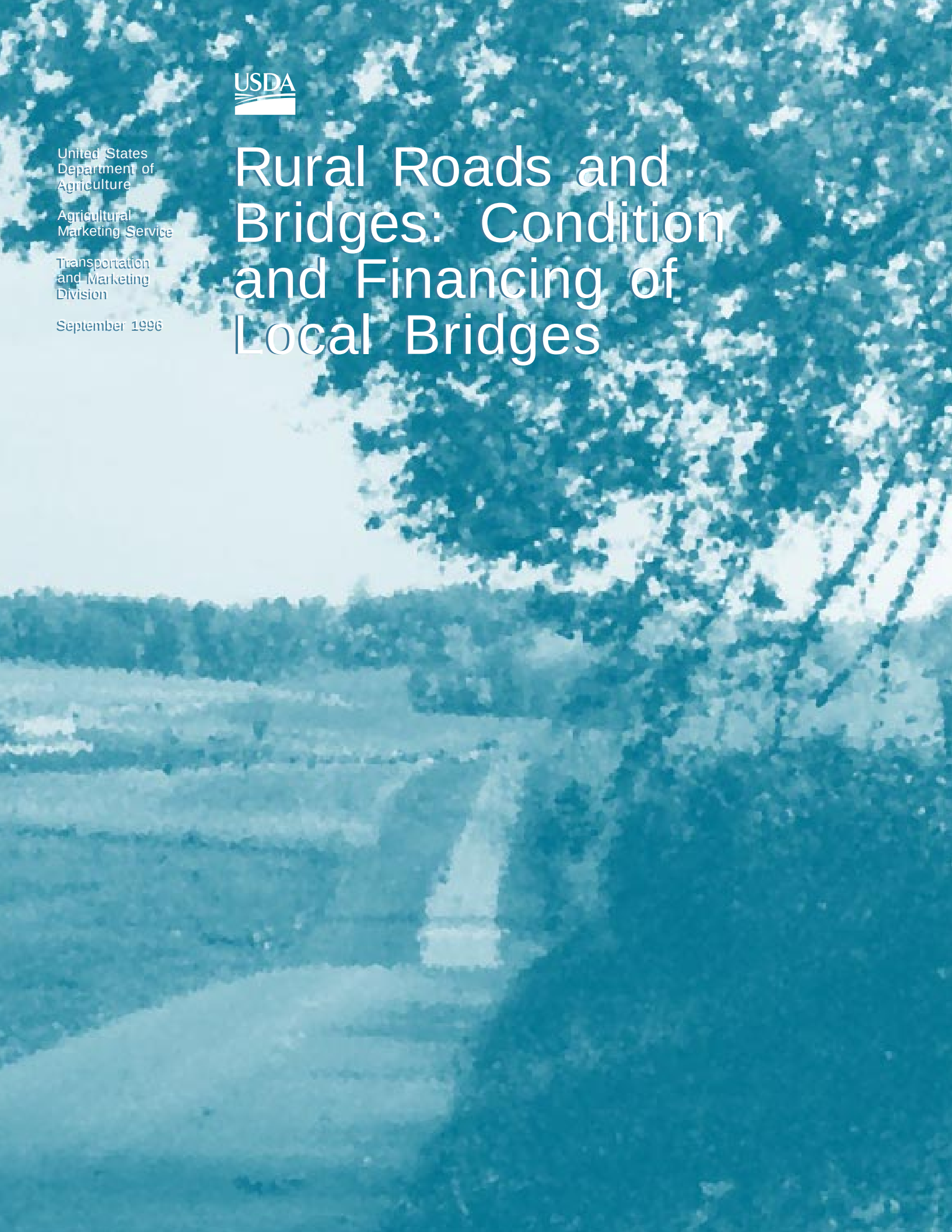

United States
Department of
Agriculture

Agricultural
Marketing Service

Transportation
and Marketing
Division

September 1996

Rural Roads and Bridges: Condition and Financing of Local Bridges

United States Department of Agriculture

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Rural Roads and Bridges: Condition and Status of Roads

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This report was prepared under a cooperative agreement between the U.S. Department of Agriculture, Agricultural Marketing Service (AMS) and Western Illinois University and the University of Wisconsin. Martha Bearer of the AMS Transportation and Marketing Division administered this agreement.

ACKNOWLEDGEMENTS
The authors thank Lori York and Stacey Swisher of the Illinois Institute of Rural Affairs, Western Illinois University, Macomb, Illinois, for data entry and tabulation.

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Introduction

The condition of local bridges is important to both the quality of life and the successful transaction of business in rural areas. Nearly one-fourth of the bridges maintained by counties and towns/townships[1] in rural areas, however, were built before 1940 and have outlived their effectiveness. The transportation modes were different then and weight requirements are much higher now. Farm consolidations during the 1980s, with the resulting large farm operations, made many bridges inadequate because they could no longer carry expected weights. Nearly 40 percent of the rural bridges maintained by counties and towns have restrictions posted or are closed. Increased traffic by nonfarm rural residents who commute daily to work or to shop creates additional demands on the bridges. Higher expectations by rural residents for health care services and increased traffic from tourism and other economic development activities mean that bridges must be able to accommodate higher traffic demands in many instances.

