Florida Department of Transportation

Bridge Inventory
2011 Annual Report

August 2011
State Maintenance Office
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Bridge Inventory - 2011 Annual Report

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Introduction

This report on Florida's bridge inventory represents a static view, or "snapshot" of the ever-changing bridge inventory database. Presented here are various ways to view the bridge inventory that are used in the bridge management industry. The objectives of this report are to establish benchmarks of bridge inventory characteristics and conditions that can be used in the future to measure progress in managing the inventory, and to present the current state of the bridge inventory.

The Department has responsibility for inspecting and rating most of the bridges in Florida. This report divides the inventory into groups that are responsible for maintaining (preserving) the bridges. The largest group includes all bridges maintained by the Florida Department of Transportation (FDOT), divided into the seven geographic districts and the Florida's Turnpike. The next largest maintenance responsibility group is that of county governments. The FDOT hires consulting engineers to inspect and rate county bridges, while the responsibility for maintaining the bridges remains with the individual county government. The next maintenance responsibility group includes city and town governments. Like the county bridges, FDOT hires consulting engineers to inspect most of the city and town maintained bridges. Maintenance of the remainder of the inventory is done by state agencies other than the FDOT, other local agencies, the federal government, railroads, private citizens and organizations.

This report presents the bridge inventory by various characteristics (number of bridges, age, structure types, and deck areas) and conditions (overall structural condition, structurally deficient bridges, posted and closed bridges, and functionally obsolete bridges). Also included for comparison are relative construction costs of bridges by structure type.

Number of Bridges

Currently there are 11,906 bridge-structures accounted for in the Florida DOT Bridge Management System. The FDOT has maintenance responsibility for 6,638 of the bridges, or 55.75%. County governments maintain 3,805 bridges (31.96%), city and towns maintain 1,196 bridges (10.05%), with the remaining 267 bridges (2.24%) maintained by others (see Figures 1 & 2).

The 6,638 bridges maintained by FDOT are divided by district and shown in Figures 3 & 4. District 2 has the most bridges, with 1,199 (18.06%), followed by District 5 (1014 bridges – 15.28%), District 1 (913 bridges – 13.75%), District 3 (788 bridges – 11.87%), District 4 (749 bridges - 11.28%), Turnpike District (699 bridges – 10.53%), District 7 (697 bridges – 10.50%), and District 6 (579 bridges – 8.72%). The number of bridges shown includes the 127 bridges maintained by the Dade County Expressway Authority (MDX) and 270 bridges maintained by the Orlando Orange County Expressway Authority (OOCEA).

