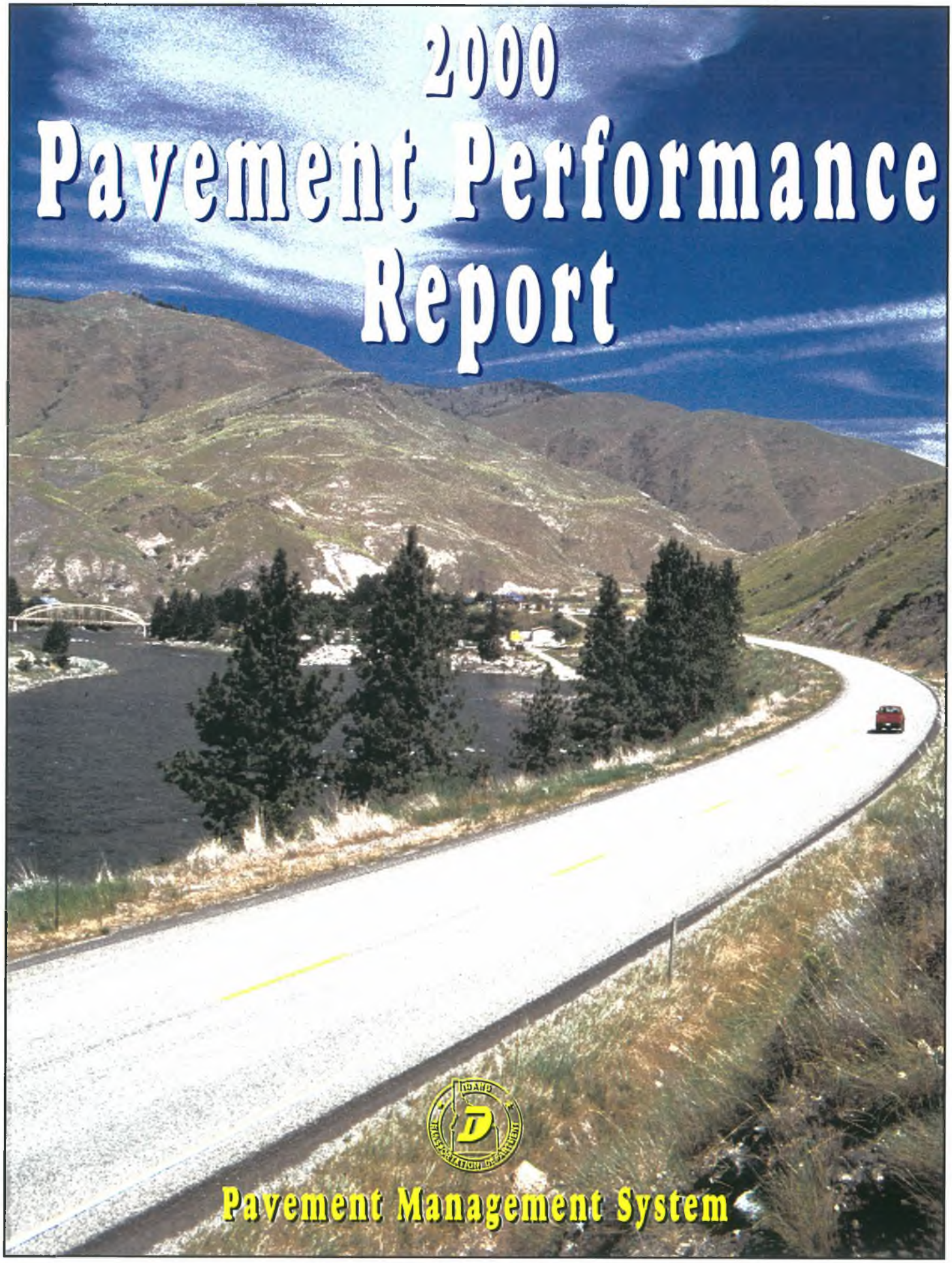
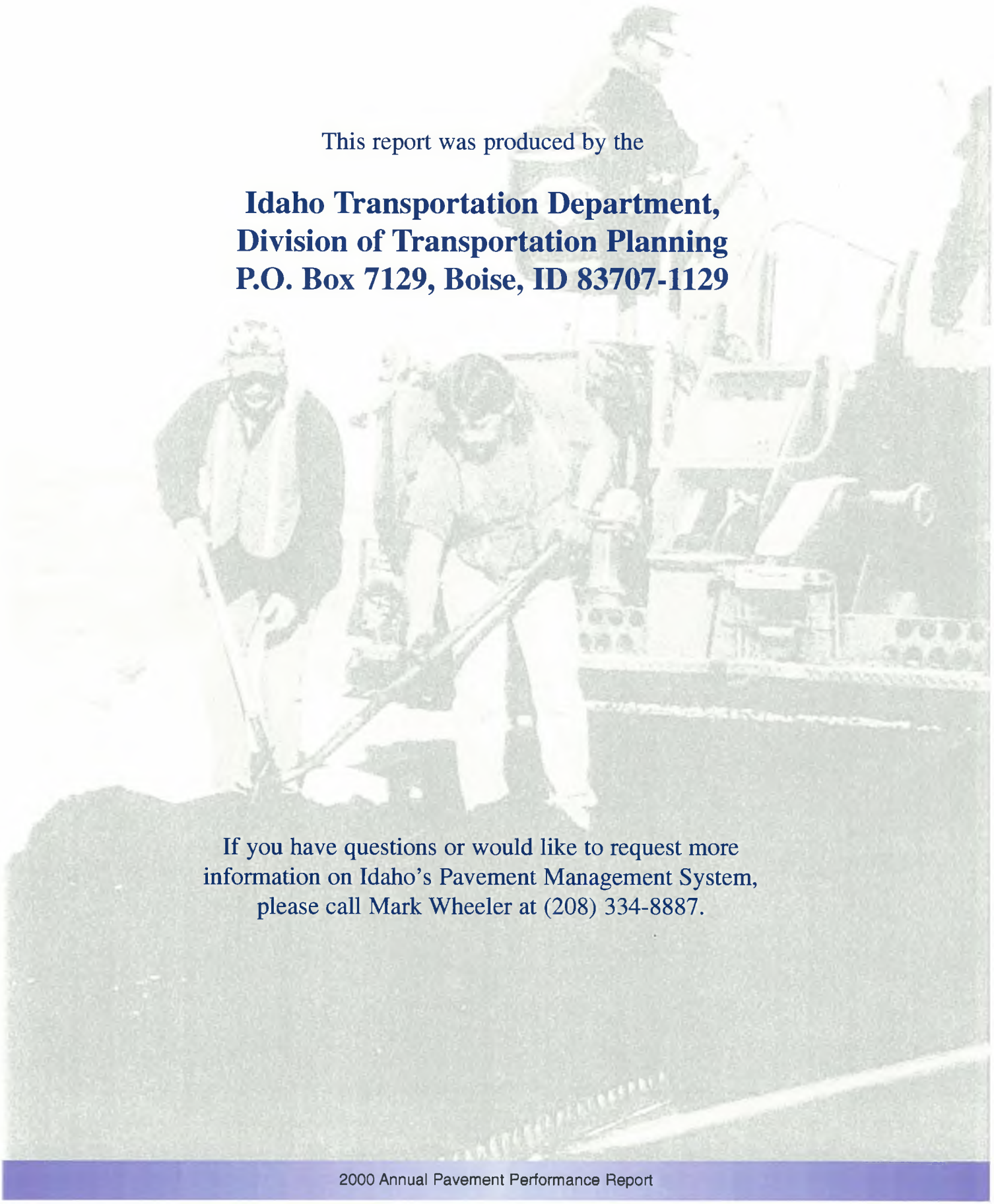
2000 Pavement Performance Report



Pavement Management System



This report was produced by the

Idaho Transportation Department,
Division of Transportation Planning
P.O. Box 7129, Boise, ID 83707-1129

If you have questions or would like to request more information on Idaho's Pavement Management System, please call Mark Wheeler at (208) 334-8887.

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PURPOSE

PURPOSE

This report provides information regarding the status of pavements on the State Highway System. The following pages contain past, present, and future projections of pavement conditions based upon cracking, roughness, and rutting. This information was obtained from Idaho's Pavement Management System (PMS).

This report is comprised of the following sections:

- Executive Summary
- Pavement Management - System Overview
- General Information
- Pavement Condition
- Highway Needs
- Preventive Maintenance / Seal Coats
- Summary

EXECUTIVE SUMMARY

ACHIEVEMENTS

The Idaho Transportation Department has made significant progress toward reducing deficient pavements and giving motorists a safer and smoother ride. Pavement deficiencies on the State Highway System have been reduced from almost 40% in 1993 to an estimated 18% by the end of calendar year 2000. Reducing Pavement Deficiencies is a high priority for the department and has been accomplished by:

- The Transportation Board committing $31 million annually toward pavement rehabilitation
- Utilizing the $15.2 million Restricted Highway Fund to repair and maintain deficient highways
- Establishing department efficiency measures
- Consolidating programs and applying the cost savings to pavement-rehabilitation projects
- Partnering with the private sector allowing the department to stretch highway dollars
- Utilizing a successful maintenance / preventative maintenance program which slows the rate of pavement deterioration
- Improving the way we collect, analyze, and report pavement data

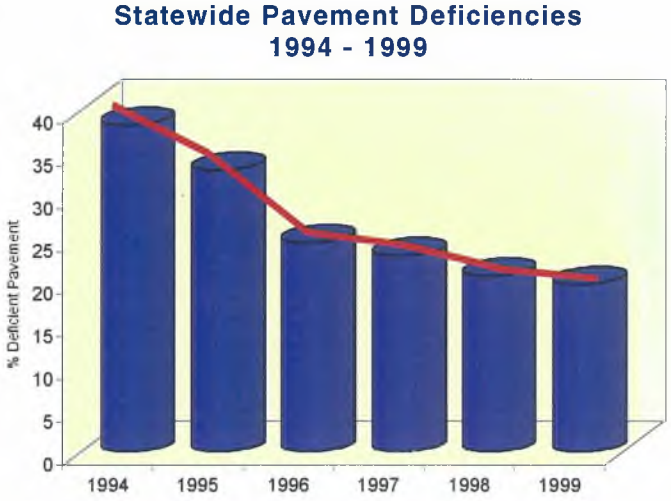


Figure 1.

NEEDS

Pavements on the State Highway System have shown a great deal of improvement in recent years, but there is still much work left to do. Figure 2 below is a summary of current statewide needs by functional class. The estimated repair costs on the state highway system alone total nearly $410 million and this is just one piece of the total transportation pie. Capacity, congestion, safety, and economic development all compete with pavement-improvement needs for limited funding.

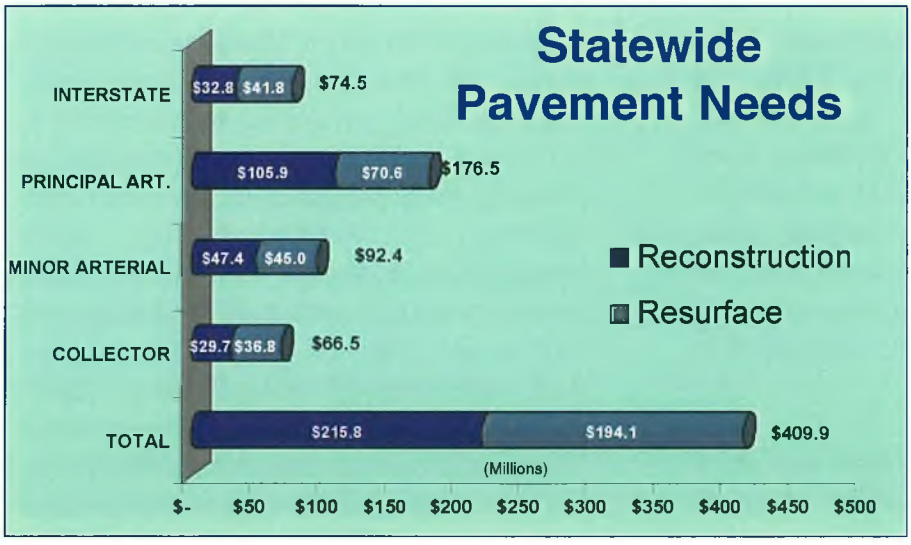


Figure 2.

Because Idaho's growing population and economy are likely to create a demand for more and heavier trucks, the department must continue its commitment to protect and maintain Idaho's investment in pavements on the State Highway System.

Section 1
PAVEMENT MANAGEMENT SYSTEM OVERVIEW

In 1977, the Idaho Transportation Department (ITD) began a review of existing pavement management programs with the goal of adopting one to fit Idaho's needs. The following year a Pavement Performance Management Information System (PPMIS) was acquired and made operational on ITD's mainframe computer. Since 1978, the PPMIS has been steadily improved and modified to meet conditions in Idaho. It has been tested and refined by ITD and consultant contract, the principal consultant being Pavement Management Systems Ltd., of Ontario, Canada. The last phase, economic analysis and optimization, was completed in July 1986.

Our Idaho State Highway System consists of approximately 5,000 centerline miles of paved highway, including 612 centerline miles of Interstate. For network-level pavement management the system has been divided into about 1,800 sections varying in length from less than one mile to approximately ten miles.

Idaho's Pavement Management System covers both the network and project level. Network-level pavement management is performed by the Division of Transportation Planning while project-level pavement management is performed by ITD's Headquarters Materials Section. Pavement condition testing conducted at the network level is also split, with Materials overseeing skid testing while Planning Services collects roughness and rutting measurements. Planning Services is also responsible for surveying pavement distress (cracking), analyzing network PMS data, producing reports,

and developing and maintaining computer programs needed for pavement management. Deflection data for project-level pavement management is collected, analyzed, and reported by ITD's Materials Section.

PAVEMENT-CONDITION TESTING

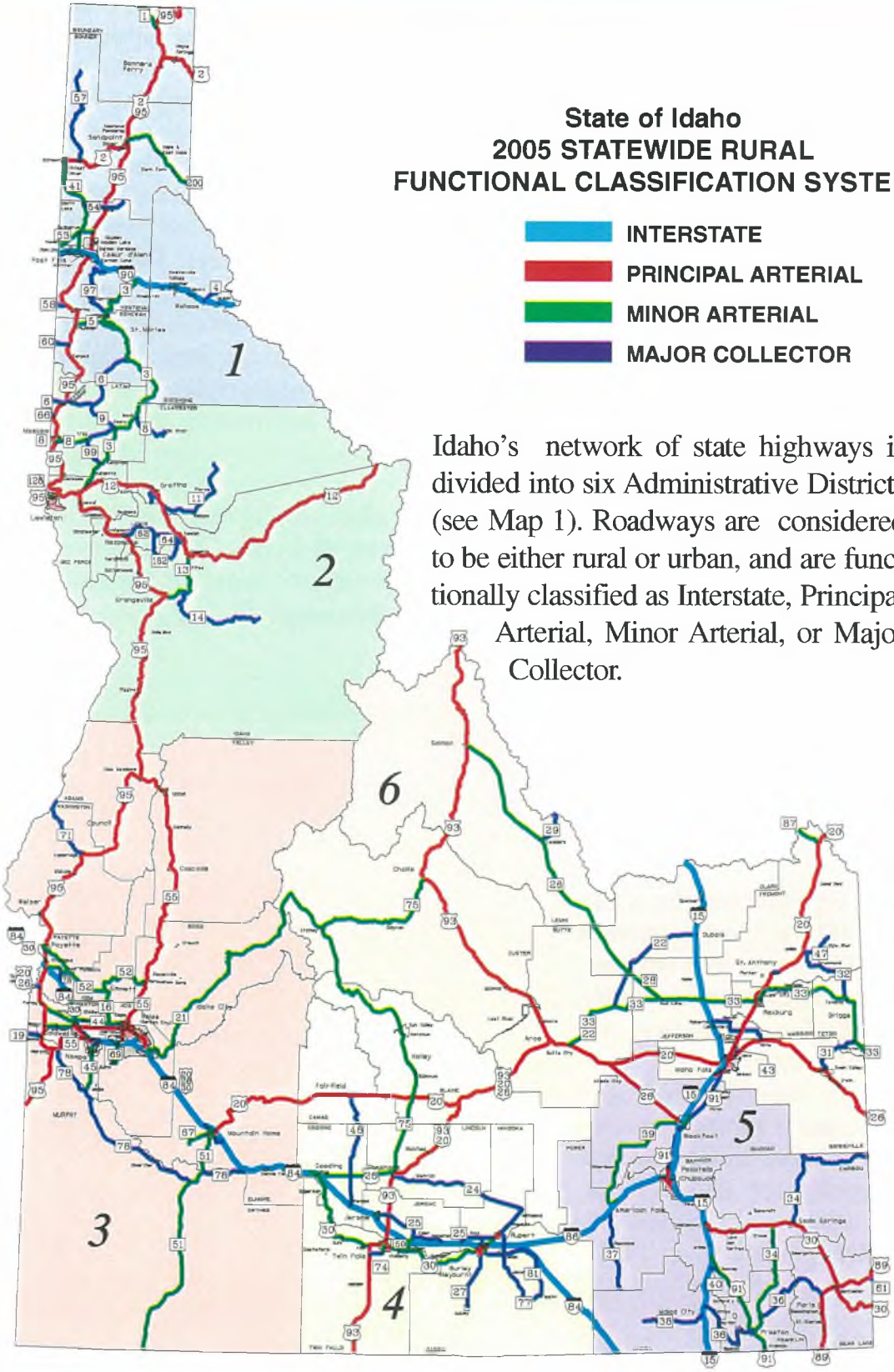
Pavement-condition data is an important component of Idaho's PMS. Two-lane roads are tested in one direction while interstates and divided arterials are tested in both ascending and descending directions. Pavement-condition data elements are collected as follows:

- **Road Roughness -** Roughness is a primary indicator of pavement serviceability; or the ability of a pavement to meet the demands and expectations of motorists. In Idaho, the public's perception of the State Highway System is very important. For that reason, a Roughness Index (RI) was adopted that correlates the longitudinal profile of the road surface to an index based upon the public's perception of road roughness. The (RI) ranges from 0.0 to 5.0 (0.0 being extremely rough and 5.0 being perfectly smooth).