While traffic demands on bridges increased, local resources available to rehabilitate or reconstruct them declined, as farmland prices decreased in the 1980s and farm groups sought revisions in property tax assessment procedures to lower tax burdens. Some of these losses were offset by greater assistance from State governments, but local governments, typically, do not have access to broad-based taxes that generate the funds necessary to maintain bridges as well as other public services.

During the 1970s and 1980s, the Federal General Revenue Sharing (GRS) program provided some financial relief to local governments in rural areas. These funds were spent on a wide variety of public uses such as infrastructure projects. In many rural areas, roads and bridges were the main use of the funds.[2] Unfortunately for local governments, GRS funds dwindled in the 1980s and were eliminated in 1987.

The national economic expansion during the late 1980s left many remote rural areas lagging behind metropolitan (metro) areas in both population and economic activity. This was especially true in agricultural-based economies. With lagging property tax bases, local officials encountered difficulty in raising revenues to rehabilitate and replace bridges. Fortunately, a Federal bridge program provided assistance and many States allocated a portion of the motor fuel tax funds to bridge purposes.

This report examines the condition of rural county and town bridges across the United States, with comparisons based on two data sets. Rural is defined as

[1]While towns (New England) and townships (Midwest) are distinct, in this report, we use the term "towns" to represent both groups.

[2]David L. Chicoine and Norman Walzer. *Financing Rural Roads and Bridges in the Midwest*. U.S. Department of Agriculture, Office of Transportation, Washington, DC, October 1984.

counties with less than 85 percent urbanized population (according to the 1990 Census). Surveys were mailed to highway administrators in 2,321 counties and 9,064 towns in fall 1994 and spring 1995. A total of 539 counties and 1,961 towns provided usable information.[3] The questionnaire asked respondents to rate the condition of bridges for which they are responsible, especially those less than 20 feet long. It also asked about management practices used in bridge construction and maintenance, plus a variety of questions about concerns facing local transportation officials. A second source of information on bridge conditions, especially those 20 feet or longer, is the National Bridge Inventory (NBI) compiled by the Federal Highway Administration (FHWA).

Three main issues are discussed in this report. First, the current condition of bridges--those less than 20 feet as well as those 20 feet or more in length--is examined. Special attention is paid to whether conditions have improved or worsened since 1989.[4] Second, the adequacy of funds available for bridges is discussed to determine whether local administrators can maintain current structures and/or meet expansion needs. Finally, the management practices used to maintain bridges are examined and potential needed changes are discussed.

Age and Condition of Bridges

According to the NBI, rural county and town highway administrators have prime responsibility for constructing and maintaining 203,490 bridges, excluding culverts. This number does not include bridges of less than 20 feet that were part of the inspection process. Bridges are important because they provide access to essential services for rural residents as well as opportunities to market farm commodities. Bridges vary in size and travel demands placed on them; therefore, the costs of construction and maintenance also vary.

In this report, bridge conditions are presented in two formats. In the mail survey, highway administrators classified bridges (less than 20 feet) into 10 condition categories, ranging from “closed and awaiting repairs” to “superior to present desirable criteria.” Information on the structural condition of bridges of 20 feet and more was obtained from NBI data. Since bridge condition information is from two sources, it is not always completely comparable, but the NBI ratings certainly influence the ratings submitted by local highway administrators because they represent a ready source of information on bridge condition.

In 1994 those responding to the posting question indicated that of the 203,490 bridges on the NBI, 112,288 (55.3 percent) have an open structure; i.e., neither

[3]There were actually 609 counties that responded to the survey. In this report, “local” bridges were examined; counties with an urban population greater than 85 percent were dropped from the analysis.

[4]The FHWA changed the criteria for bridge ratings in 1987, making data prior to that time not comparable with later years. We used 1989 as a benchmark to adjust for these differences in criteria.

posted for weight limits, nor should be posted, nor closed to traffic. A total of 10,614 (5.2 percent) are open but should be posted, and 77,496 (38.1 percent) were posted at the time of reporting (December 1994). An additional 2,802 (1.4 percent) bridges were closed. A comparison by region shows that 78.3 percent of the bridges in Western States were open, while 41.1 percent of bridges in Southern States were open. These wide differences demonstrate that regional variations are important as far as bridge conditions are concerned. In the South, for instance, 47.7 percent of the bridges were posted. Examples can be found on well-traveled highways where low speed limits are placed on bridges to protect them from heavy vibrations caused by truck travel.

Thus, overall and especially in the South, nearly one-half of the bridges maintained by counties and towns are not in good condition. This condition relates to age of structure; only 57 percent of the bridges were built, or have been rebuilt, since 1960. In other words, more than 40 percent of the bridges on the inventory are more than 35 years old. In the South, nearly one-quarter (24.5 percent) of the county/town bridges were constructed or rebuilt prior to 1950 and 38.8 percent were constructed prior to 1960. The age of bridges goes a long way in explaining their condition.

Bridges of Less Than 20 Feet

While smaller bridges are not as costly to repair or replace, they are numerous, and failures can seriously impede traffic. In 1994 (**table 1**), counties responding to the mail survey reported that 69.2 percent of the bridges of less than 20 feet met the minimum tolerable condition, with a high priority to repair (4 rating and higher). One in five (19.9 percent) were in basically intolerable condition, with a high priority to repair, or worse condition (3 rating and below). This condition level is consistent with the information on bridges being posted for weight limits. The important point, of course, is the weight at which a bridge is posted and the detours required by the weight limits.

