvest vehicles/day	14,000	15,000



For comparison, the current 37,000 FS employees would indicate an administrative traffic of 9,000 vehicles/day.

While the FDR system has grown significantly (Figure 2), recreation use has grown even faster (Figure 9). Recreation traffic per mile of road in 1996 is over five times greater than that in 1950.

	1950	1996
Rec. vehicles/day	137,000	1,706,000
FDR mile	165,000	373,000
Traffic per mile	0.8	4.6

Westside forest in Region 6 are a notable exception to these service-wide averages. Although specific data are not available, there are significant miles of Region 6 road for which timber haul determined higher road standards than otherwise needed for other Forest uses. With the significant decrease in harvesting in these areas, maintenance levels on many miles of road are being reduced from 3 and 4 to maintenance levels 1 and 2, and many miles of maintenance level 1 and 2 roads are expected to be decommissioned.

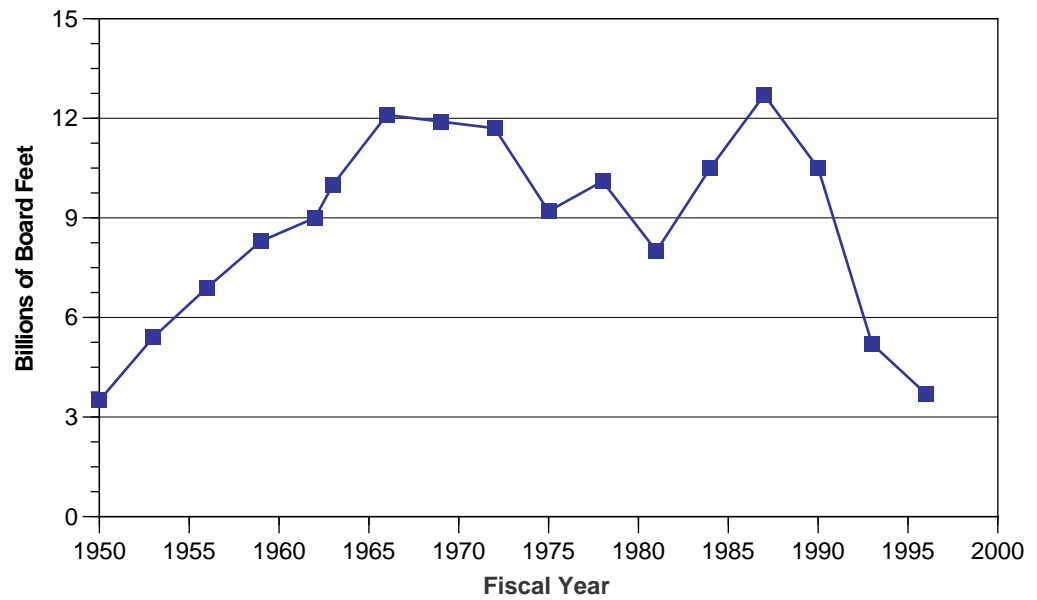
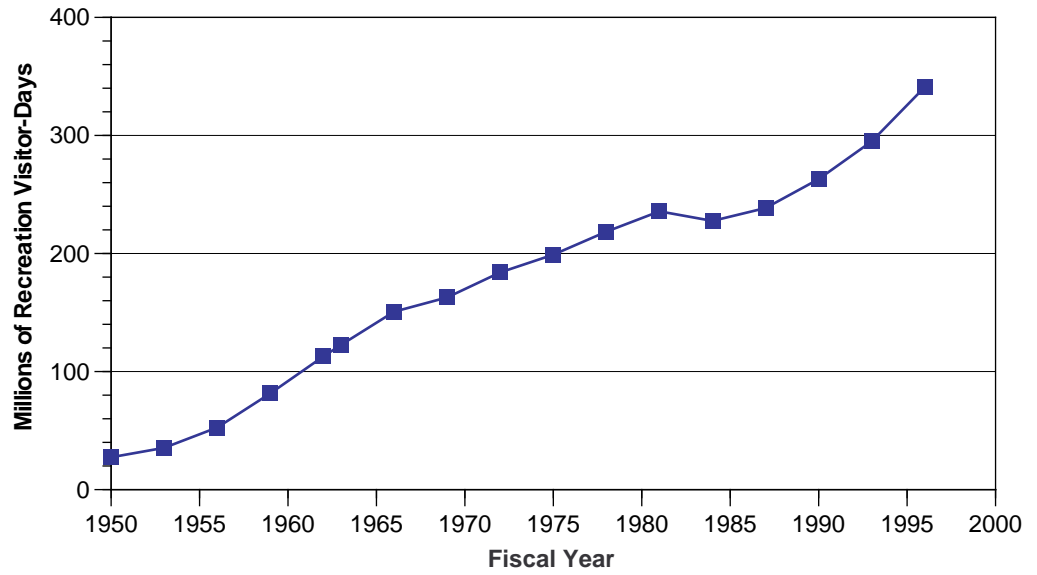
Table I compares Forest Development Road recreation vehicle-miles/day driven with FDR function class and miles. Recreation vehicle use by road category has been estimated based on road design guidelines to shift from single to double lane when traffic exceeds 100 vehicles per day (assumed between arterial and collector roads), and on anecdotal observations for traffic on maintenance level 2 roads ranging from 1 to 20 vehicles per day. Because maintenance level 1 roads are restricted to management and protection vehicle access, recreation vehicle access is assumed as zero. Because of the decreased user service levels resulting from road deterioration and limited maintenance budgets (see Table B), it is probable that use is higher at lower maintenance levels, for example passenger car use on former maintenance level 3 roads which were reduced to maintenance level 2.