  A South-Dakota-type Profilometer is currently used by ITD to obtain pavement roughness. This instrument uses laser sensors and a personal computer to collect and store road-profile information. The vehicle stores profile and rutting measurements at one-foot intervals traveling at highway speeds, and is mounted in a van operated by the Planning Services Section. Longitudinal profiles of all pavement-management sections statewide are obtained annually.

- **Pavement Distress (C r a c k i n g) -** Pavement distress, or cracking, is another important indicator of pavement condition. The video-inspection vehicle used to collect profile information also collects pavement video on the entire State Highway System each year. The Pavement Management Engineer then uses this video to determine the type, extent, and severity of cracking within each PMS section. Based on this input a Crack Index (CI) is calculated by the computer for each section. The CI is a rating very similar to the RI with 5.0 corresponding to a section with little or no cracking and 0.0 representing a section with severe cracking.

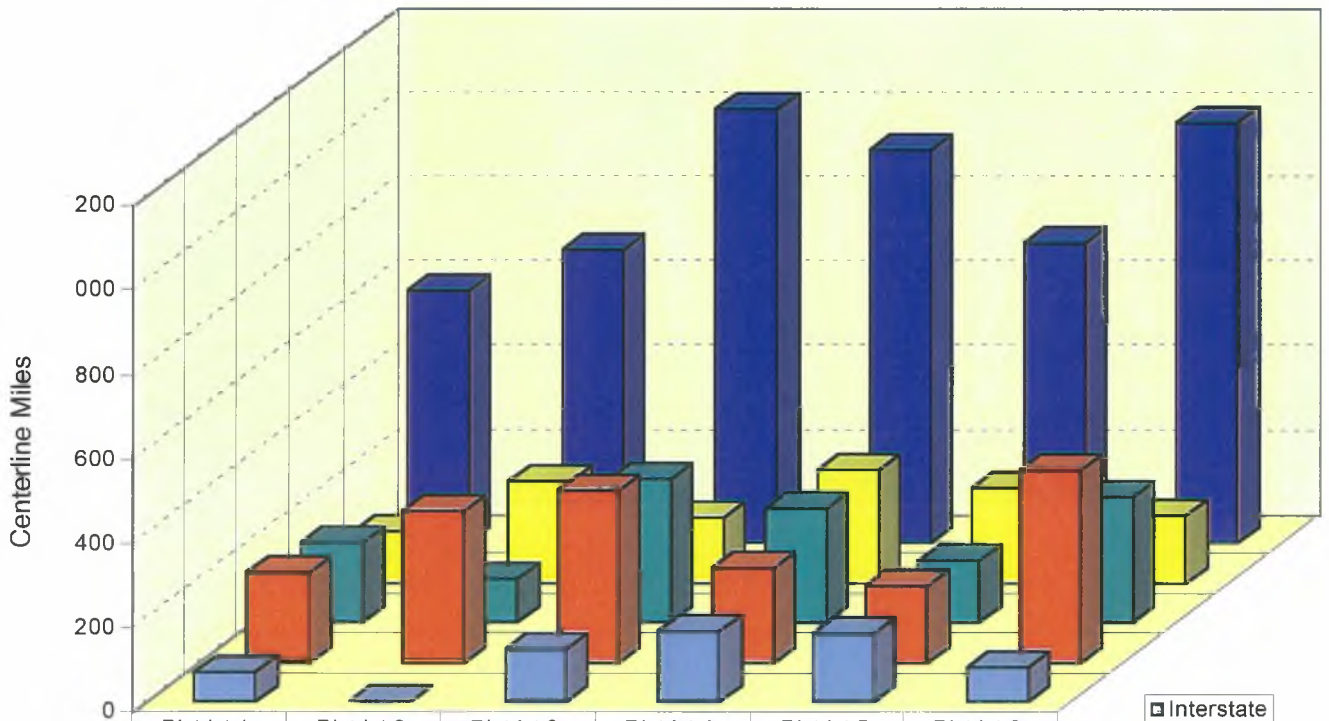
- **Final Index -** A Final Index (FI), which is the average of RI and CI, is used as a single indicator of Pavement Condition in many PMS reports.



Idaho's network of state highways is divided into six Administrative Districts (see Map 1). Roadways are considered to be either rural or urban, and are functionally classified as Interstate, Principal Arterial, Minor Arterial, or Major Collector.

Map 1

1999 CENTERLINE MILES BY DISTRICT



	District 1	District 2	District 3	District 4	District 5	District 6
Interstate	74	0	125	169	160	84
Prncp Art	212	356	408	223	180	456
Minor Art	190	101	341	272	147	294
Collector	123	239	152	268	222	158
TOTAL	599	696	1026	931	709	992

Figure 3.

Centerline mileage, by district and functional class, is shown in Figures 3, 4, and 5. There are 4,953 centerline miles on the state highway system. District 3 is the largest district with 1,026 centerline miles (20.7% of total statewide miles) and District 1 is the smallest of the six districts with 599 centerline miles (12.1% of total mileage).

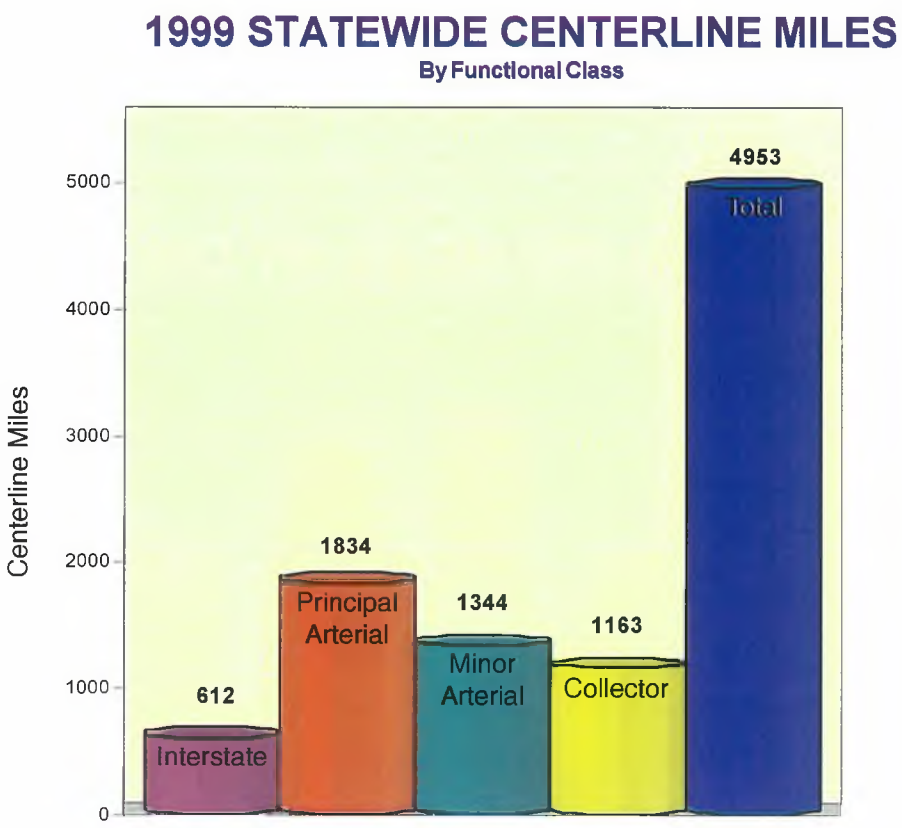


Figure 4.

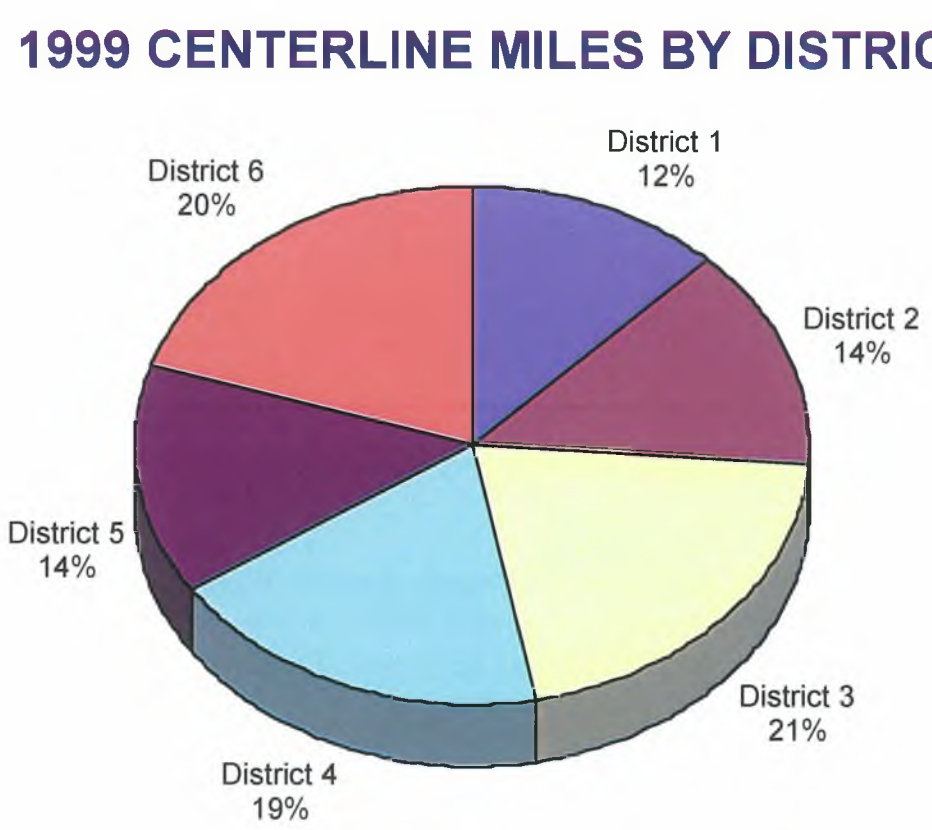
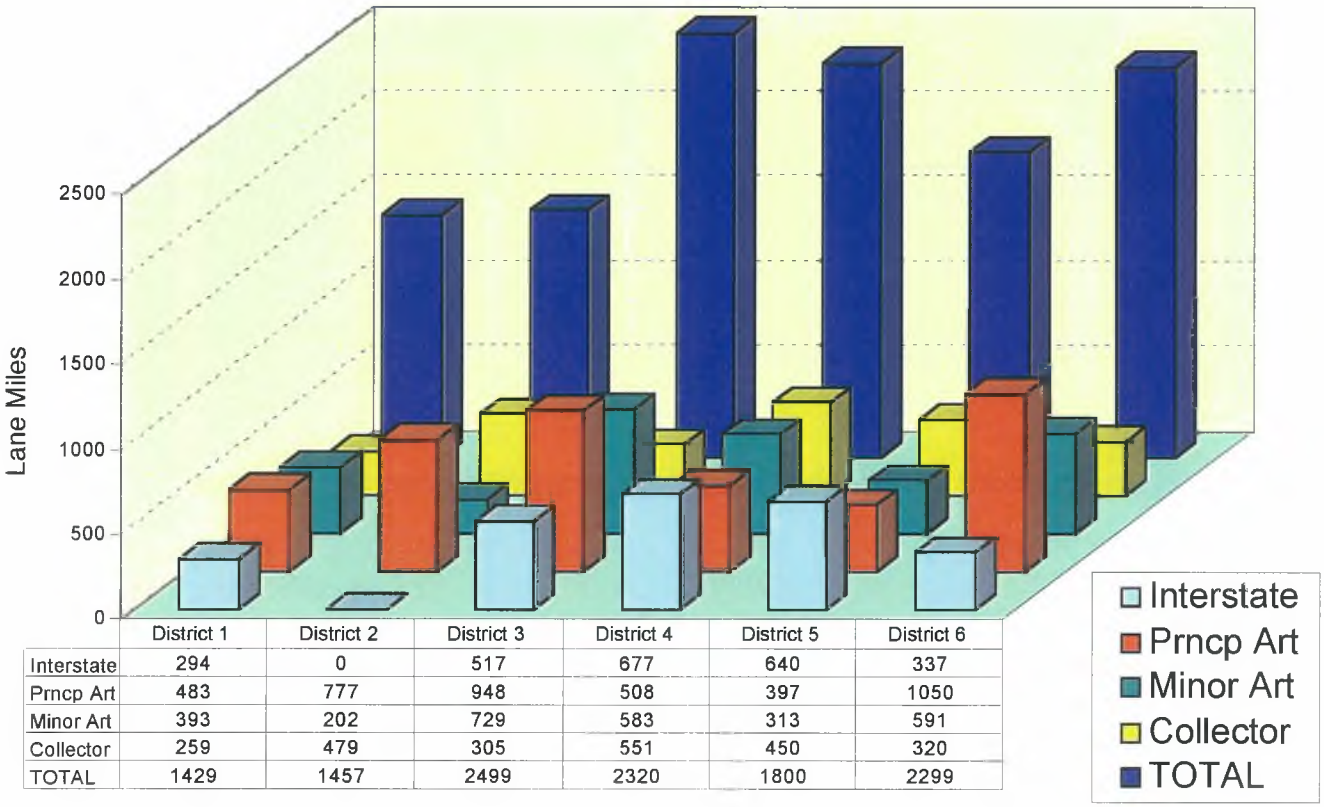


Figure 5.

1999 LANE MILES BY DISTRICT



	District 1	District 2	District 3	District 4	District 5	District 6
Interstate	294	0	517	677	640	337
Prncp Art	483	777	948	508	397	1050
Minor Art	393	202	729	583	313	591
Collector	259	479	305	551	450	320
TOTAL	1429	1457	2499	2320	1800	2299

Figure 6.

Figure 6 is a summary of lane miles by functional class. Lane miles are calculated by multiplying centerline miles by the number of through lanes. Idaho has approximately 11,800 lane miles on the State Highway System.

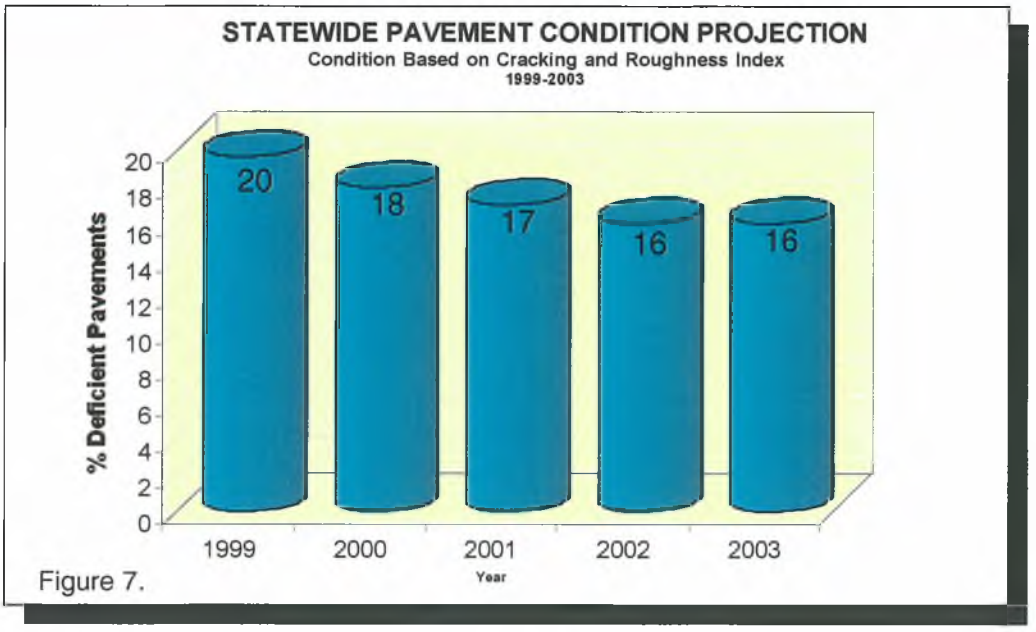


Figure 7.

PAVEMENT CONDITION

Pavement condition assessment is highly dependent upon functional classification and is divided into two categories: (1) interstates and arterials, (2) collectors.

- Pavements on interstates, arterials, and collectors are classified as good if the lower of the Cracking Index (CI) or Roughness Index (RI) is greater than 3.0;
- Interstate and arterial pavements are considered fair if the lower of CI or RI is between 2.5 and 3.0 (2.0 to 3.0 for collectors);
- Poor pavements exhibit indices between 2.0 and 2.5 (1.5 to 2.0 on collectors);
- Interstate and arterial pavements considered to be very poor are those with the lower of the two indices falling below 2.0, or a CI or RI rating below 1.5 for collectors.
- Pavements are considered to be deficient if they are classified as poor or very poor.

The current statewide distribution of good, fair, poor, and very poor pavements, based upon roughness and cracking, is shown on page 10 in Figures 8 and 9.