Town bridges were in slightly poorer condition, with 62.6 percent reported as meeting minimum tolerable condition, with a high priority to repair, or worse (4 rating and higher), and 26.5 percent were in an intolerable condition or needing immediate attention (3 rating and below). Thus, depending on the condition indicator used, more than one in three bridges, or one in four, respectively, can be classified as in relatively poor condition. Although many bridges in remote areas are traveled infrequently, they are often an important link to employment centers or essential public services.

Changes in travel demands on bridges are sometimes beyond the control of local officials. For example, a family with school-age children may move to a house on a formerly infrequently traveled road. The need to transport these children to school by bus may mean costly repairs to the bridge for safety reasons, unless the school district can use smaller vehicles and/or access the house from a different

Table 1. Condition of Local Bridges (Less Than 20 Feet), 1994

		Counties				*Towns*			
Condition Description	*Rating*	*Cumulative Pct.*	*Pct.*	*Number Bridges*	*(n)*	*Cumulative Pct.*	*Pct.*	*Number Bridges*	*(n)**
Superior to Present Desirable Criteria	9	100.0	9.8	3,313	128	100.0	11.5	686	107
Equal to Present Desirable Criteria	8	90.2	16.6	5,611	240	88.5	14.8	883	239
Better Than Present Minimum Criteria	7	73.6	12.9	4,360	225	73.7	11.6	692	194
Equal to Present Minimum Criteria	6	60.7	15.2	5,138	280	62.1	13.5	805	247
Better Than Minimum Adequacy To Tolerate Being Left in Place As Is	5	45.5	14.7	4,969	248	48.6	11.2	668	157
Meets Minimum Tolerable Condition Requiring High Priority To Repair	4	30.8	10.9	3,684	232	37.4	10.9	650	167
Basically Intolerable Condition Requiring High Priority To Repair	3	19.9	7.4	2,501	141	26.5	6.4	382	51
Basically Intolerable Condition Requiring High Priority of Replacement	2	12.5	7.1	2,400	146	20.1	8.8	525	81
Immediate Repair Necessary To Put Back Into Service	1	5.4	3.0	1,014	44	11.3	5.9	352	16
Closed, Awaiting Repairs or Replacement	0	2.4	2.4	811	50	5.4	5.4	322	16

**number responding*

Source: Illinois Institute for Rural Affairs, National Association of Counties/National Association of County Engineers (NACo/NACE) Survey of County Officials and National Association of Towns and Townships (NATAT) Survey of Township Highway Officials, 1994.

approach. The adjustments needed to provide services mean additional expenditures for rural governments.

While counties reported 2.4 percent of bridges closed and awaiting repairs, 5.4 percent of town-maintained bridges were reported in this category. Information was not available on the number of bridges that could be closed without seriously impeding traffic, and it may be that some bridges identified as closed could be taken out of use. However, since the NBI information is used in allocating bridge program dollars, the intent is to include only those bridges that will remain in use.

Bridges 20 Feet and More

The most complete information on the condition of bridges 20 feet and more is from the NBI.[5] Because common inspection practices and standards are employed, these data are more consistent among States than responses from the mail survey. The complete 1994 NBI data set includes 182,421 county-maintained and 21,069 town-maintained bridges.

On average, 70.7 percent of the county bridges and 81.8 percent of the town bridges meet minimum tolerable limits to be left in place as is (**table 2**). As noted above, these bridges can be posted for weight limits and still be left in service. Likewise, 29.3 percent of the county and 18.2 percent of the town bridges were rated as basically intolerable with a high priority for corrective action (3 rating and below). These comparisons suggest that the longer bridges are in somewhat better condition than those of less than 20 feet. This may be because heavier traffic demands, both weight and volume, require that more attention be paid to them. Heavily traveled bridges probably receive larger local allocations of resources, and bridges with higher traffic demands probably also receive higher priority in State or Federal funding programs.

The data indicate that bridge repair and replacement receive an increasing share of available funds. During a 5-year period starting in 1990, obligations for new bridges declined from 34 percent of total obligations to 22 percent in 1994. Bridge replacements represent the largest share of project obligations, averaging more than 40 percent during the 5-year period.[6] One might expect that the bridges in the worst condition will be replaced, leaving more attention to be paid to rehabilitation efforts in the future.

The percentage of bridges rated as closed was minimal in both counties and towns; however, 23.3 percent of county bridges and 12.7 percent of town bridges were in intolerable condition with a high priority for replacement (2 rating and

[5]The last inspection date for which information is available is December, 1994.

[6]U.S. Federal Highway Administration. *1994 Highway Statistics.* U.S. Department of Transportation, Federal Highway Administration, October 1995, p. IV-40, Washington, D.C., 1995.