The FY96 *Report of the Forest Service* displays recreation use by State by activity. The largest single recreation use activity is Mechanized Travel and Viewing Scenery, often referred to as “driving for pleasure.” Driving for pleasure contributed 35.8 percent of all Forest Service recreation use in FY96.

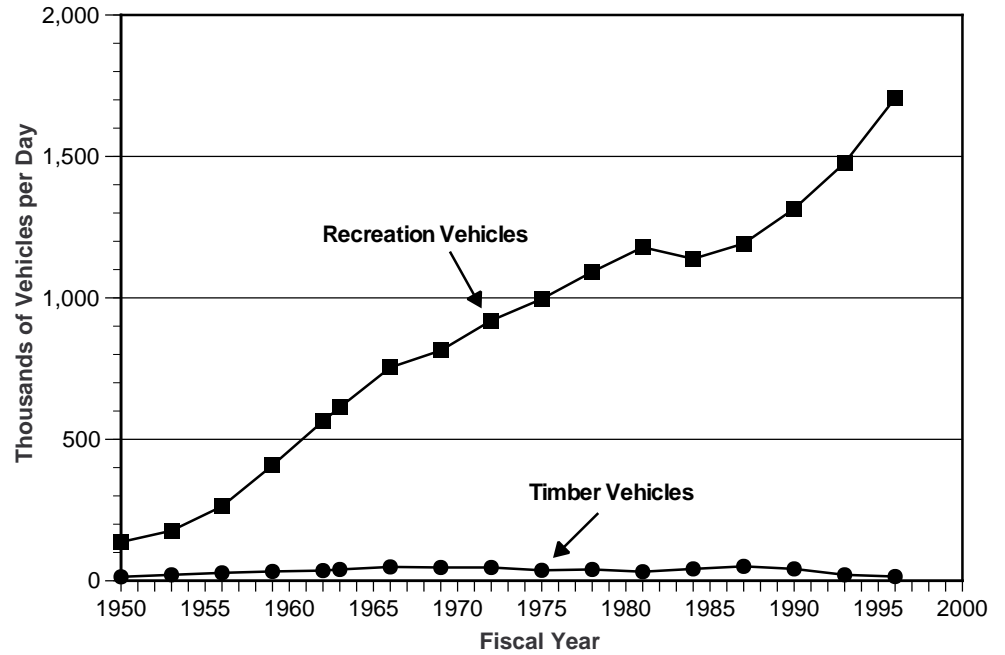
Based upon Recreation staff recommended groupings of recreation visitor use as “developed” or “dispersed,” Figure 10 shows the trends in recreation use over time. It appears that nearly 60 percent of the use is dispersed, and dispersed use is growing faster than developed use.