Pavement Condition	Interstates and Arterials	Collectors
	Lower Index of Cracking (CI) or Roughness (RI)	
Good	(CI or RI) > 3.0	(CI or RI) > 3.0
Fair	2.5 ≤ (CI or RI) ≤ 3.0	2.0 ≤ (CI or RI) ≤ 3.0
Poor	2.0 ≤ (CI or RI) < 2.5	1.5 ≤ (CI or RI) < 2.0
Very Poor	(CI or RI) < 2.0	(CI or RI) < 1.5

Distribution of Cracking and Roughness Indices

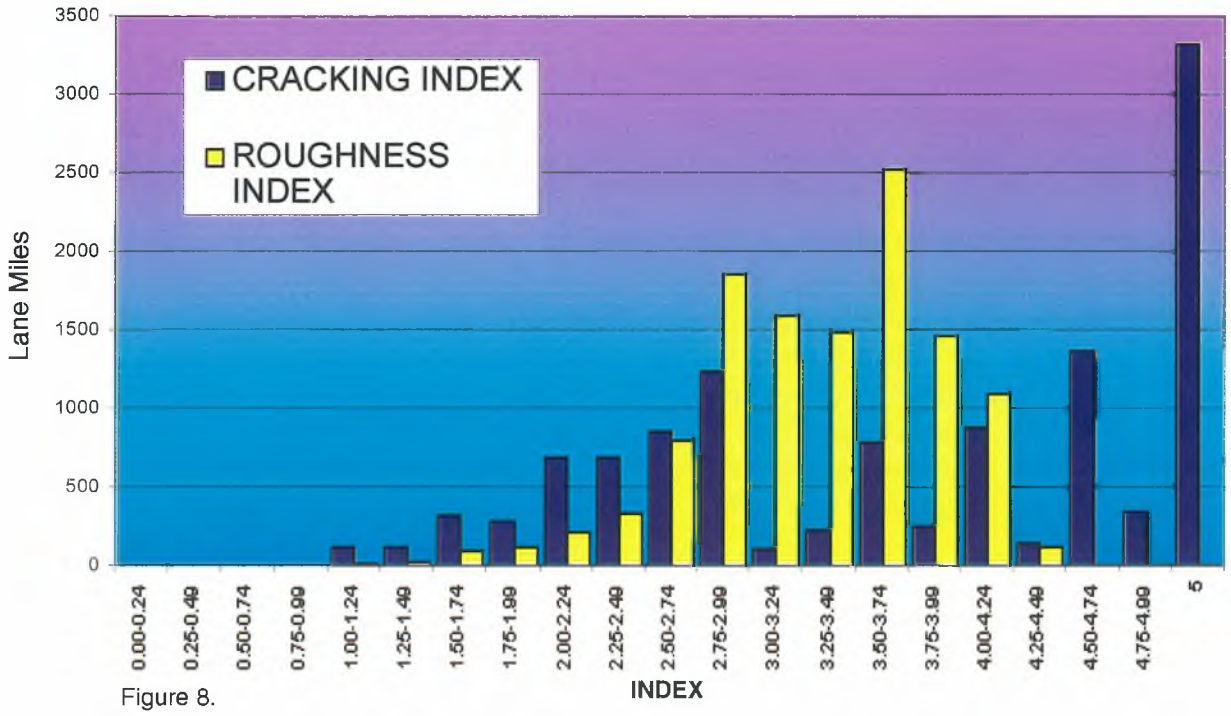


Figure 8.

Distribution of Lowest Index (Cracking or Roughness)

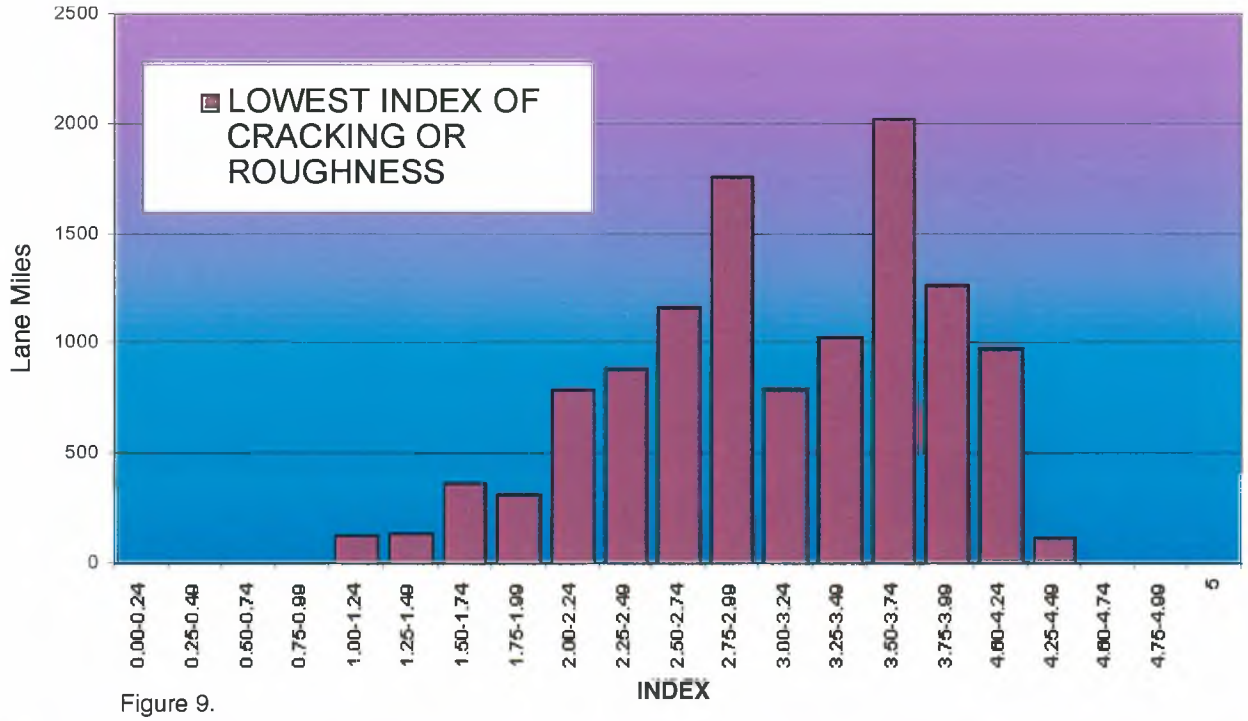


Figure 9.

PAVEMENT CONDITION (continued)

Figures 10 and 11 are summaries of pavement conditions from 1995 through 2000 (2000 is projected). This summary indicates that pavements considered good have risen from a statewide low of about 18.7% in 1994 to approximately 57% projected for 2000. Fair pavements have declined from approximately 44% in 1994 to 25% projected for 2000. Pavements considered poor or very poor have declined from a maximum of almost 38% in 1994 to approximately 18% projected for the end of calendar year 2000.

Figure 12 is a pie chart representing current pavement condition on the State Highway System in terms of percent "good," "fair," "poor," and "very poor."

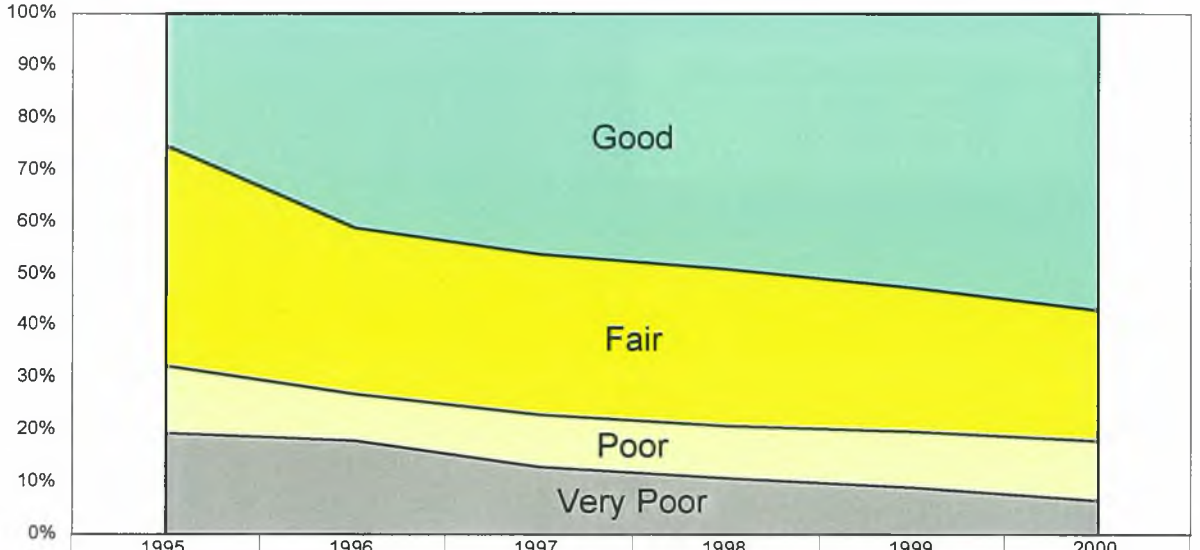
Current pavement condition by district is shown in Figure 13. The percentages in Figure 13 are based on statewide lane miles. For example, 9% of all pavements statewide considered good, and 17% of all pavements considered very poor are located in District 1.

Figure 14 is also a summary of pavement condition based on total lane miles in each district, as opposed to statewide mileage. For example: 13% of District 1 roadways are considered very poor; and 60% of District 5 roadways are considered good.

STATEWIDE PAVEMENT CONDITION

By Lane Miles

Condition Based on Cracking and Roughness Index (2000 Projected)



	1995	1996	1997	1998	1999	2000
Good	2,996	4,839	5,438	5,797	6,201	6,687
Fair	4,931	3,707	3,595	3,535	3,243	2,951
Poor	1,528	1,081	1,207	1,161	1,254	1,347
Very Poor	2,248	2,077	1,498	1,270	1,062	772

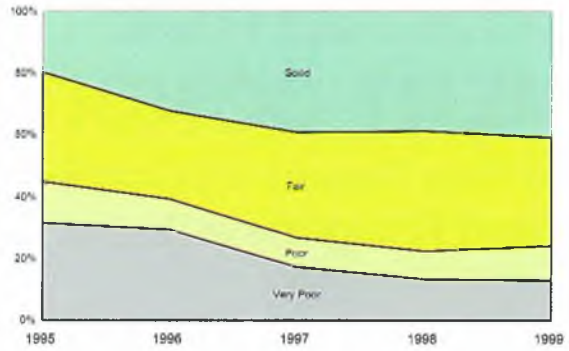
Figure 10.

District Pavement Condition

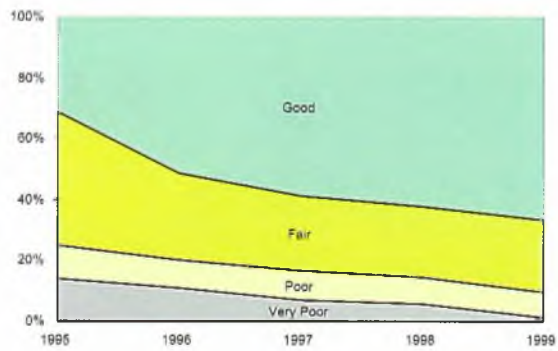
by Lane Miles

Condition based on cracking and roughness index

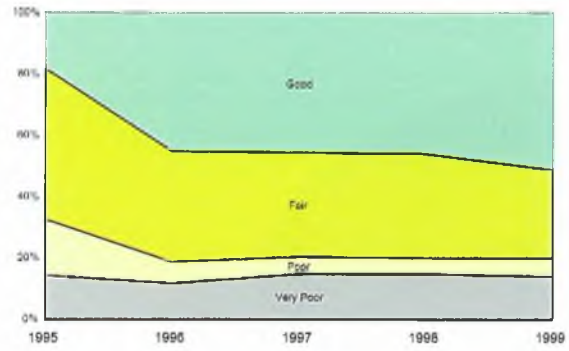
District 1



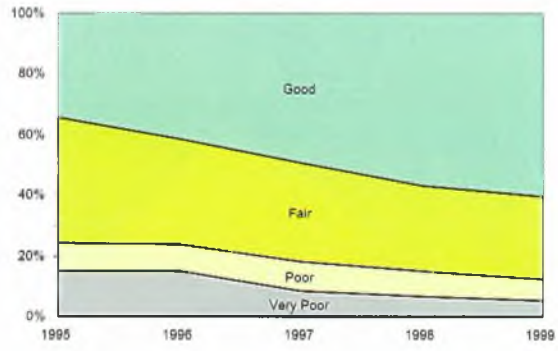
District 4



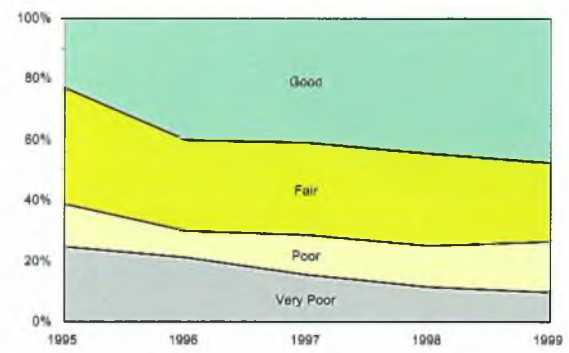
District 2



District 5



District 3



District 6

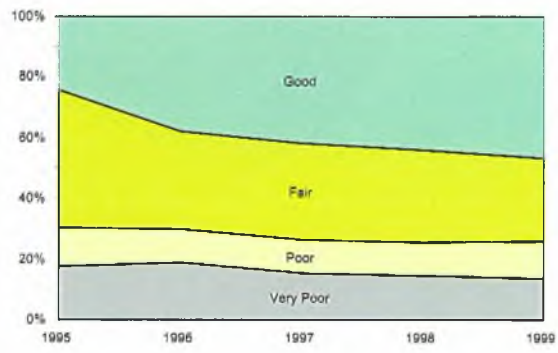


Figure 11.

STATEWIDE PAVEMENT CONDITION

Condition Based on Cracking and Roughness Index 1999

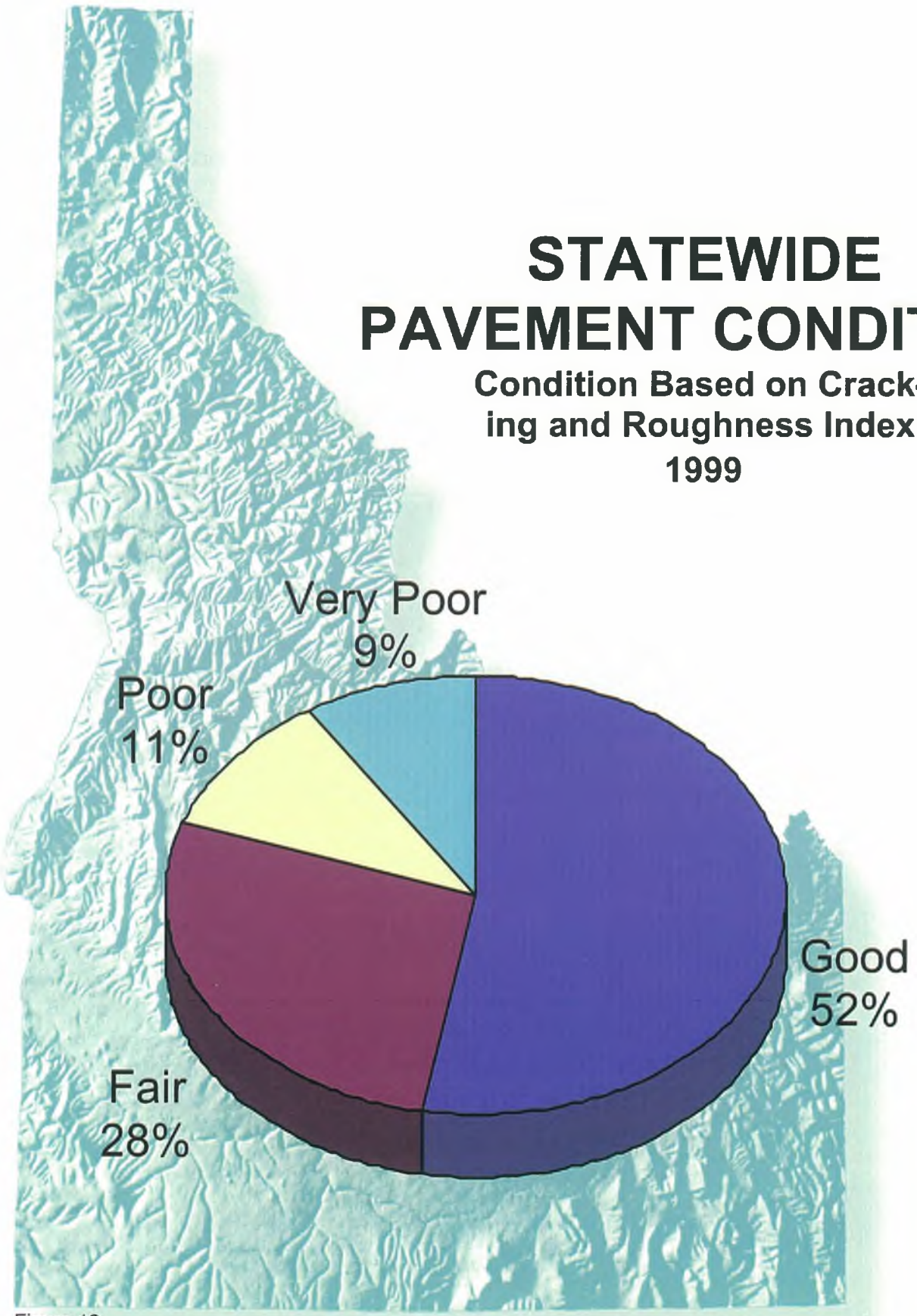


Figure 12.