Table 2. Condition of Local Bridges (20 Feet and More), 1994

		Counties			*Towns*		
Condition Description	*Rating*	*Cumulative Pct.*	*Pct.*	*Number Bridges*	*Cumulative Pct.*	*Pct.*	*Number Bridges*
Superior to Present Desirable Criteria	9	100.0	0.6	1,107	100.0	1.1	226
Equal to Present Desirable Criteria	8	99.4	10.2	18,606	98.9	20.2	4,238
Better Than Present Minimum Criteria	7	89.2	8.4	15,340	78.7	10.1	2,126
Equal to Present Minimum Criteria	6	80.8	16.9	30,786	68.6	22.1	4,667
Somewhat Better Than Minimum Adequacy To Tolerate Being Left in Place As Is	5	63.9	17.8	32,402	46.5	15.0	3,146
Meets Minimum Tolerable Limits To Be Left in Place As Is	4	46.1	16.8	30,681	31.5	13.3	2,788
Basically Intolerable Requiring High Priority of Corrective Action	3	29.3	6.0	10,897	18.2	5.5	1,166
Basically Intolerable Requiring High Priority of Replacement	2	23.3	21.9	39,793	12.7	10.9	2,285
This Value of Rating Code Not Used	1	—	—	—	—	—	—
Bridge Closed	0	1.4	1.4	2,608	1.8	1.8	372

Source: U.S. Department of Transportation, Federal Highway Administration, National Bridge Inventory, December 1994.

below). Some of these bridges may not be safe for occasional heavy loads which travel over them, but are adequate for the vast majority of traffic.

Construction materials can also have an effect on the condition of local bridges. Concrete bridges have an average 5.9 rating, followed by steel bridges which have an average 4.1 rating. Timber bridges have the lowest rating at 3.5. Almost one in six bridges (16.2 percent) is a timber bridge. Over half (50.7 percent) of the timber bridges are located in the South.

An important question is whether bridge conditions are improving or worsening. County and town highway administrators were asked to estimate what percentage of their bridges had improved, remained the same, or declined since 1989 (**table 3**). On average, 16.6 percent of the county bridges and 25.9 percent of the town bridges were reported as having improved during this period, with the highest percentages reported in New Mexico (50.0 percent), Kentucky (42.1 percent), and Arkansas (33.3 percent). States reporting relatively minor improvements include California (5.4 percent) and New Jersey (7.0 percent). Several other States reported lower percentages with improvements but the number of counties reporting was small.

At the other extreme, 20.7 percent of the bridges were reported as having declined in condition. While rural bridges may seem more likely to have declined because of the sluggish tax base, there is virtually no difference between metro and nonmetro counties in the percentages which had declined. Likewise, no substantial difference was found in the proportions reported to have improved in condition.

States with substantial percentages of bridges having declined in condition since 1989 include Montana (46.7 percent) and Georgia (32.9 percent). It is important to note the relatively larger number of counties reporting a greater percentage of bridges in which conditions had declined than had improved. This point will be made in later discussion to demonstrate the shortfalls in funding available for bridge purposes. The figures presented show that many county highway officials do not perceive that they have made significant progress in meeting bridge needs and some think conditions have worsened.

Whether all existing bridges are needed to meet local travel demands is a question that is often raised. The rural road network was created at a time when travel was much slower and more difficult, and detours meant long delays and inconvenience. With larger farms and faster moving equipment, some bridges could possibly be eliminated or modified to minimize maintenance and/or replacement costs.

As noted previously, a major factor underlying bridge condition is age of structure. Based on 1994 NBI information, the average age of bridges in the best

Table 3. Bridge Conditions, by State, 1994

State	Improved	Remained the Same	Declined	(n)
Counties:				
Alabama	10.0	65.0	25.0	1
Arizona	28.7	65.3	6.0	5
Arkansas	33.3	36.2	30.5	4
California	5.4	64.5	30.1	18
Colorado	22.8	61.2	16.0	9
Florida	7.7	61.5	31.4	10
Georgia	31.3	35.8	32.9	8
Idaho	3.7	92.3	4.0	3
Illinois	14.0	69.5	16.5	61
Indiana	12.6	73.5	13.9	14
Iowa	10.6	59.3	30.1	45
Kansas	12.7	72.6	14.7	24
Kentucky	42.1	54.8	3.1	13
Louisiana	30.0	67.5	2.5	4
Maryland	20.5	65.1	14.4	7
Michigan	10.0	58.7	31.3	24
Minnesota	10.1	64.8	25.1	27
Mississippi	3.0	67.0	30.0	1
Missouri	23.3	76.7	0.0	3
Montana	13.1	40.2	46.7	7
Nebraska	15.9	67.7	16.4	9
Nevada	26.7	50.0	23.3	3
New Jersey	7.0	69.0	24.0	4
New Mexico	50.0	37.5	12.5	2
New York	19.3	55.0	25.7	27
North Dakota	24.2	56.2	19.6	9
Ohio	17.6	58.1	24.3	31
Oklahoma	21.0	55.0	24.0	5
Oregon	15.9	59.2	24.9	15
Pennsylvania	12.5	63.3	24.2	6
South Carolina	12.8	59.7	27.5	4
South Dakota	19.1	61.7	19.2	15
Tennessee	30.0	52.5	17.5	8
Texas	28.7	60.0	11.3	19
Utah	15.0	80.0	5.0	3
Washington	12.0	79.6	8.4	20
Wisconsin	18.9	65.0	16.1	26
Wyoming	15.7	65.1	19.2	6
County Mean	***16.6***	***62.7***	***20.7***	***500***
County Metro Mean	***16.5***	***61.4***	***22.1***	***129***
County Nonmetro Mean	***16.4***	***63.3***	***20.3***	***369***
Towns:				
Illinois	31.7	49.0	19.3	130
Minnesota	27.0	44.9	28.1	388
New York	25.6	41.0	33.4	35
North Dakota	23.8	44.8	31.4	56
Ohio	24.4	50.8	24.8	121
South Dakota	22.1	46.0	31.9	51
Wisconsin	26.9	47.1	26.0	225
Town Mean	***25.9***	***46.1***	***28.0***	***1,006***