Relating developed and dispersed uses to the Forest Development Road system, clearly all users travel the arterial/collector roads (maintenance levels 3–5). Most all developed recreation sites are accessible by passenger car, which includes the arterial/collector roads. Some significant but indeterminate proportion of the dispersed recreation use continues on the

lower standard roads. These more numerous level 2 roads individually receive significantly less traffic. However, these are the roads that permit dispersion; they are the capillaries that feed the forest visitors quest for a natural outdoor experience, peace and personal renewal. This is the special Forest Service contribution to the recreating public. As maintenance level 2 roads may be closed or decommissioned, there will be some indeterminate deterioration of dispersed recreation experience due to increase densities resulting from displaced users. Further, these maintenance level 2 roads are highly valued by local users, and closure proposals will become very contentious. Maintenance level 1 roads, though gated, are used to further disperse visitor use by hiking, horse riding, snowmobiling, etc.



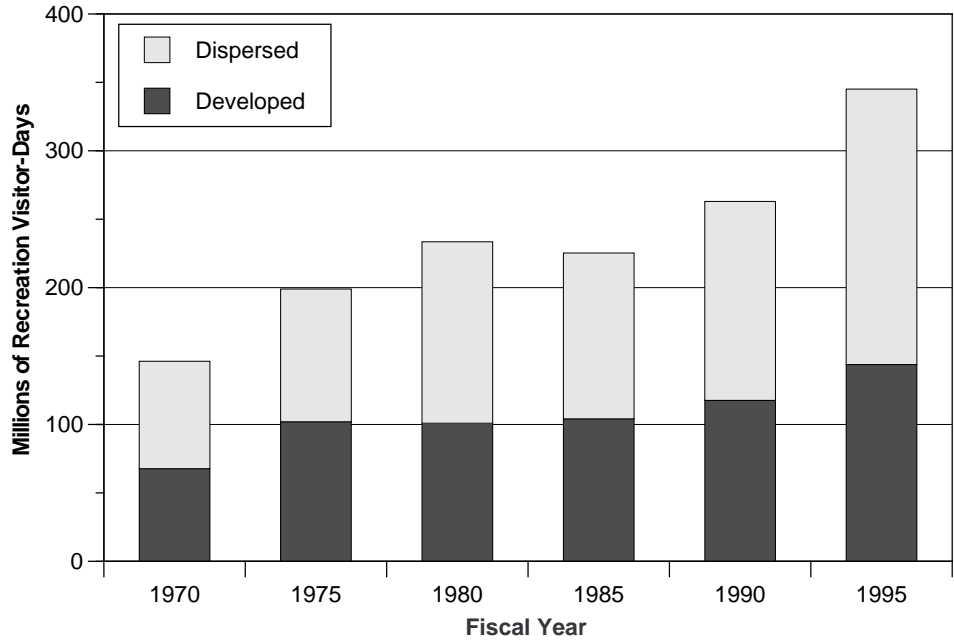
**Figure 8.** *Timber Harvest and Recreation Visitor-Days, 1950–96*