1999
District Pavement Condition

Based on Statewide Percentages
Condition Based on Cracking and Roughness Index

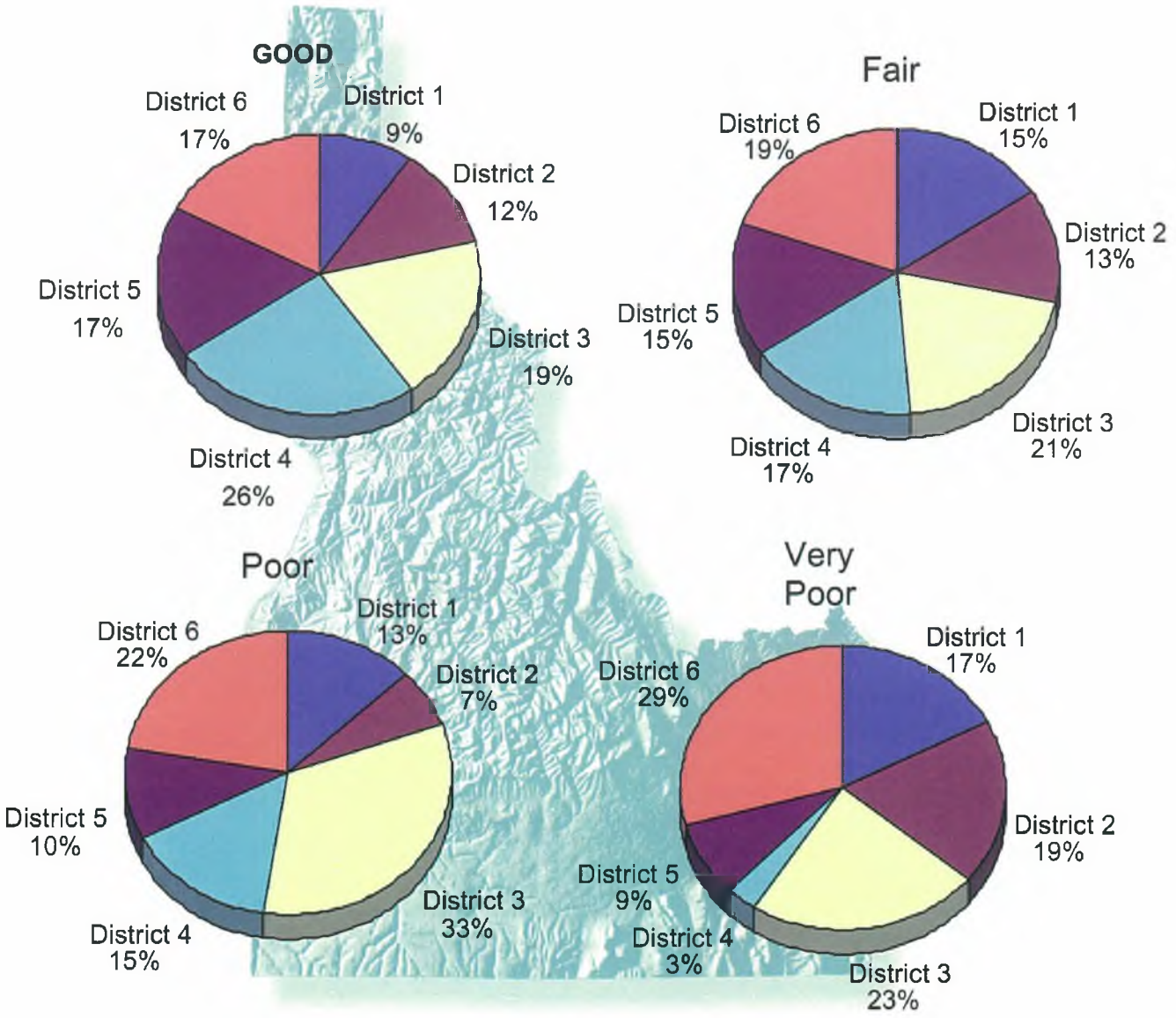


Figure 13.

1999
District Pavement Condition
Condition Based on Cracking and Roughness Index

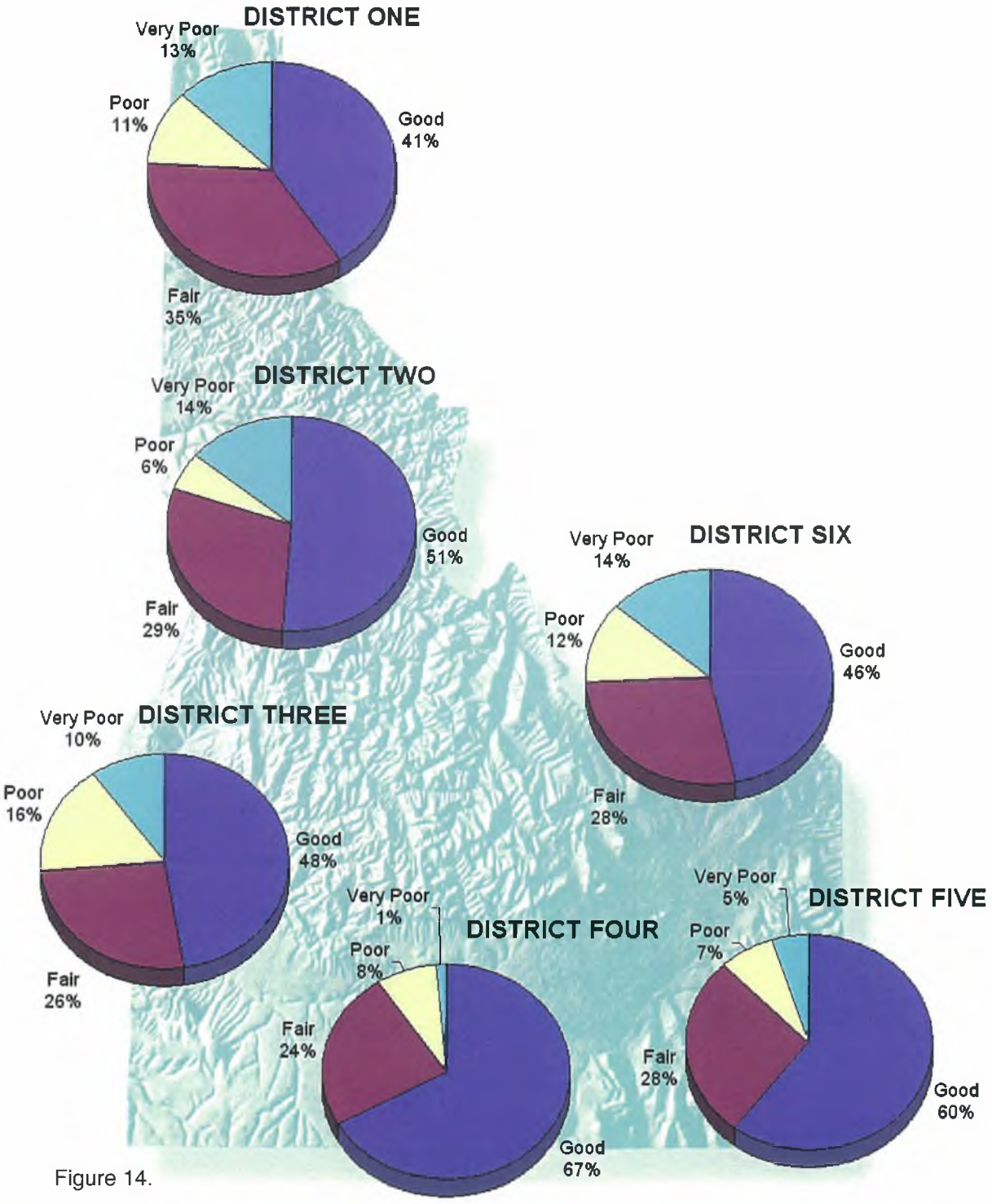


Figure 14.

PAVEMENT DEFICIENCIES BY SYSTEM

The following graphs represent a summary of Idaho's five-year pavement performance on interstates, remaining National Highway System (NHS), and Non National Highway System (Non-NHS) routes.

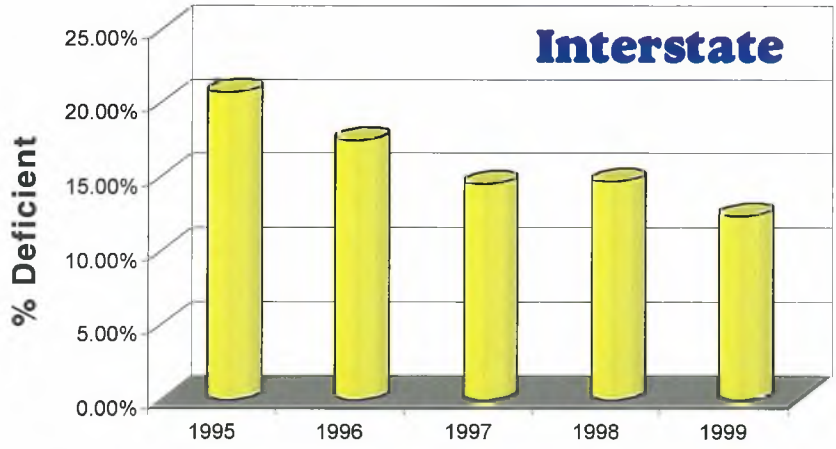


Figure 15.

Interstate highways in Idaho have improved from 23 percent deficient in 1994 to 12 percent deficient in 1999, a reduction of 11% in five years.

The remaining (Non-Interstate) NHS routes have improved from 38 percent deficient in 1994 to approximately 22 percent deficient in 1999, a reduction of 16% in five years.

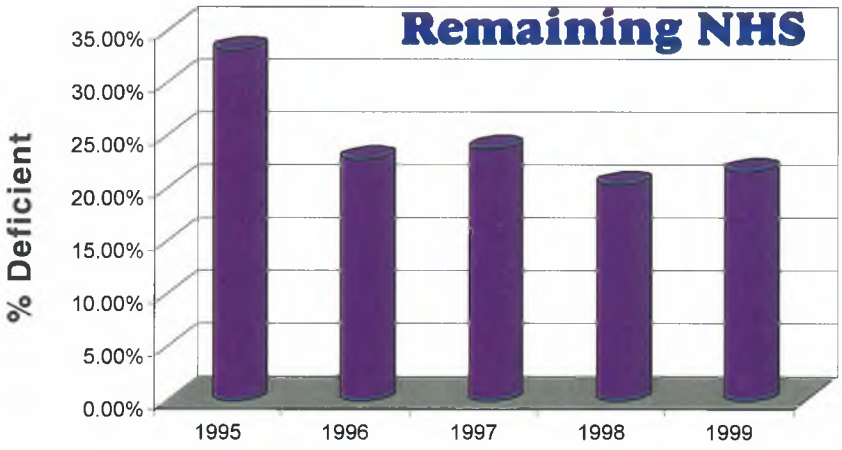


Figure 16.

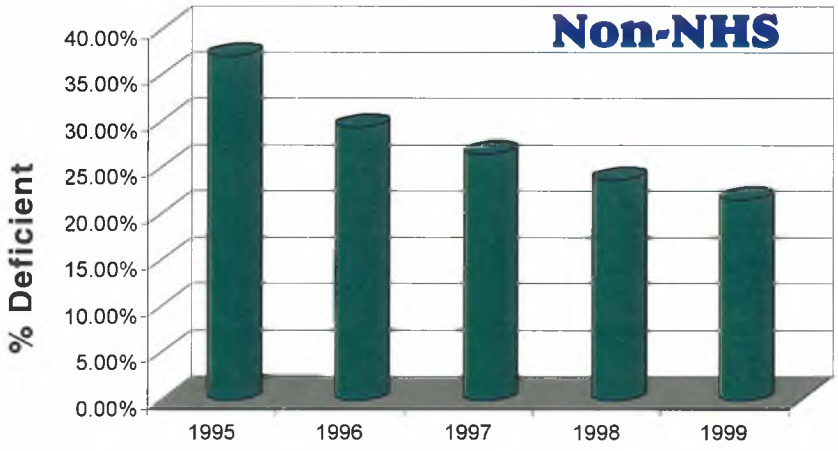


Figure 17.

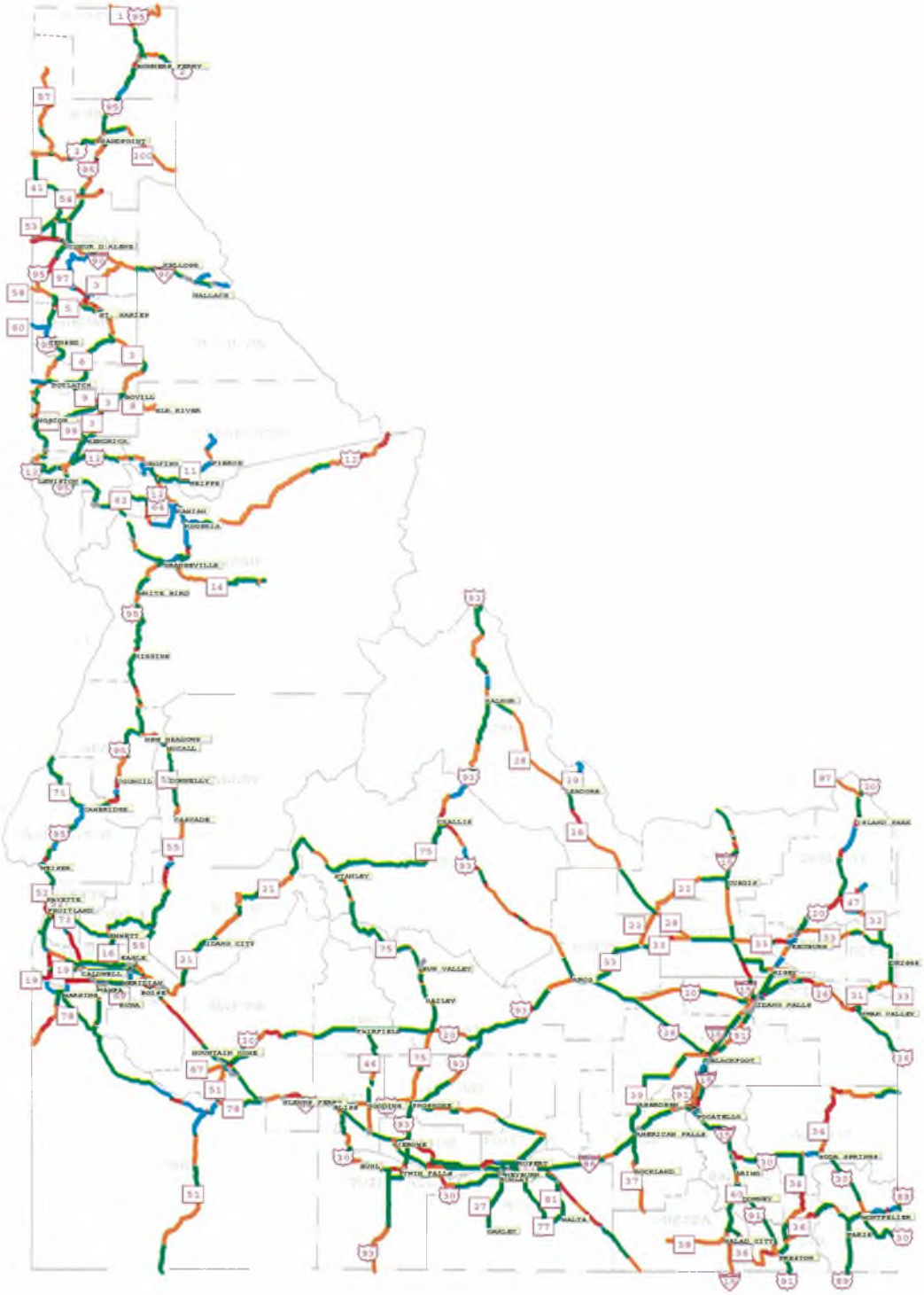
Non-NHS route deficiencies have also been reduced from over 44% in 1994 to 22% in 1999, a reduction of 22% in five years.

State of Idaho

Pavement Condition Map

(11,760 Lane Miles)

Good	Fair	Poor	Very Poor
(6,201 Lane Miles)	(3,243 Lane Miles)	(1,254 Lane Miles)	(1,062 Lane Miles)



Map 2.