**number responding.*

Source: IIRA, NACo/NACE Survey of County Officials and NATAT Survey of Township Highway Officials, 1994.

condition category is 7.9 years in the county system and 6.3 years in the town system. However, for bridges with a 4 rating (meets minimum tolerable limits), the average age in the county system is 43.5 years, and 54.3 years in the town system.

The next lowest rating (basically intolerable condition with high priority for corrective action) contains county bridges with an average age of 45.1 years and town bridges averaging 55.6 years. As one might expect, the average age of bridges increases as the condition rating decreases. For towns included in this study, the average age of closed bridges was 76.6 years, indicating that these bridges were constructed in 1917 or 1918. Some of these may be closed permanently. Even among those with a 7 rating (better than minimum criteria), the average age of county bridges is 22.1 years and of town bridges is 21.3 years. Given current financing difficulties faced by many local governments, one might expect the average age of bridges to increase during the next several years, unless local governments can find resources to replace older structures.

Sufficiency Ratings

The Federal bridge program allocates funds based on bridge needs. The biennial bridge inspections generate the expected costs of making necessary bridge improvements. The needed improvements are combined and the proportion of needed improvements is used to distribute funds among States. Within each State there can be several methods of distributing the funds, but often it is on a project basis agreed upon by local and State highway administrators.

Bridge improvement needs are based on a sufficiency rating (SR) system where bridges begin with 100 points and deductions are made for deficiencies. For bridges classified as functionally obsolete or structurally deficient, three categories of sufficiency ratings trigger funding opportunities from the Federal bridge program.[7] Bridges with a rating of 80 or above do not qualify for Federal funding. Those between 50 and 80 qualify for repair or rehabilitation, but not replacement. Bridges with less than a 50 SR qualify for replacement or rehabilitation. Thus, the lower the average SR in a State, the more likely that it will qualify for bridge funding from the national program.

The current national bridge program, the Highway Bridge Replacement and Rehabilitation Program (HBRRP), has existed since 1978. Funding began at $4.2 billion for fiscal years (FY) 1979-82. Since that time, funding has increased on three occasions. The latest increase was in the Intermodal Surface Transportation and Efficiency Act (1991) (ISTEA), which authorized $16.1 billion over a 6-year period (FY 1992-97). ISTEA authorizations for bridge improvements are distributed to the States with certain requirements for spending according to functional

[7] A "structurally deficient" bridge, as defined by DOT, is closed or limited to light vehicles only because of deteriorated structural components. A "functionally obsolete" bridge cannot safely service the volume or type of traffic using it.

Table 4. Bridges by Sufficiency Rating for Counties and Towns, 1994

Region and State	*Replace*	*Rehab*	*Not Eligible*
		(Percent)	
Northeast			
New Jersey	30.9	17.0	52.1
New York	40.8	23.8	35.4
Pennsylvania	32.7	16.3	51.0
Mean	***34.6***	***19.9***	***45.5***
Midwest			
Illinois	16.7	7.6	75.7
Indiana	24.0	9.1	66.9
Iowa	24.1	9.8	66.1
Kansas	30.4	9.8	59.8
Michigan	27.3	8.7	64.0
Minnesota	20.3	10.2	69.5
Missouri	53.4	6.6	40.0
Nebraska	37.8	6.7	55.5
North Dakota	29.5	11.0	59.5
Ohio	20.5	12.8	66.7
South Dakota	29.1	8.4	62.5
Wisconsin	29.6	14.0	56.4
Mean	***27.8***	***9.3***	***62.9***
West			
Arizona	13.8	10.3	75.9
California	16.1	13.7	70.2
Colorado	19.7	7.5	72.8
Idaho	11.8	7.2	81.0
West, continued			
Montana	19.4	8.9	71.7
Nevada	16.7	8.3	75.0
New Mexico	22.7	24.7	52.6
Oregon	10.3	12.2	77.5
Utah	23.0	8.0	69.0
Washington	9.1	10.0	80.9
Wyoming	31.4	10.3	58.3
Mean	***15.5***	***11.0***	***73.5***
South			
Alabama	42.3	6.6	51.1
Arkansas	41.5	8.5	50.0
Florida	14.9	14.8	70.3
Georgia	43.8	7.7	48.5
Kentucky	28.0	14.0	58.0
Louisiana	46.7	7.4	45.9
Maryland	21.8	19.5	58.7
Mississippi	45.8	4.0	50.2
Oklahoma	48.8	10.2	41.0
South Carolina	38.0	3.5	58.5
Tennessee	32.1	15.6	52.3
Texas	46.0	12.9	41.1
Mean	***42.2***	***9.6***	***48.2***
U.S. Mean	***31.4***	***10.3***	***58.3***

Source: U.S. Department of Transportation, Federal Highway Administration, National Bridge Inventory, December 1994.

classifications of highways. Roads are grouped into classes according to the type of service they provide for vehicle travel on the highway network. Interstates, State roads, arterials, and major collectors are central components of the Nation's traffic network and are classified as the Federal-aid Highway system, or simply as "on-system." Roads not on the Federal-aid system are classified as "off-system" and consist of local or rural minor collectors. About 83 percent of all local county/town bridges are located on off-system roads. Each State must spend at least 15 percent and no more than 35 percent of its allocated HBRRP funds on bridges located on off-system roads.