**Figure 9.** Timber Harvest and Recreation Vehicles per Day, 1950-96

**Table H.** Timber and Recreation Road Use

FY	RVD'S (thousands)	Timber Harvest (BBF)	Recreation Vehicles (1,000 veh./day)	Timber Vehicles (1,000 veh./day)
50	27.4	3.5	137	14
53	35.4	5.4	177	21
56	52.6	6.9	263	28
59	81.5	8.3	408	33
62	112.8	9.0	564	36
63	122.6	10.0	613	40
66	150.7	12.1	754	49
69	162.8	11.9	814	47
72	184.0	11.7	920	47
75	199.0	9.2	996	37
78	218.5	10.1	1092	40
81	235.7	8.0	1179	32
84	227.6	10.5	1138	42
87	238.5	12.7	1192	51
90	263.0	10.5	1315	42
93	295.0	5.2	1477	21
96	341.0	3.7	1706	15



Source: Report of the Forest Service

**Figure 10.** Developed and Dispersed Recreation Uses

**Table I.** Recreation Vehicle Miles per Day by Forest Development Road Category

FDR Category	System		Recreation	
	Miles	Percent	Percent	Miles per Day
Arterial	12,000	7	57	7,800,000
Collector	74,000	16	27	3,600,000
Local-Open	210,000	56	16	2,200,000
Local-Closed	77,000	21	0	0
Total	373,000	100	100	13,600,000

## Further Data Considerations

1. **Redisplay Data by Eco-Region.** Those data currently available by Forest or State could be grouped and displayed by forest or state bounded eco-region. Those data noted as not available by Forest would necessitate various levels of effort and time to gather. These were generally not gathered as part of the initial data because of the significant time and workload impact.
2. **Land Allocation.** RARE II data by Forest/State are moderately available. RARE II data by Congressional District would require a significant forest impact.

Considerable interest was expressed in quantifying roadless areas smaller than 5000 acres (RARE II), e.g. 1,000 acres. When Forests complete GIS implementation as part of the next round of Forest planning, various roadless inventory scenarios will be possible. Currently, very few forests have the inventory and land allocation in a GIS environment to make roadless determinations.

Forests with this capability can be inventoried and sampled as examples. However, it is not anticipated that the current availability would be sufficient to extrapolate into any meaningful interpretation.

Preliminary contacts on the Southern Appalachian Assessment have given conflicting indications as to what roadless information was developed. A more formal followup will be necessary.

Any study of roadless areas will require clear and common understanding of definitions. While "a road is a road is a road" seems to simplistically state the issue, perceptions vary based on travelways being "visible" even if not available for use being physically closed by stabilization and drainage removal, being open or closed to ORV's, being physically barriered or gated, being closed to motorized use some or all the time by Forest Plan or closure order, etc. Also, there are various road densities being quoted and compared with no description of definitions, standards or cited data sources.

Relating road information to various land allocation categories has also been proposed. Such a relationship will require implementation of GIS and some common definitions of land allocation categories.

3. **Road Construction, Reconstruction and Decommissioning by System Classification.** Currently these data are not available, and it is not anticipated that the accounting or reporting codes will be expanded to generate this information. It may be practical to sample Forests or Districts to some level of confidence. Engineering and Research will investigate the feasibility of such a statistical sampling plan.

- 4. Forest Development Road System Expansion and Age by System Classification.** Bob Wolf provided some road age distribution by percentage data of unknown date, source or accuracy. We have only limited historical data on the overall system age, condition or growth. These data give perspective on use and reconstruction backlog. There is a good chance that a copy of old 7700-9R road inventory is hidden away in a Regional Office drawer, or a retiree's memorabilia. This would give a 1970-era bench mark. Prior to the 1964 Roads and Trails Act, there were no formal definitions, and it is unlikely that any comprehensive inventory ever existed.
- 5. Traffic Counts and Type by System Classification.** This data has not been gathered for many years. Even when data was gathered, it was not taken to measure the whole system by system classification. Historical data is not available. Current data would require development of a statistically defensible sampling plan, at least one year, and a significant investment in funds and staff to obtain.
- 6. ROW's Needed.** There are two categories of Right-of-Way needs: Those needed by private interest, e.g. to private lands or mineral rights; and those needed by the public, e.g. forest lands blocked to public access by private land, and undocumented government easement over old existing roads. These needs have not been documented and quantified, and it would require specific forest planning direction to resolve.