District 1

Pavement Condition Map

(1,429 lane miles)

Good	Fair	Poor	Very Poor
(583 Lane Miles)	(503 Lane Miles)	(160 Lane Miles)	(183 Lane Miles)

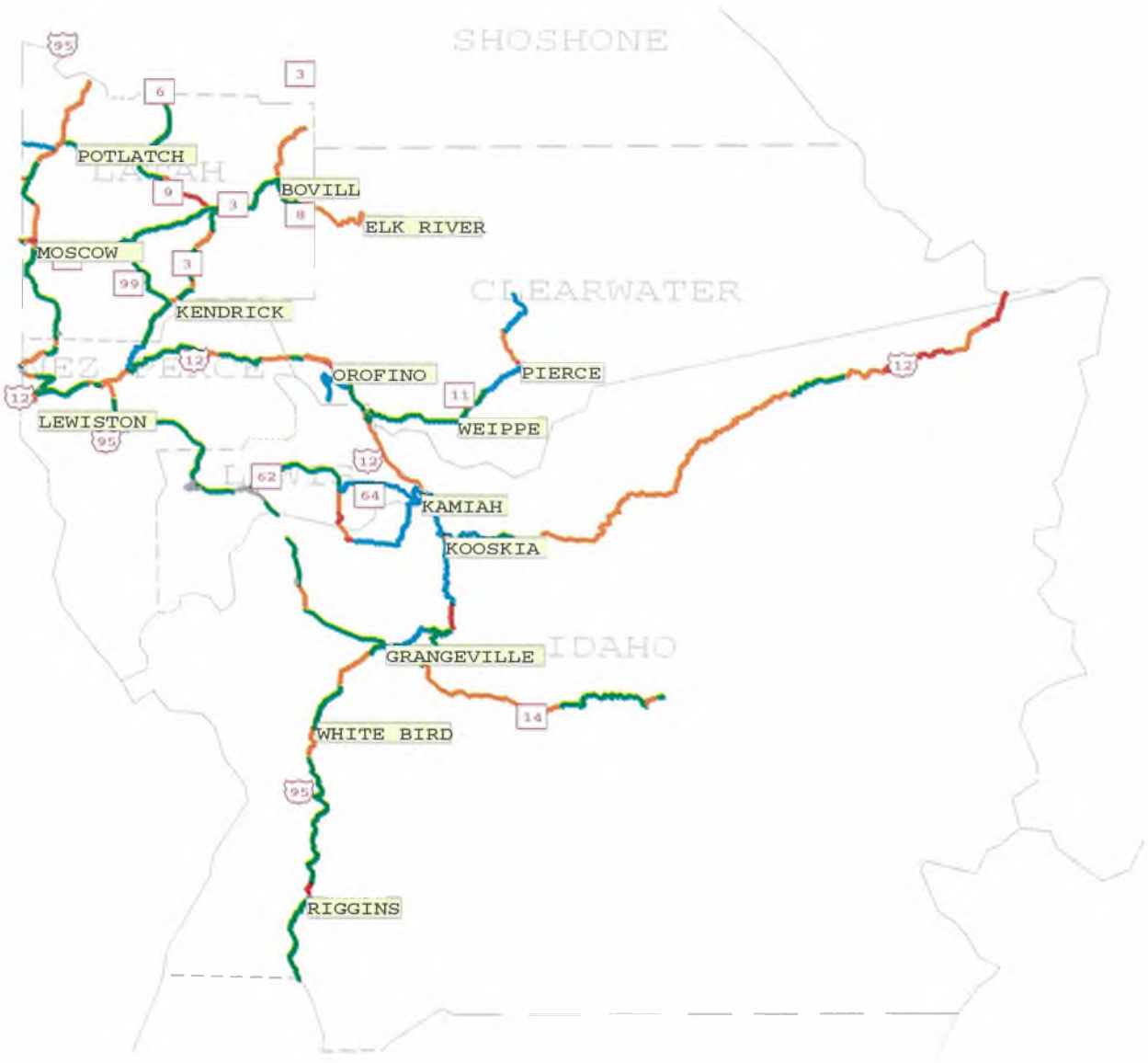
Map 3.

District 2

Pavement Condition Map

(1,434 lane miles)

Good	Fair	Poor	Very Poor
(733 Lane Miles)	(417 Lane Miles)	(85 Lane Miles)	(199 Lane Miles)



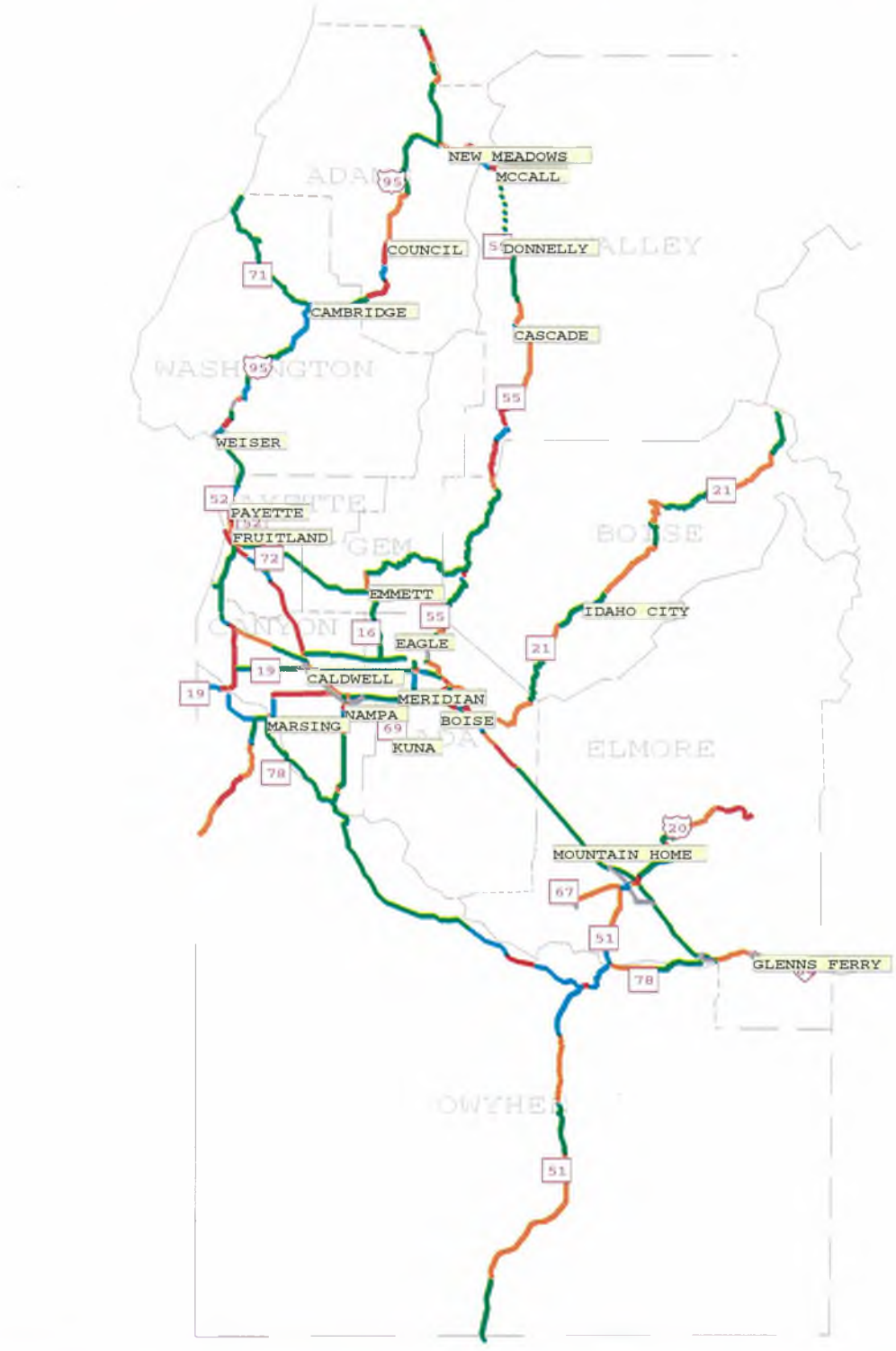
Map 4.

District 3

Pavement Condition Map

(2,499 lane miles)

Good	Fair	Poor	Very Poor
(1,186 Lane Miles)	(653 Lane Miles)	(412 Lane Miles)	(247 Lane Miles)



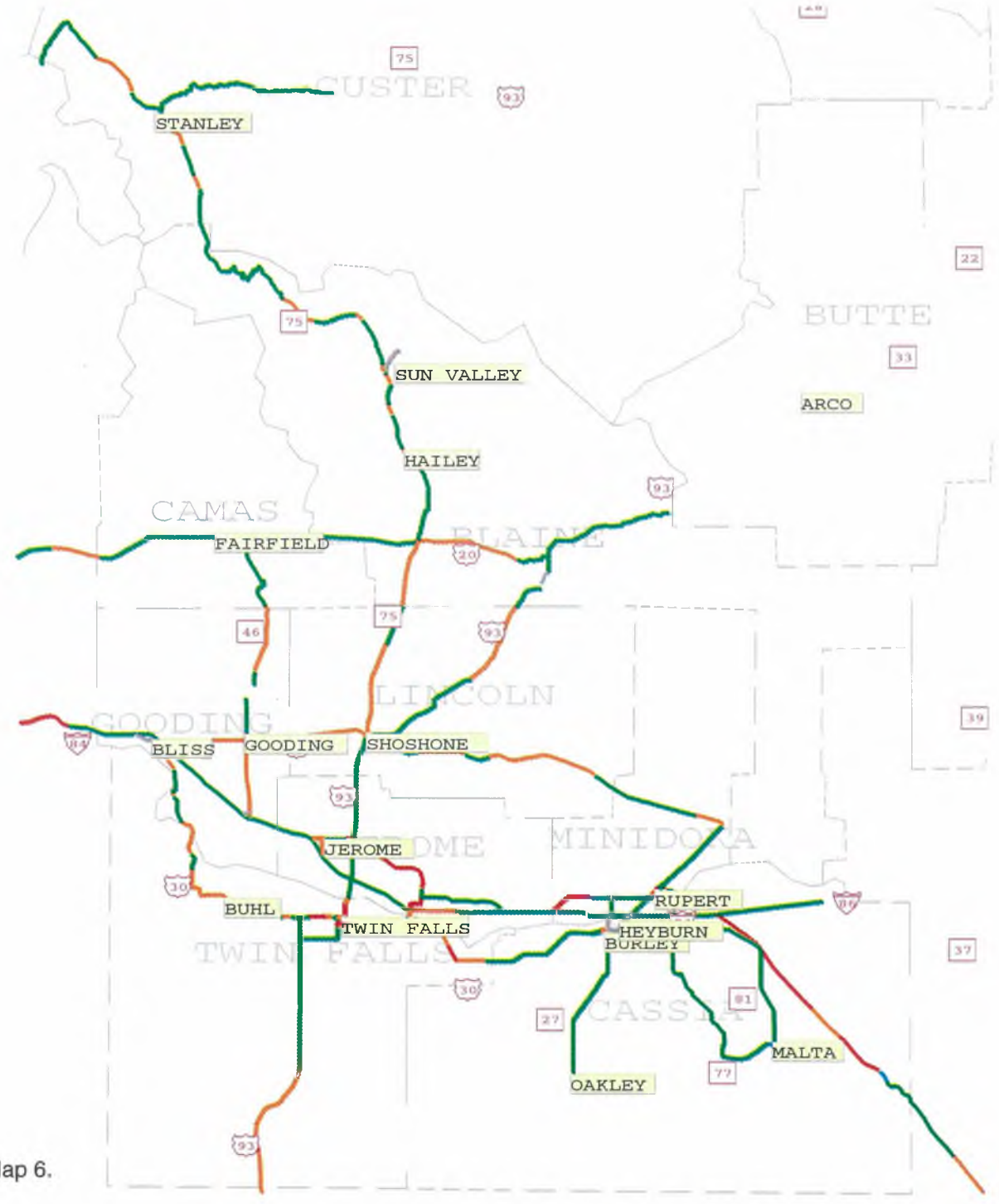
Map 5.

District 4

Pavement Condition Map

(2,320 lane miles)

Good	Fair	Poor	Very Poor
(1,552 Lane Miles)	(547 Lane Miles)	(191 Lane Miles)	(30 Lane Miles)



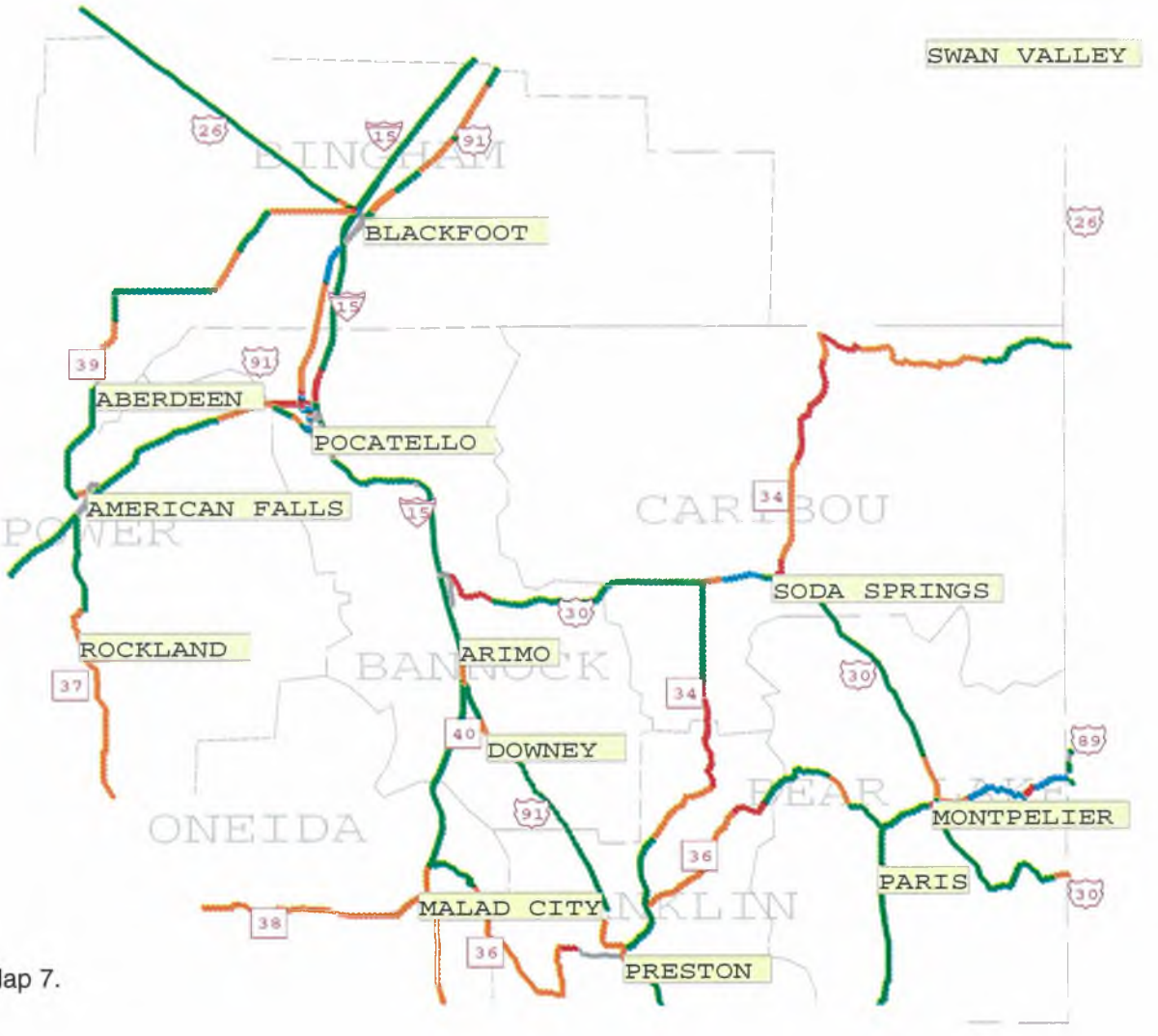
Map 6.

District 5

Pavement Condition Map

(1,800 lane miles)

Good	Fair	Poor	Very Poor
(1,083 Lane Miles)	(496 Lane Miles)	(129 Lane Miles)	(92 Lane Miles)



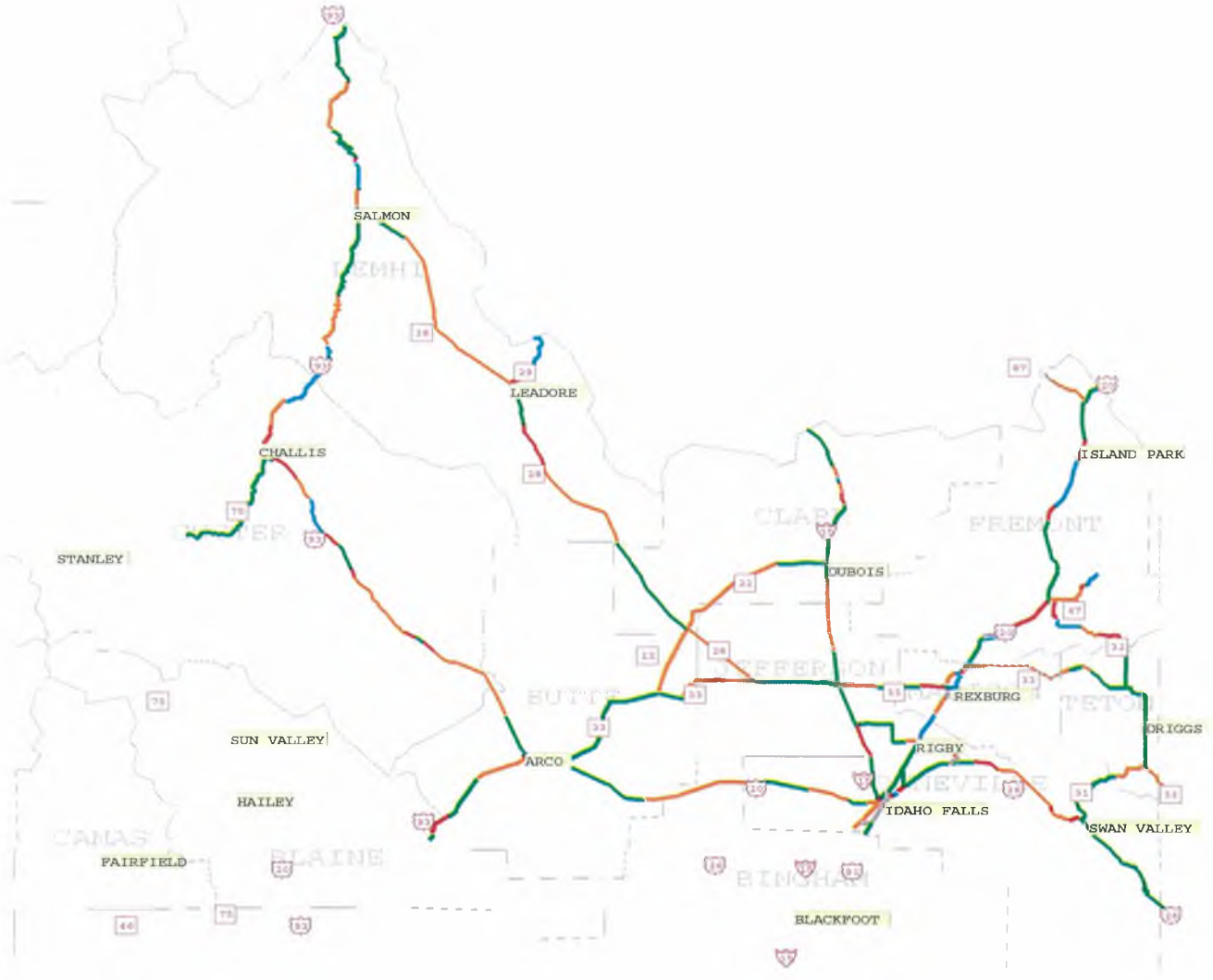
Map 7.