In comparing sufficiency ratings, it is useful to compare the entire NBI and those bridges which have been classified as functionally obsolete or structurally deficient. In this report, summary statistics will be presented for the entire NBI with more detailed attention paid to the structurally deficient or functionally obsolete bridges. The latter group may be eligible for national funding.

Nationwide, bridges fell into three categories--31.4 percent in the replacement or rehabilitation category, 10.3 percent in the rehabilitation only category, and 58.3 percent that do not qualify under the Highway Bridge Replacement and Rehabilitation Program **(table 4)**.

States vary widely in bridge condition, however. Bridges in Western States, on average, seem to be in the best overall structural condition, with 73.5 percent not qualifying for the national program. Bridges in the Northeast and South are in the poorest condition with 45.5 percent and 48.2 percent, respectively, not qualifying for the national bridge program.

There are exceptions by State in each region, however. For instance, 75.7 percent of the county and town bridges in Illinois have an SR of more than 80 which means that they do not qualify for repair or replacement. Neighboring Missouri, though in the Midwest region, has only 40.0 percent of the bridges in this category. The Midwest has the greatest variation among States, followed by the Southern States where Oklahoma has 41.0 percent of its bridges in the higher than 80 SR category and Florida has 70.3 percent.

States with a higher percentage of bridges in the less than 50 SR grouping should benefit most from the national bridge program. The South has the most bridges in this category with 42.2 percent, but the States are reasonably similar, except for Florida with only 14.9 percent in this category.

Once bridges in a State fall behind in repairs and maintenance, catching up without a strong local economic base to generate revenues can be difficult. The costs of making improvements are significant, and several years of a recession or slow economic growth can seriously erode the tax base to support these services. Therefore, in evaluating local bridge conditions, it is important to compare condition levels through time. It is also useful to examine how conditions have changed, by size of county.

Table 5. Sufficiency Ratings for Counties and Towns (Bridges 20 Feet and More)

Category	*Mean 1989*	*Mean 1994*	*Percent Change 1989-1994*
All Bridges	58.0	61.3	5.7
Maintenance Responsibility:			
County	57.0	62.2	9.1
Town	64.5	70.9	9.9
Region*:			
Midwest	61.8	66.7	7.9
Northeast	54.8	59.5	8.6
South	48.6	54.2	11.5
West	70.0	73.4	4.9
Type*:			
Metro	61.6	66.4	7.8
Nonmetro-Adjacent	56.9	62.0	9.0
Nonmetro-Remote	56.7	62.0	9.3
Structural Condition*:			
Rating 3 or Less	32.9	38.8	17.9
Rating 4 or Less	49.0	51.6	5.3
Rating 4 or Greater	78.3	82.8	5.7

* Includes town bridges.

Source: U.S. Department of Transportation, Federal Highway Administration, National Bridge Inventory, 1989 and 1994.

In 1988, the Federal Highway Administration revised the criteria used in the bridge sufficiency rating system, especially the standards for approaches. This change caused more bridges to be rated as acceptable than under previous standards and rendered direct comparisons between 1987 (the previous survey year) and 1994 meaningless. Consequently, the bridge condition comparisons from the NBI are based on 1989, rather than 1987, on the grounds that the 1988 changes in standards had been implemented by 1989.

A comparison of changes in the average SR for county and town bridges suggests that significant improvements occurred in counties and towns as a group and in the different categories (**table 5**). For instance, in 1989, the average sufficiency rating for counties was 57.0, based on the revised criteria. The comparable figure in 1994 was 62.2, and this change is statistically significant. The same trend was found in towns also. In each county group, the average sufficiency rating improved between 1989 and 1994, suggesting that strong efforts were made to effectively use the funding available to improve bridge conditions.

County bridges also were grouped by percentage with a 4 condition rating (meets minimum tolerable limits) or a 3 condition rating (basically intolerable condition). In 1989, the average county had 56.5 percent of its bridges rated at 4 or less with an average SR of 49.0; however, by 1994, the average SR had increased to 51.6. Bridges in intolerable condition had an average SR of 32.9 and 38.8 for the years 1989 and 1994, respectively.

The overall status of bridges, by region, varies markedly **(table 6)**. Overall, 56.5 percent of the county bridges and 62.5 percent of the town bridges are considered neither structurally deficient nor functionally obsolete. In general, bridges in the Western States were in the best condition, with 72.1 percent neither structurally deficient nor functionally obsolete. Bridges in the Northeastern States were in the worst condition, with only 50.6 percent in this category.