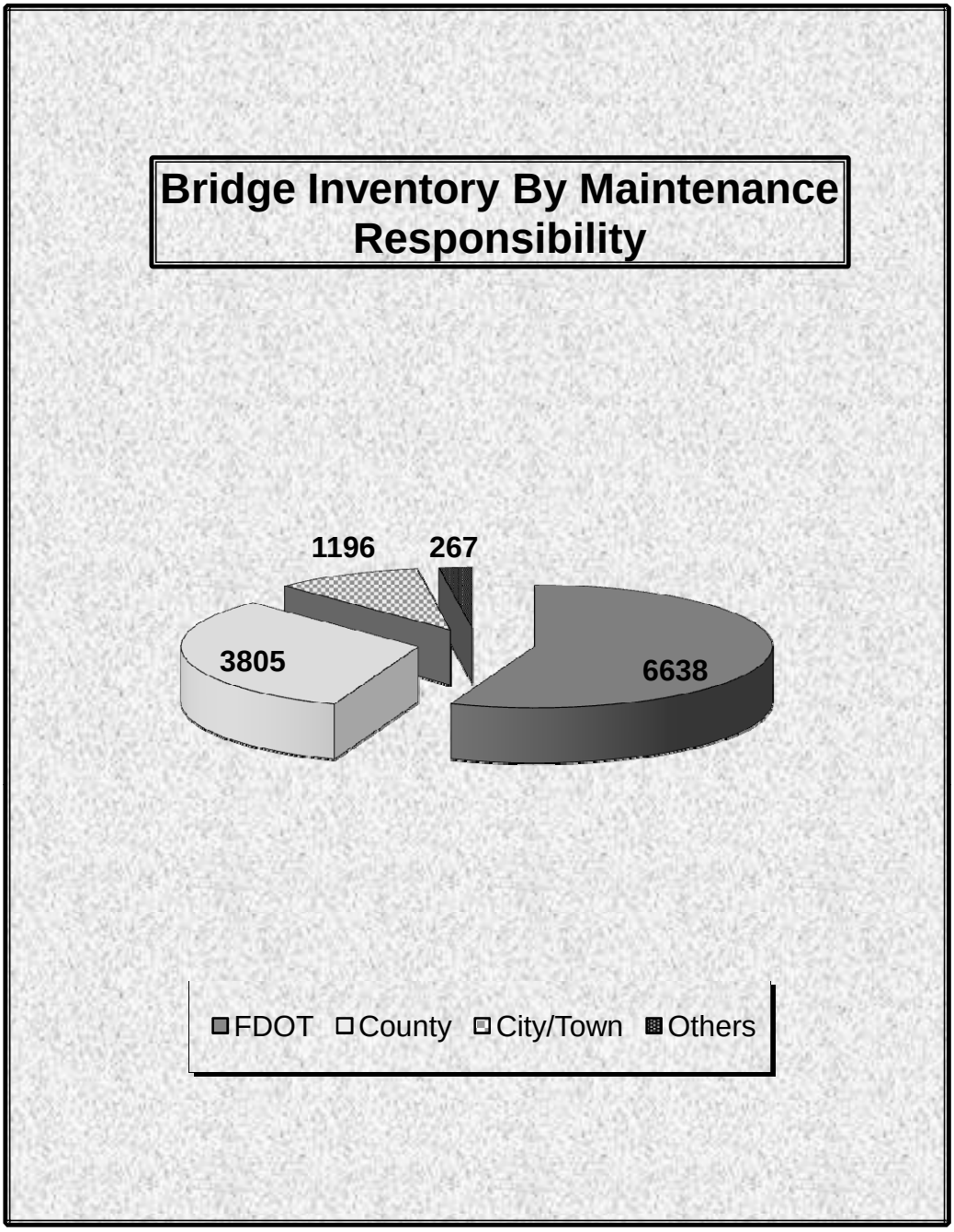

Figure 1

NOTE: The number of FDOT bridges includes 127 MDX bridges and 270 OOCEA bridges.