District 6

Pavement Condition Map

(2,280 lane miles)

Good	Fair	Poor	Very Poor
(1,065 Lane Miles)	(627 Lane Miles)	(277 Lane Miles)	(311 Lane Miles)



Map 8.

Idaho 3 7948

Section 4
NEEDS ANALYSIS

PAVEMENT NEEDS

The pavement-condition needs identified on the following pages were obtained through the Highway Performance Monitoring System - Analytical Package (HPMS-A/P).

The HPMS-A/P is a model developed by the Federal Highway Administration (FHWA) to analyze data furnished to them by the states. The results of the analysis are used by the FHWA in policy development and for their bi-annual reports to Congress on the status and performance of the Nation's Highways. This model has been adapted in-house and by consultant contract for ITD's use so that we may apply the same types of analysis to Idaho's pavement-management data.

The A/P's function is to analyze highway inventory data and to develop relationships between various levels of capital investment, and the resulting condition of the State Highway System. It is a tool to help management predict the effects of any proposed level of capital investment and the corresponding condition, safety, and service characteristics of the highway system. It responds to a variety of questions regarding the levels of investment necessary to accomplish desired objectives.

The Planning Services Section has enhanced the program by modifying it to reflect:

- Idaho's costs (based on ITD project history files)
- The department's design standards
- Our minimum tolerable conditions

(continues on next page)

PAVEMENT NEEDS (continued)

The analytical package analyzes data related to:

- pavement condition,
- geometrics,
- roadway cross section,
- operation, and
- access control.

Among its many reports, the program produces a prioritized list of pavement-management sections, year of need, and the type and cost of rehabilitation.

Figure 18 is a graphical representation of needs by district.

The table on page 27 is a summary of current pavement needs by district and functional class. Deficiencies are defined as very poor and poor pavements (based on roughness and cracking).

Pavement needs are further classified as either resurface or reconstruction depending on the level and type of deficiency identified for individual pavement sections. Costs are based on the average project costs for Idaho over the last ten years.

The district maps on pages 28 through 33 identify the specific locations of pavement deficiencies and programmed highway projects in each district.

Pavements on the State Highway System have shown a great deal of improvement in recent years, but there is still much work left to do.

1999
Pavement Needs
(Lane Miles)

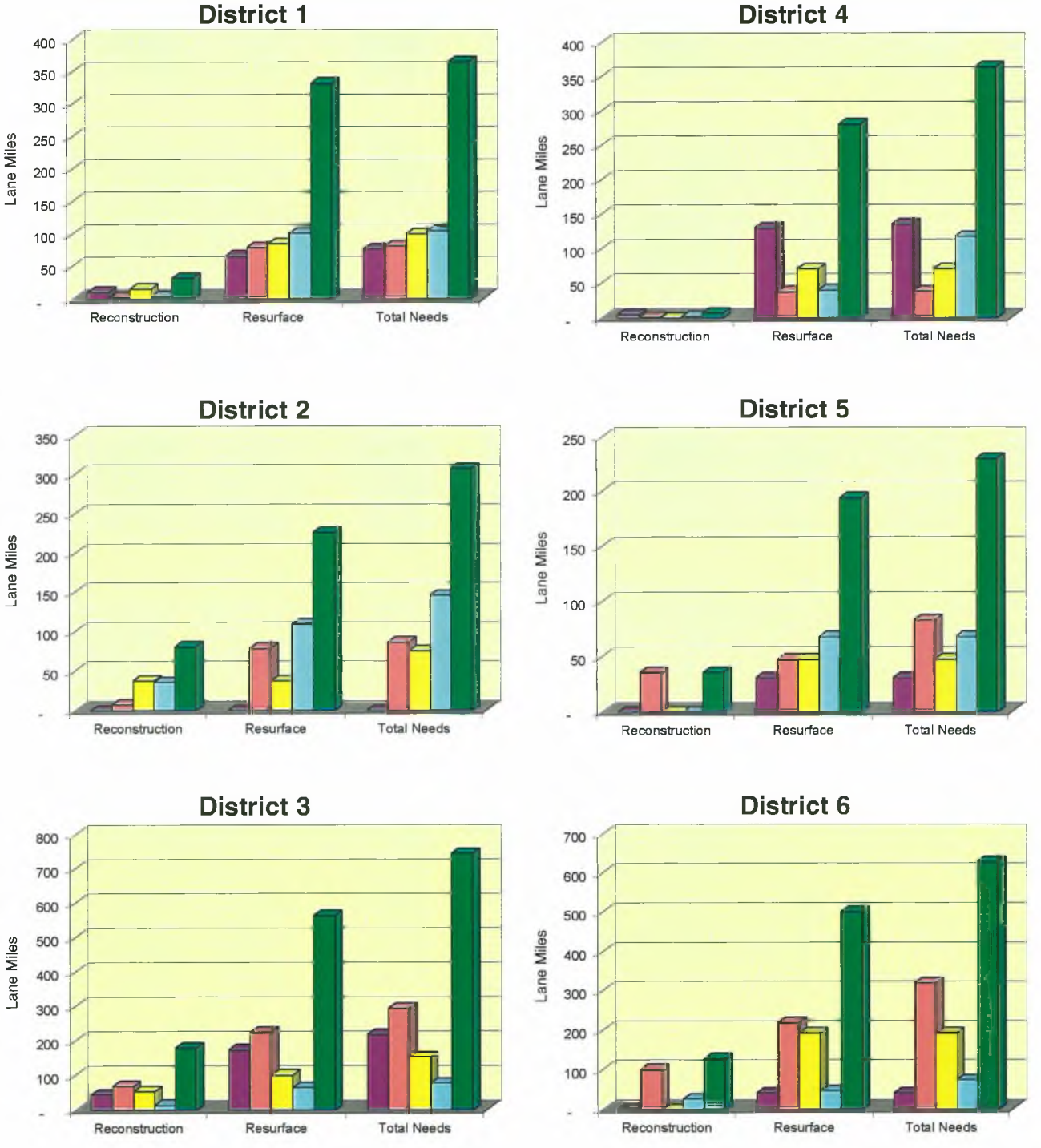


Figure 18.

INTERSTATE PRINCIPAL ART. MINOR ARTERIAL COLLECTOR TOTAL

1999 Pavement Needs
(State Highway System)

DISTRICT 1

	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	11	6,170	66	7,334	77	13,504
PRINCIPAL ART.	3	1,392	80	7,895	82	9,287
MINOR ARTERIAL	15	6,734	85	8,990	101	15,724
COLLECTOR	3	1,407	101	10,711	105	12,118
TOTAL	33	15,703	333	34,930	365	50,633

DISTRICT 2

	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	-	-	-	-	-	-
PRINCIPAL ART.	7	4,326	79	9,907	87	14,233
MINOR ARTERIAL	38	19,766	38	3,324	76	23,090
COLLECTOR	36	14,007	110	9,549	146	23,556
TOTAL	81	38,099	227	22,780	308	60,879

DISTRICT 3

	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	44	24,040	174	15,826	219	39,866
PRINCIPAL ART.	69	32,911	225	23,306	294	56,217
MINOR ARTERIAL	53	20,907	100	9,030	154	29,937
COLLECTOR	13	3,488	64	4,460	77	7,948
TOTAL	180	81,346	564	52,622	744	133,968

DISTRICT 4

	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	5	2,558	131	11,857	136	14,415
PRINCIPAL ART.	1	308	38	4,381	39	4,689
MINOR ARTERIAL	-	-	71	6,470	71	6,470
COLLECTOR	2	516	40	2,766	118	3,282
TOTAL	7	3,382	281	25,474	364	28,856

DISTRICT 5

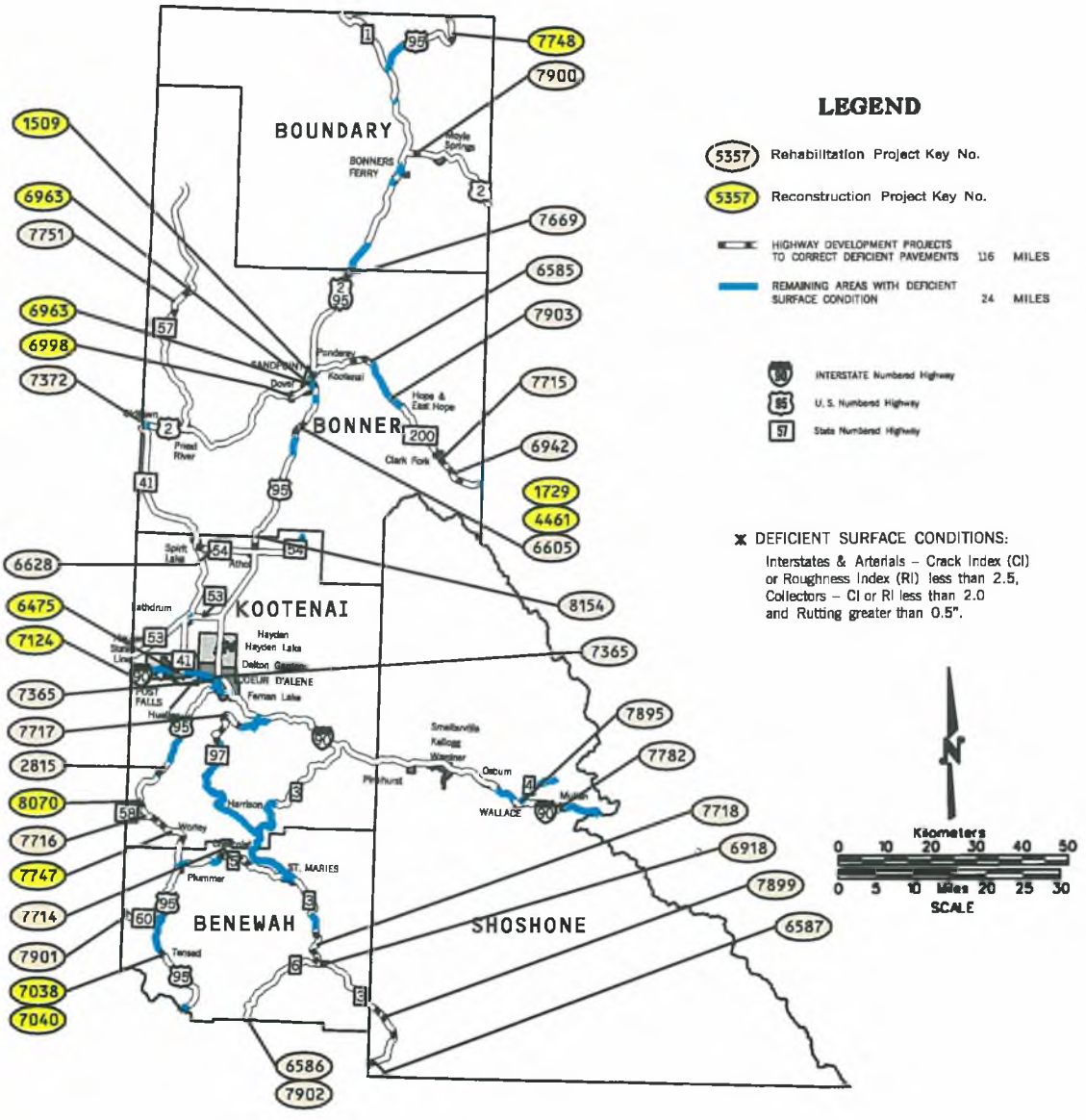
	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	-	-	31	3,040	31	3,040
PRINCIPAL ART.	36	18,272	48	6,011	83	24,283
MINOR ARTERIAL	-	-	48	3,541	48	3,541
COLLECTOR	-	-	68	5,382	68	5,382
TOTAL	36	18,272	194	17,974	230	36,246

DISTRICT 6

	RECONSTRUCTION		RESURFACE			
	DEFICIENT LANE MILES	COST ($000)	DEFICIENT LANE MILES	COST ($000)	TOTAL LANE MILES	TOTAL COST ($000)
INTERSTATE	-	-	41	3,704	41	3,704
PRINCIPAL ART.	101	48,699	219	19,082	321	67,781
MINOR ARTERIAL	-	-	193	13,667	193	13,667
COLLECTOR	26	10,281	47	3,915	74	14,196
TOTAL	128	58,980	501	40,368	629	99,348

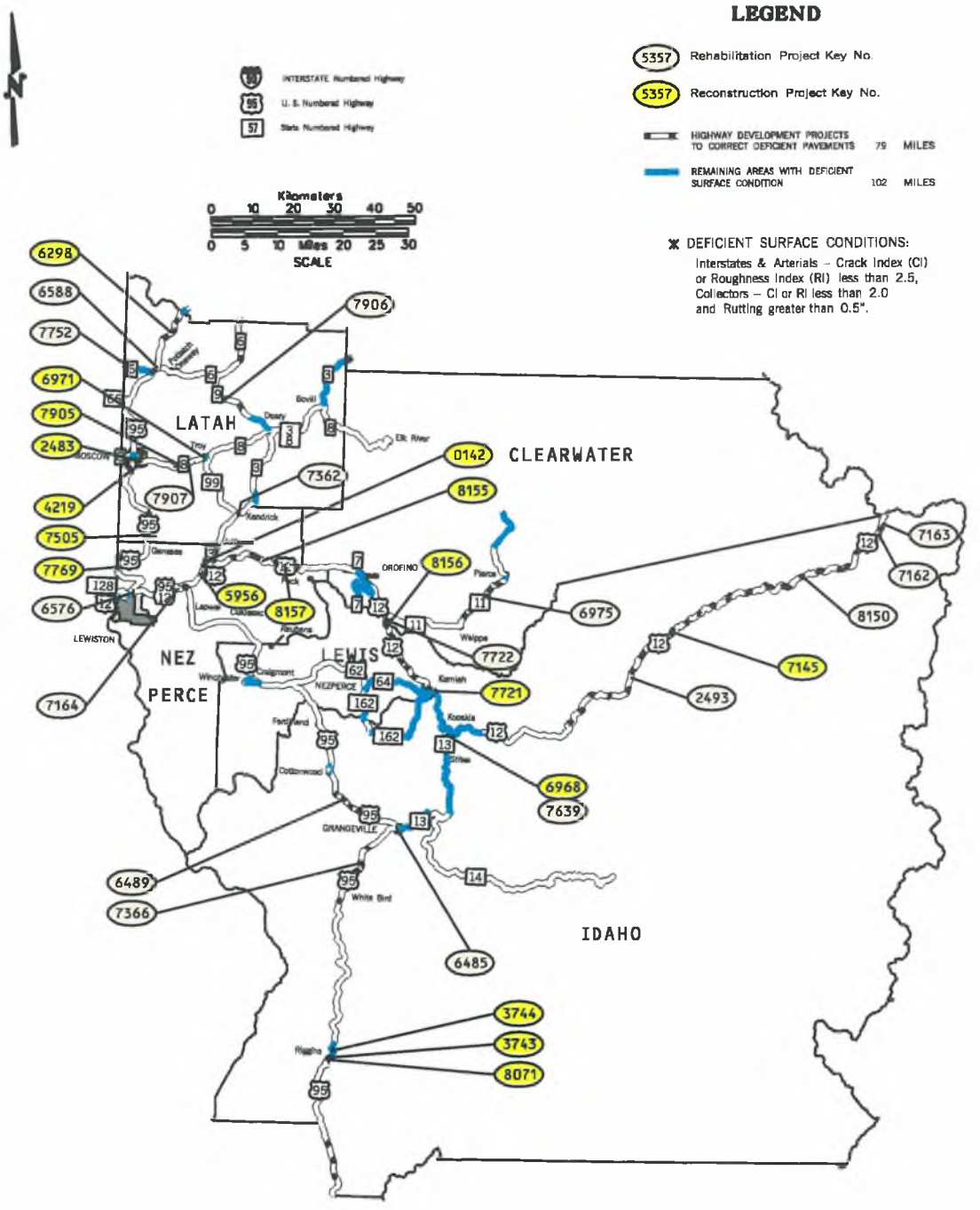
GRAND TOTAL	464	215,782	2,100	194,148	2,640	409,930

DISTRICT 1
Programmed Projects vs. Pavement Deficiencies*
FY 2000 – 2004



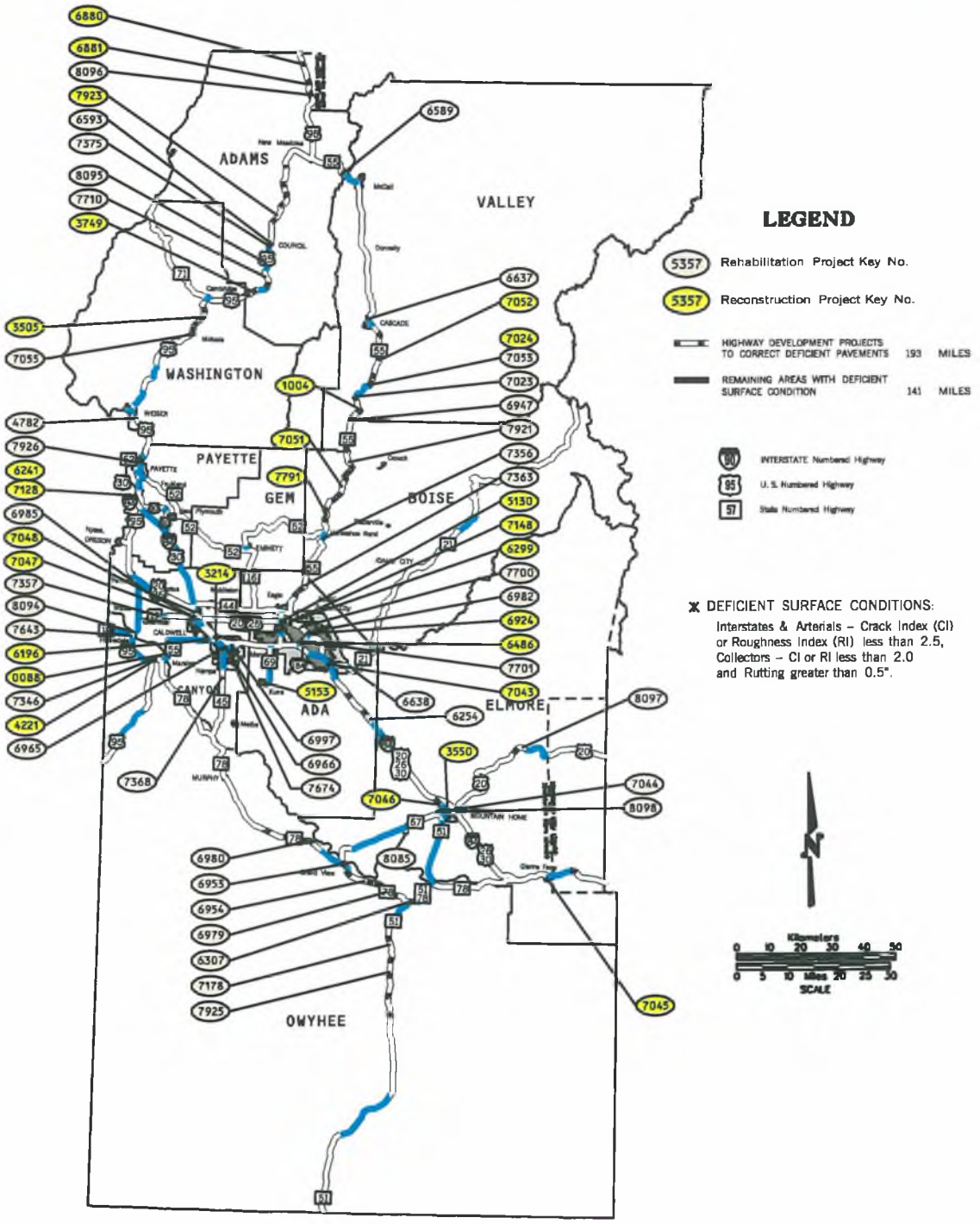
Map 9.