In all regions more bridges were considered structurally deficient than functionally obsolete. In the Northeast, nearly half (49.1 percent) of the county bridges are rated structurally deficient. At the other extreme, in Western States, only 15.3 percent of county bridges are included in this rating. On average, only 11.5 percent of the county-maintained bridges are considered functionally obsolete with relatively small variations among regions.

A somewhat similar experience is reported for bridges maintained by towns. Overall, 62.5 percent of the bridges are neither structurally deficient nor functionally obsolete. Bridges were in the best condition in the Midwest with 69.9 percent reported in the "all other bridges" category. Compared to the other regions of the country, the lowest percentage in the okay category was reported in the West, but the number of observations (102) is relatively small because town-maintained bridges are more common in the Midwest and Northeast.

Table 6. Status by Region

	West		*Midwest*		*South*		*Northeast*		*All Regions*	
Status	***(n)***	***Pct.***	***(n)***	***Pct.***	***(n)***	***Pct.***	***(n)***	***Pct.***	***(n)***	***Pct.***
Counties										
Okay	13,074	72.1	58,045	60.5	28,509	47.7	3,494	40.6	103,122	56,5
Structurally Deficient	2,783	15.3	26,443	27.6	24,821	41.5	4,222	49.1	58,269	31.9
Functionally Obsolete	2,283	12.6	11,411	11.9	6,444	10.8	891	10.4	21,029	11.5
Towns										
Okay	102	45.9	9,753	69.9	245	47.0	3,069	48.1	13,169	62.5
Structurally Deficient	64	28.8	3,298	23.7	162	31.1	2.294	36.0	5,818	27.6
Functiolnally Obsolete	56	25.2	893	6.4	114	21.9	1,011	15.9	2,074	9.8

**number responding.*

Source: National Bridge Inventory, December, 1994.

Table 7. County Management Practices, 1994

Survey Item	*U.S.*		*U.S. Nonmetro*		*U.S. Metro*	
	Average	*(n)*	*Average*	*(n)*	*Average*	*(n)*
What Was Your County Expenditure for Roads and Bridges Maintenance in FY93[1]?						
Average	$2,721,022	475	$2,009,373	349	$4,707,871	125
Per capita	92.36	475	111.22	349	39.72	125
Counties That Expect To Have Shortfalls on What They **Should** Spend Compared To What They **Expect** To Spend To Adequately Provide Bridges[1]						
With Shortfall	80.9%	310	79.9%	223	83.7%	87
Without Shortfall	19.1%	73	20.1%	56	16.3%	17
How Much **Should** You Spend **Each Year** During the Next 5 Years To Adequately Provide Bridges?[2]						
Average	1,791,408	310	1,369,440	223	2,873,006	87
Per Bridge:	15,381	293	13,943	209	18,958	84
How Much Do You **Expect** To Be Able To Spend **Each Year** for the Next 5 Years?[2]						
Average	696,104	310	474,193	223	1,264,912	87
Per Bridge:	5,248	293	4,291	209	7,629	84

[1]Data reported in this question may not correspond to a similar question in the *Road and Bridge Report*. This is due to the fact that this report examines "local bridges" and n=539; in the *Road and Bridge Report* n=609.

[2]Data for this question only includes counties that will have a shortfall of what they should spend compared to what they expect to spend.

Source: Illinois Institute for Rural Affairs, National Association of Counties/National Association of County Engineers (NACo/NACE) Survey of County Officials and National Association of Towns and Townships (NATAT) Survey of Township Highway Officials, 1994.

In all regions, there is a far greater percentage of town bridges in the structurally deficient category (27.6 percent) than in the functionally obsolete category (9.8 percent). Town bridges in the Northeast are in the worst condition, with 36.0 percent reported as structurally deficient. The West and South reported the largest proportions of bridges in the functionally obsolete category, with 25.2 percent and 21.9 percent, respectively; however, the number of towns is small in both regions. The Midwest had the lowest percentage of town bridges in the functionally obsolete category, with 6.4 percent.

Funding Adequacy

Previous discussions show that a sizeable proportion of the bridges in both the county and town systems still need repair. Whether local officials have adequate funds to make the necessary improvements is the next question to be addressed.

County respondents to the mail survey were asked for the annual amount considered necessary to spend per bridge during the next 5 years to provide adequate services. Nationwide, 293 counties responded that an average of $15,381 per bridge would be needed annually (**table 7**). Substantial differences were found between nonmetro and metro counties on this issue, with the former reporting an average of $13,926 needed and the latter reporting an average of $19,036 needed per bridge.[8]

When asked about the amount that will be available to spend, the 293 responding counties reported expecting to spend an average of $5,248 per bridge in each of the next 5 years. Metro areas apparently are in a better fiscal position and expect to spend an average of $7,706 per bridge compared with $4,292 per bridge in nonmetro areas but, as will be seen, the costs of the bridges are substantially higher in metro than in nonmetro areas.

Comparing expenditures needed and expected funds available reveals an average annual shortfall of $10,133 per bridge for 5 years. Nonmetro counties had an annual shortfall of $9,634 per bridge, while metro counties expected a shortfall of $11,330 per bridge. Clearly, not every bridge will require this level of spending; rather, the aggregate expected shortfall is spread over the total number of bridges so that differences in bridge responsibilities are included in the comparisons. Based on these responses, counties expect to face a fairly significant budget shortfall during the next 5 years in meeting bridge needs, and the NBI information presented earlier indicates that many local bridges need attention.

Policy Options

In looking to the future, it is clear that bridge conditions will continue as a significant concern for local public officials and residents, especially in rural areas. The major issue, of course, is how to finance the needed structural improvements.

[8]For this comparison, counties were classified as to whether they are in a Metropolitan Statistical Area or not.

Alternatives include changing the travel demands on the bridges or finding alternatives to meet these travel requirements. Local policy makers have several options which are reviewed in this section. The discussion is not prescriptive and the feasible solutions differ with local and State institutional arrangements for financing services.

Reduce Operating Costs

Local governments have several options for reducing the costs of financing transportation facilities. In sparsely populated rural areas, one possibility is to create cost-sharing arrangements for materials, equipment, and personnel. For instance, adjoining counties might share the services of a professionally trained administrator or engineer. This system already exists in some counties and seems to work well.

In other cases, county engineers work with local highway commissioners to coordinate joint purchasing programs for materials that can be purchased in bulk. Joint bids can reduce unit costs, so that participating governments save on both purchases and administrative costs.

Cooperative projects to provide services are also important. For instance, several governments in adjoining areas can cooperate on tasks that involve specialized equipment. If several governments jointly purchase a piece of specialized equipment and then combine efforts to complete projects, the total cost of performing the work may be lower. While this approach requires coordination, it may mean that taxpayers get more use out of expensive equipment.

Accommodate Changes in Travel Demands

With increased traffic speed and farm consolidations, it may be unnecessary to maintain the current number of roads in the future. These trends are difficult to predict for bridge traffic, however. Increases in numbers of nonfarm-related families in rural areas probably bring more traffic to rural roads and bridges, although the weight requirements may be less than for agricultural operations. However, the nonfarm residents may demand higher levels of service. When residents are linked to urban centers for employment, they may be unwilling to experience delays or major inconveniences because of the local transportation infrastructure. While the houses constructed by these new residents may add significantly to the property tax base in unincorporated areas, the residents will also contribute to the traffic requirements in certain areas.

Prioritization of roads and bridges in some rural areas may help reduce costs. Because of traffic demands, not all road mileage and bridges need to be maintained at the same level. The overriding aim should be to create a transportation network that efficiently moves people and goods from farm or home to market or workplace.

One consideration in designing a prioritized transportation network must be the liability of local governments in maintaining parts of the road system at a lower

level. For instance, if a prioritized system has bridges with lower load limits, then these bridges must be clearly posted so that travelers understand that they travel at their own risk. In sparsely populated rural areas, maintaining these signs and designations for safety can be costly.

Raise Additional Revenues

Local transportation administrators should work with State legislators to identify new revenue sources to support the transportation network. Possible changes can involve additional revenue-raising authority that captures changes in economic activity resulting from an economic restructuring in rural areas. For instance, if agriculture decreases in economic importance, it makes sense that revenues to fund the transportation system should rely more on other tax bases.

Likewise, when special groups use bridges heavily, it makes sense to tax or charge them directly for bridge maintenance or construction. For example, a special tax is commonly imposed on vehicles involved in mining operations to meet the additional cost associated with the wear and tear they cause to roads and bridges.

Summary

Local transportation administrators, especially in rural areas, will face several major challenges in the future. First, declining population and stagnating economies in many rural areas have meant the tax bases used to finance rural bridges have not grown at a rate to keep pace with demands for services. In other areas, outmigration from urban areas into the surrounding unincorporated areas has changed the traffic demands on county and town roads.

Second, growing pressures on State and Federal budgets make it harder to attract resources for rural projects which often have lower traffic counts. Thus, rural transportation managers can expect to encounter even greater difficulties in fighting for resources. The loss of rural political influence in many State governments also may weaken the ability of rural policy makers to attract the share of State and Federal resources needed to finance these services. Growing suburban areas face transportation congestion that will require major funding increases. These needs will compete with those for town- and county-maintained roads and bridges in rural areas.

Third, changes in the population composition, with a greater proportion of rural residents independent of farming activities and more dependent on access to urban centers, mean that bridges must be dependable. Long delays and detours will not be accepted, and newer residents are not as likely to tolerate relatively poor bridge conditions as well as longtime rural residents because suburbanites are used to higher quality public services.

Fourth, as the Federal Government shifts to block grants, combining programs and uses, and transfers responsibility to States, it is likely that rural areas will experience greater difficulty in competing for funding. Population growth is

likely to continue in suburban areas in many States and this growth will continue to concentrate decision-making power in these areas.

Both the mail survey of county and town highway commissioners and the National Bridge Inventory show that local bridges in rural areas need serious attention. In some regions, as many as half of the bridges are posted with weight limits or travel restrictions, but overall only slightly more than half of the county-maintained bridges are neither structurally deficient nor functionally obsolete. Overall, respondents to the mail survey report a shortfall between the funds perceived as needed for bridge purposes and the amounts available for spending. With the reduction of State and Federal funds, local governments are finding it difficult to maintain the same number of roads and bridges as in the past. This places even greater pressure on local decision-makers to find creative solutions to local transportation financing issues.