DISTRICT 2
Programmed Projects vs. Pavement Deficiencies*
FY2000 – 2004



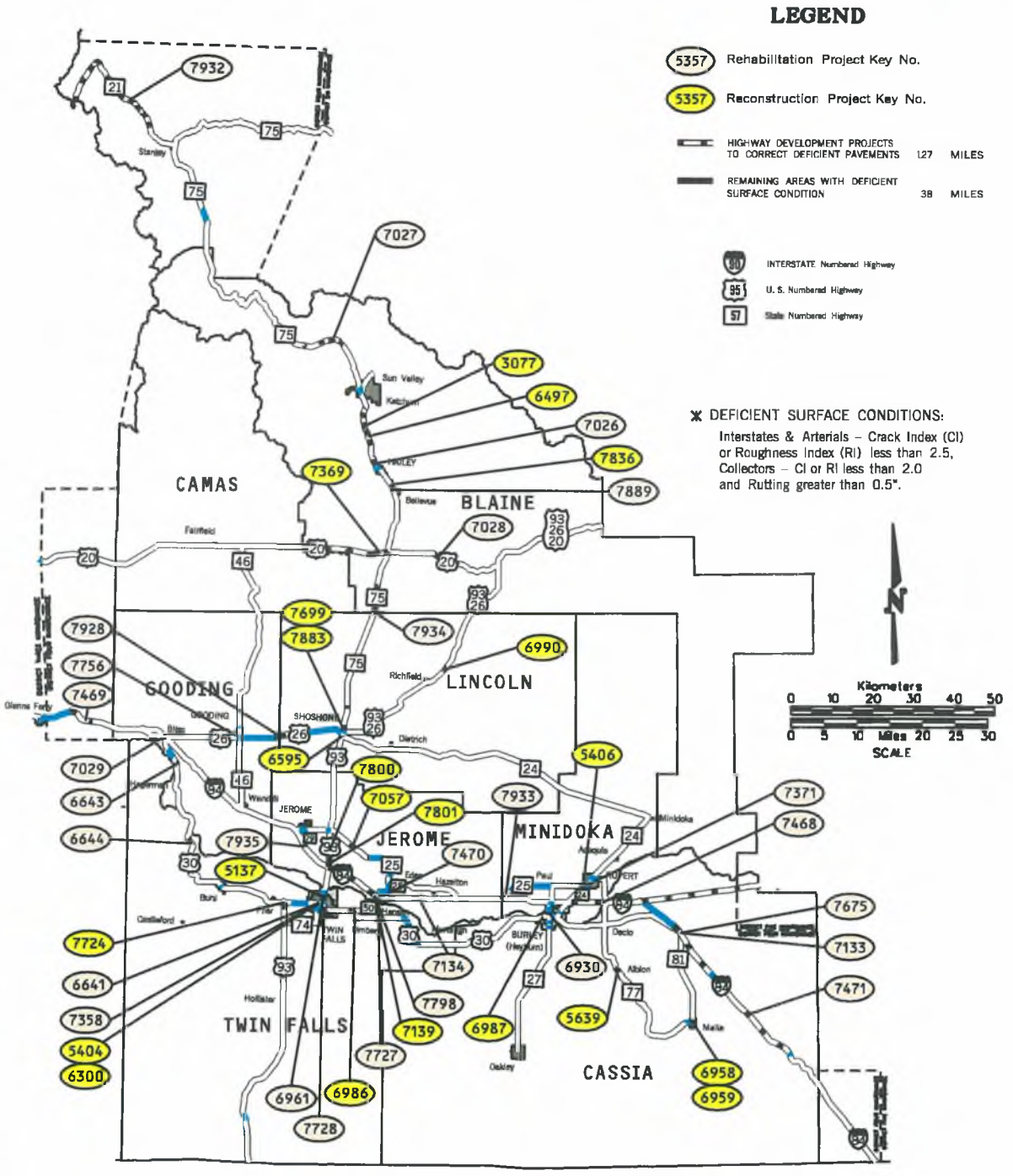
Map 10.

DISTRICT 3
Programmed Projects vs. Pavement Deficiencies*
FY 2000 – 2004



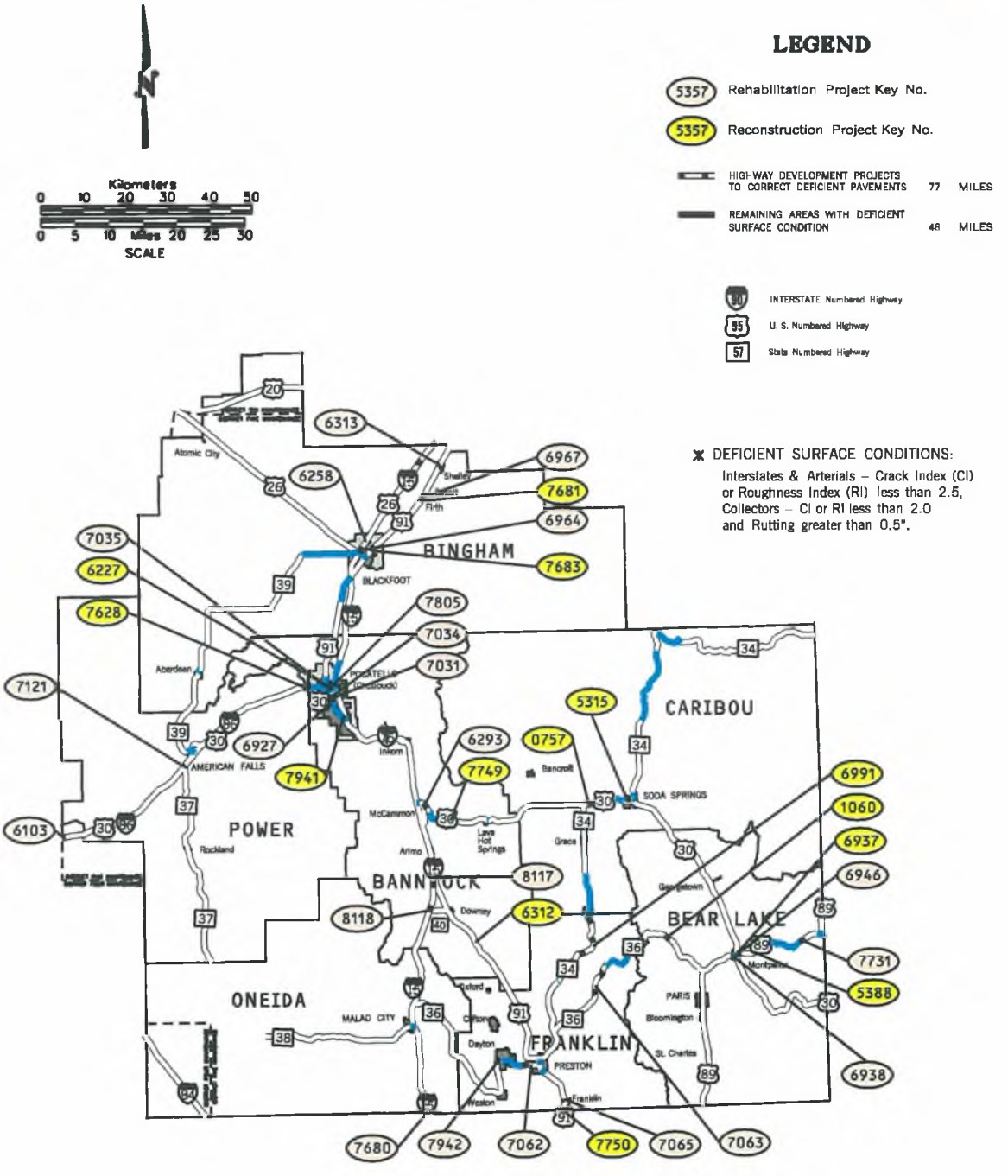
Map 11.

DISTRICT 4
Programmed Projects vs. Pavement Deficiencies *
FY 2000 – 2004

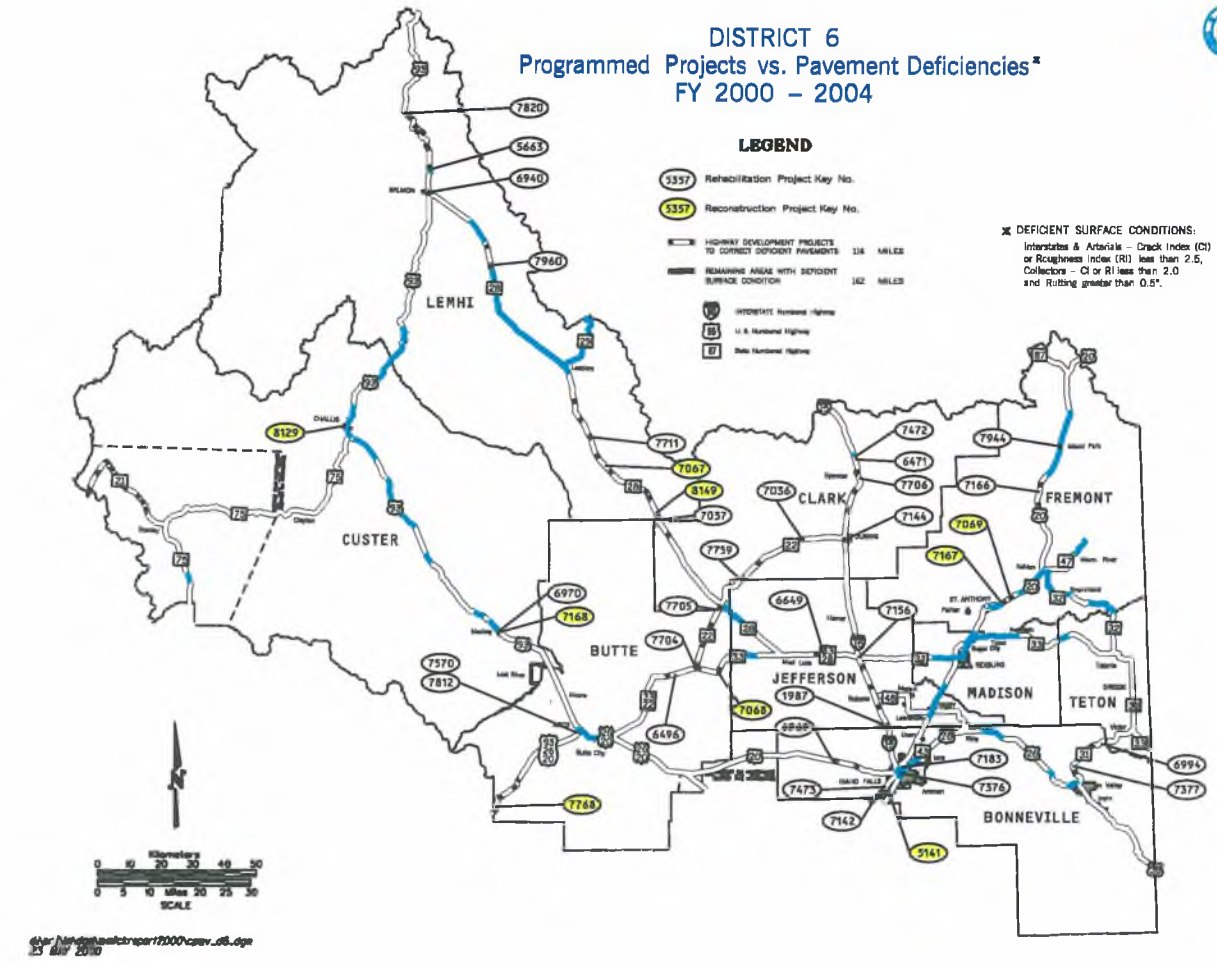


Map 12.

DISTRICT 5
Programmed Projects vs. Pavement Deficiencies *
FY 2000 – 2004



Map 13.


DISTRICT 6
Programmed Projects vs. Pavement Deficiencies*
FY 2000 – 2004
LEGEND
Rehabilitation Project Key No.
Reconstruction Project Key No.
HIGHWAY DEVELOPMENT PROJECTS TO CORRECT DEFICIENT PAVEMENTS 116 MILES
REMAINING AREAS WITH DEFICIENT SURFACE CONDITION 162 MILES
* DEFICIENT SURFACE CONDITIONS:
Interstates & Arterials – Crack Index (CI) or Roughness Index (RI) less than 2.5, Collectors – CI or RI less than 2.0 and Rutting greater than 0.5".
LEMHI
CUSTER
BUTTE
CLARK
FREMONT
JEFFERSON
MADISON
TETON
BONNEVILLE
7820
5663
6940
7960
8129
7711
7067
8149
7037
7036
7472
6471
7706
7166
7944
7144
7069
7167
7739
6649
7705
7156
6970
7168
7704
7570
7812
1987
7068
6496
7183
6994
7377
7473
7376
7142
7768
5141
SCALE

Map 14.

Section 5
SEAL COATS

Seal-coat projects are designed to preserve and maintain rural Idaho highways.

Seal coats are an important part of the department's preventative-maintenance program. Preventative maintenance slows the rate of pavement deterioration which increases the service life of our highway system. Seal coats help protect our pavements by reducing damage caused by oxidation and moisture and improve skid resistance.

Figures 19 and 20 provide a five-year look at seal coats from a statewide perspective. Centerline and lane miles of seal-coat projects are tabulated for years 1995 through 1999.

Figure 21 shows the five-year average of lane miles seal coated and the percentage of lane miles seal coated by district.

- District 2 has the highest "percentage" of lane miles seal coated annually (17.6% or 249 lane miles).

- District 6 seal coats more lane miles annually that any other district (an annual average of 327 lane miles or 14.4%).

Figures 22 through 27 show the miles seal coated from 1995 to 1999 in each of ITD's six districts.

seems Good

STATEWIDE FIVE-YEAR SEAL COAT HISTORY

(1995 - 1999)

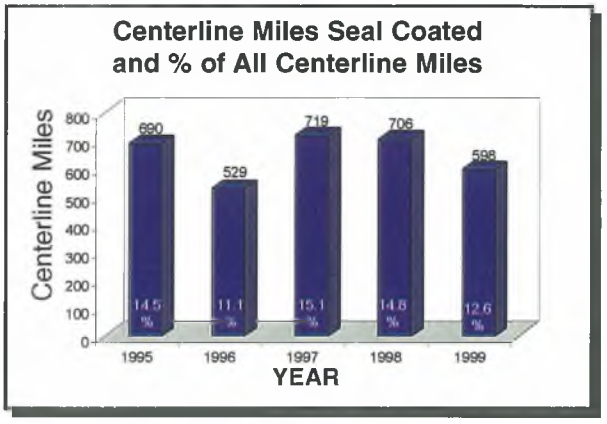


Figure 19

Figure 20

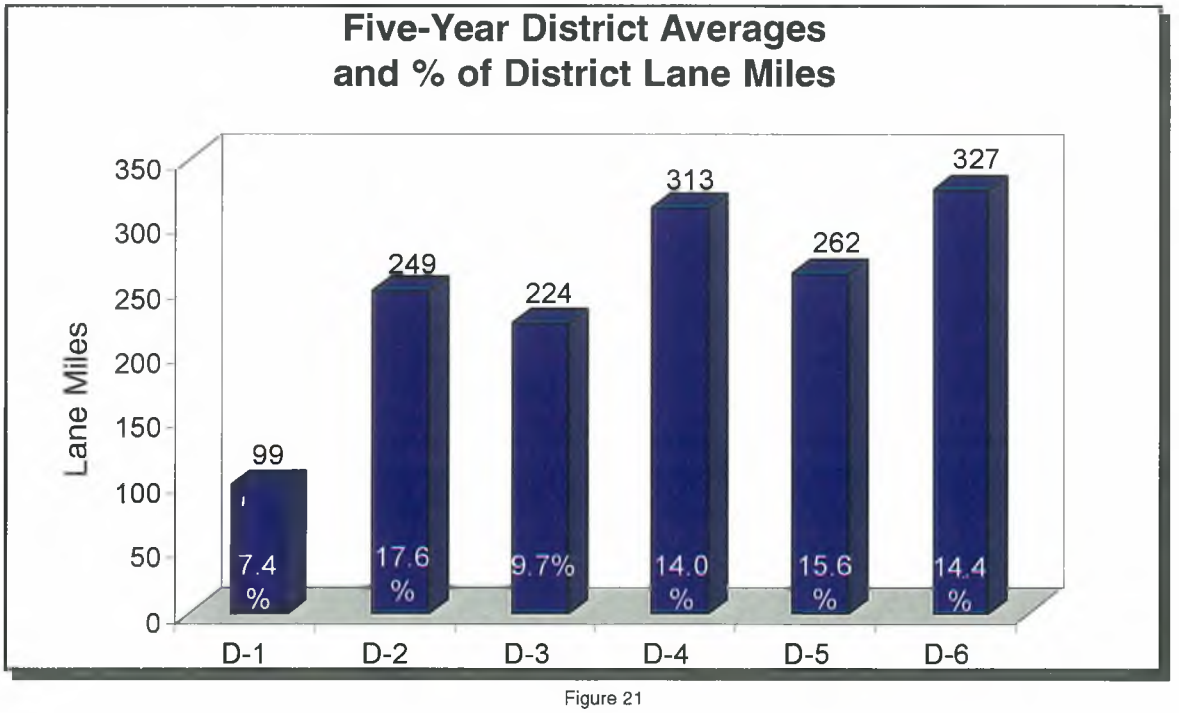
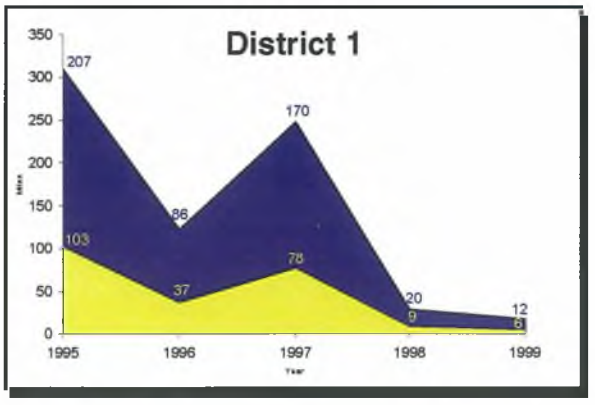
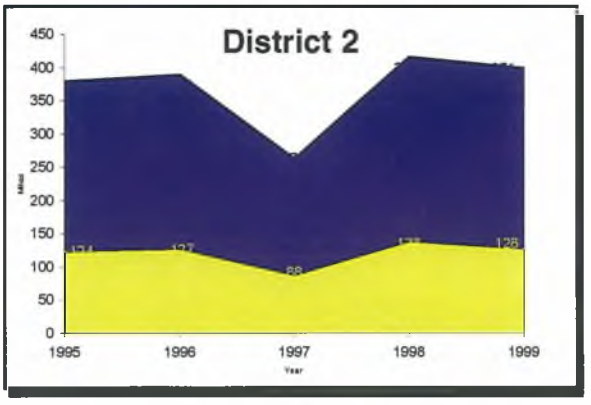


Figure 21

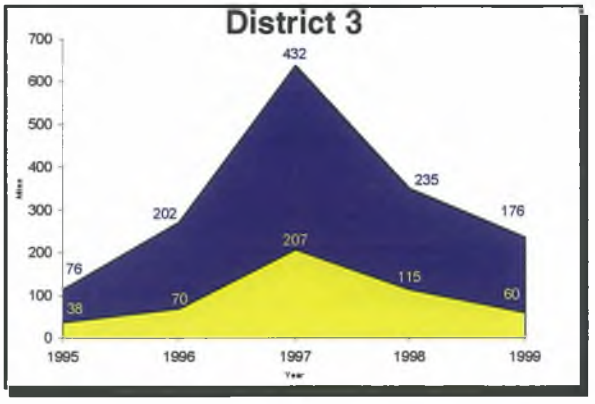
STATEWIDE FIVE-YEAR SEAL COAT HISTORY BY DISTRICT (1995 - 1999)



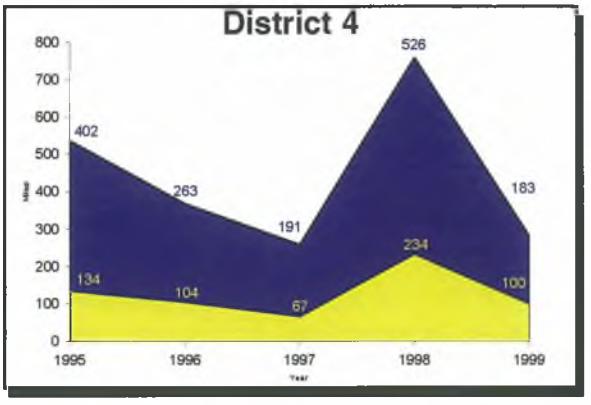
5-Year Lane Mile Average = 99



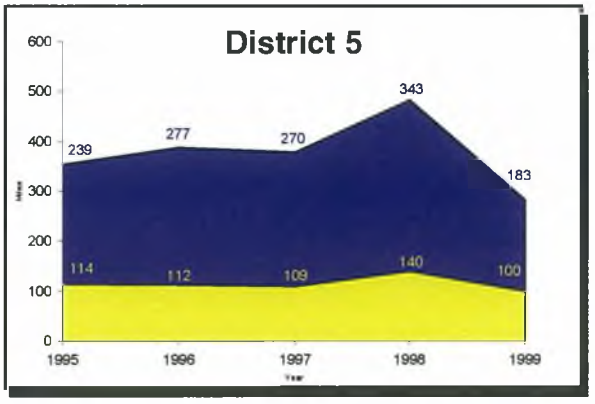
5-Year Lane Mile Average = 249



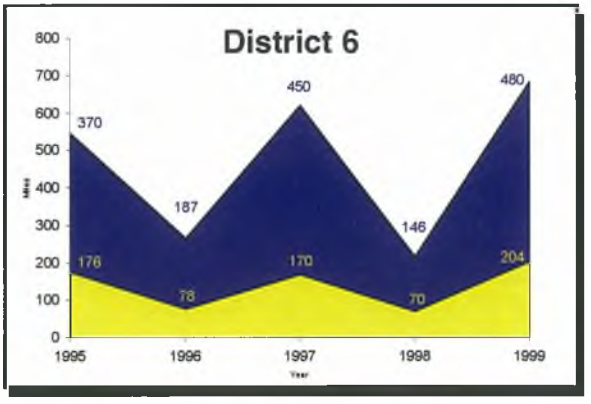
5-Year Lane Mile Average = 224



5-Year Lane Mile Average = 313



5-Year Lane Mile Average = 262



5-Year Lane Mile Average = 327

Lane Miles Centerline Miles

Figures 22 through 27

Section 6
SUMMARY

MAINTENANCE, REHABILITATION, AND RECONSTRUCTION

Idaho is making significant progress in the reduction of pavement deficiencies on the State Highway System. Pavements that are considered deficient have declined from nearly 40% in 1993 to 18% projected for calendar year 2000.

This reduction in deficiencies can be attributed to:

- **Maintenance:** Seal coats and other activities slow the rate of deterioration. The result of a strong maintenance program is that fewer deficiencies come on the system each year.

- **Rehabilitation:** The minor rehabilitation program has reduced pavement deficiencies. Under this program, pavements are resurfaced before they deteriorate to the point that reconstruction is necessary. The program allows us to keep our pavements in good condition.

- **Reconstruction:** When pavements have reached the end of their service life an effective reconstruction program is necessary.

Maintenance, rehabilitation, and reconstruction are all appropriate tools that need to be used at different times in the life of a pavement. It is important to select the proper tool to use at the appropriate time. Wise future project selections will allow Idaho to continue:

- Spending its limited roadway dollars wisely;

- Reducing roadway deficiencies and the rate at which roadways become deficient.

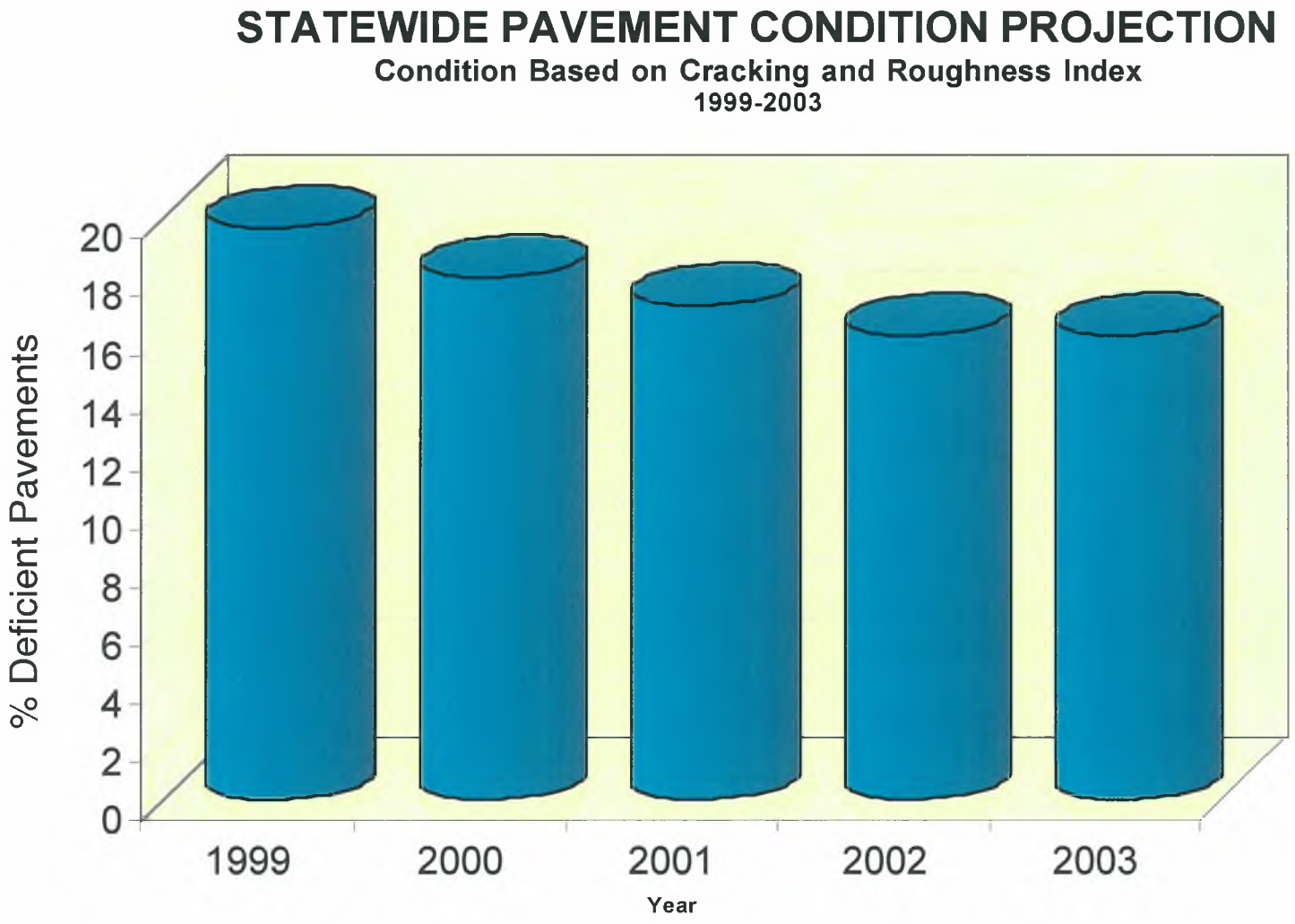
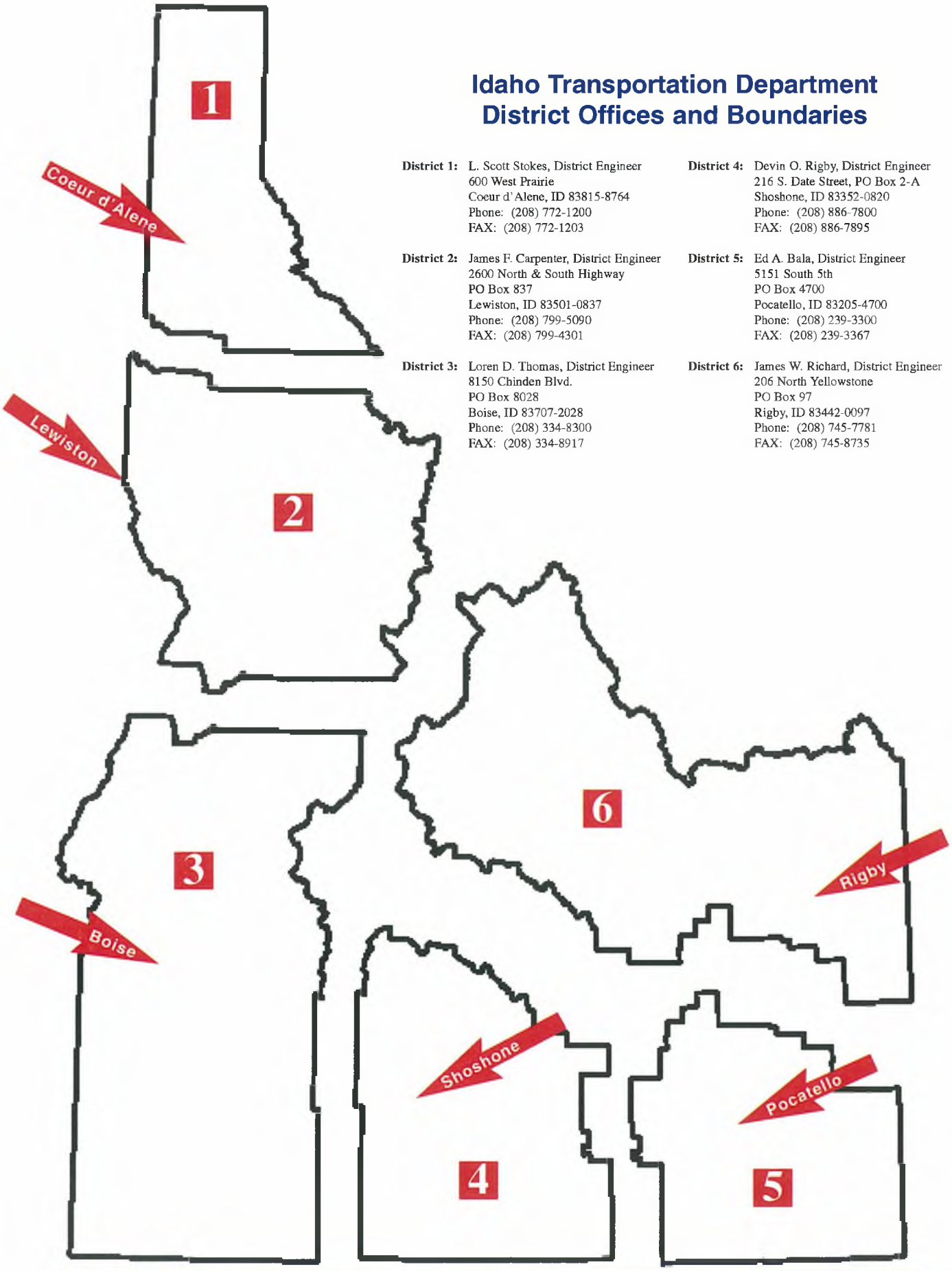

STATEWIDE PAVEMENT CONDITION PROJECTION
Condition Based on Cracking and Roughness Index
1999-2003
% Deficient Pavements
20
18
16
14
12
10
8
6
4
2
0
1999
2000
2001
2002
2003
Year

Figure 28.

Idaho Transportation Department
District Offices and Boundaries



District 1: L. Scott Stokes, District Engineer
600 West Prairie
Coeur d'Alene, ID 83815-8764
Phone: (208) 772-1200
FAX: (208) 772-1203

District 2: James F. Carpenter, District Engineer
2600 North & South Highway
PO Box 837
Lewiston, ID 83501-0837
Phone: (208) 799-5090
FAX: (208) 799-4301

District 3: Loren D. Thomas, District Engineer
8150 Chinden Blvd.
PO Box 8028
Boise, ID 83707-2028
Phone: (208) 334-8300
FAX: (208) 334-8917

District 4: Devin O. Rigby, District Engineer
216 S. Date Street, PO Box 2-A
Shoshone, ID 83352-0820
Phone: (208) 886-7800
FAX: (208) 886-7895

District 5: Ed A. Bala, District Engineer
5151 South 5th
PO Box 4700
Pocatello, ID 83205-4700
Phone: (208) 239-3300
FAX: (208) 239-3367

District 6: James W. Richard, District Engineer
206 North Yellowstone
PO Box 97
Rigby, ID 83442-0097
Phone: (208) 745-7781
FAX: (208) 745-8735

Notes

18944

Pavement Management System