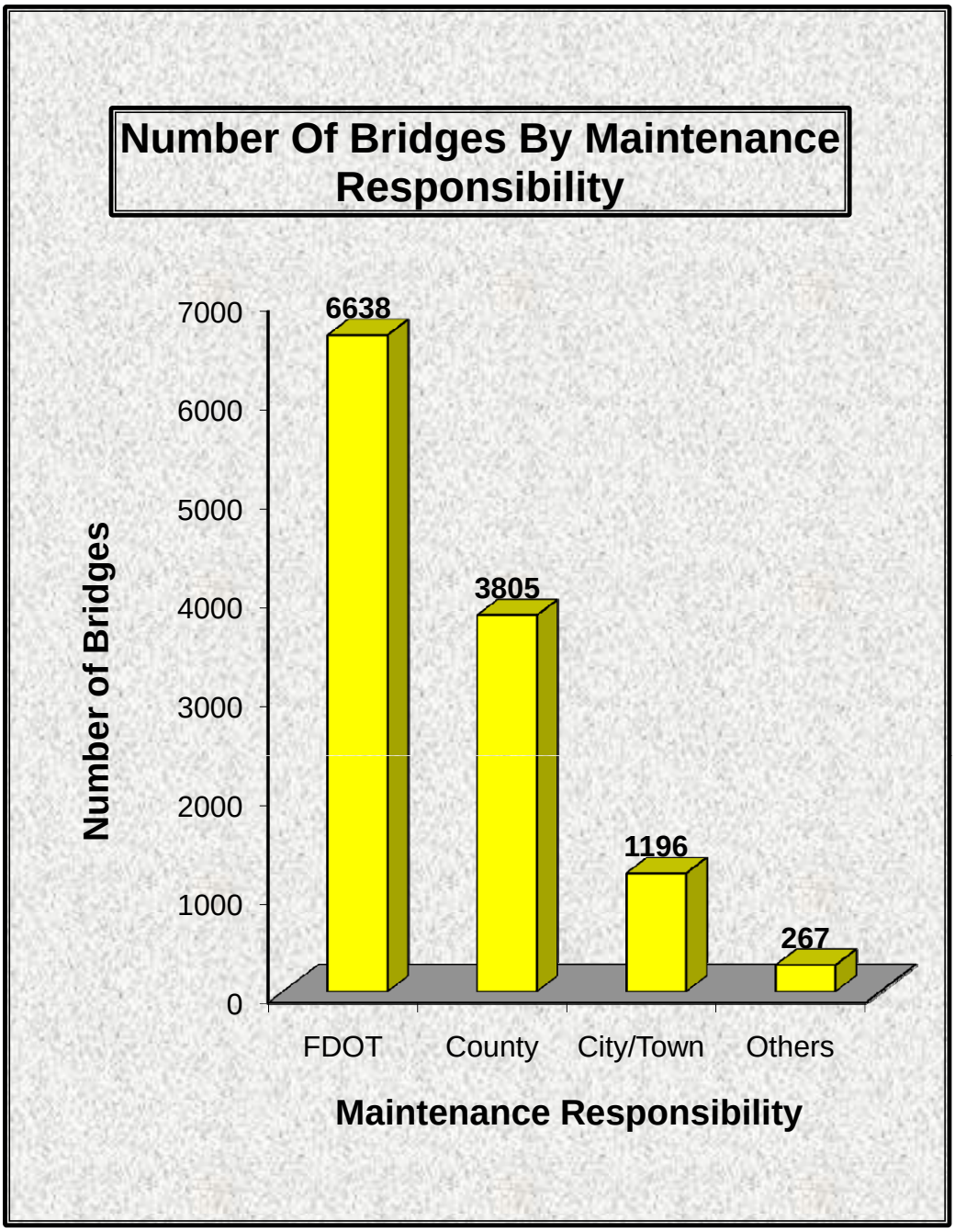

Figure 2

NOTE: The number of FDOT bridges includes 127 MDX bridges and 270 OOCEA bridges.

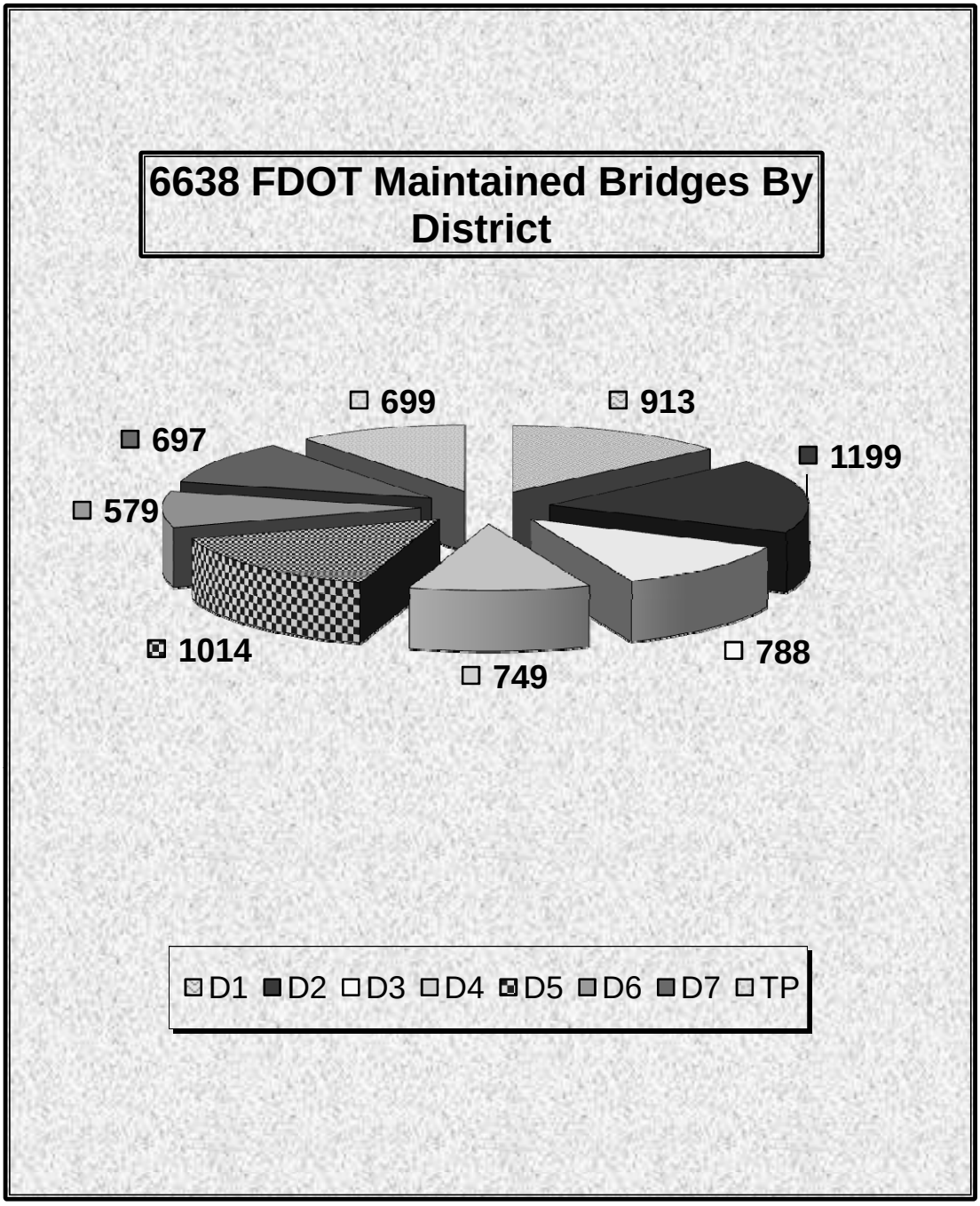

Figure 3

NOTE: The number of bridges includes 127 MDX bridges and 270 OOCEA bridges.

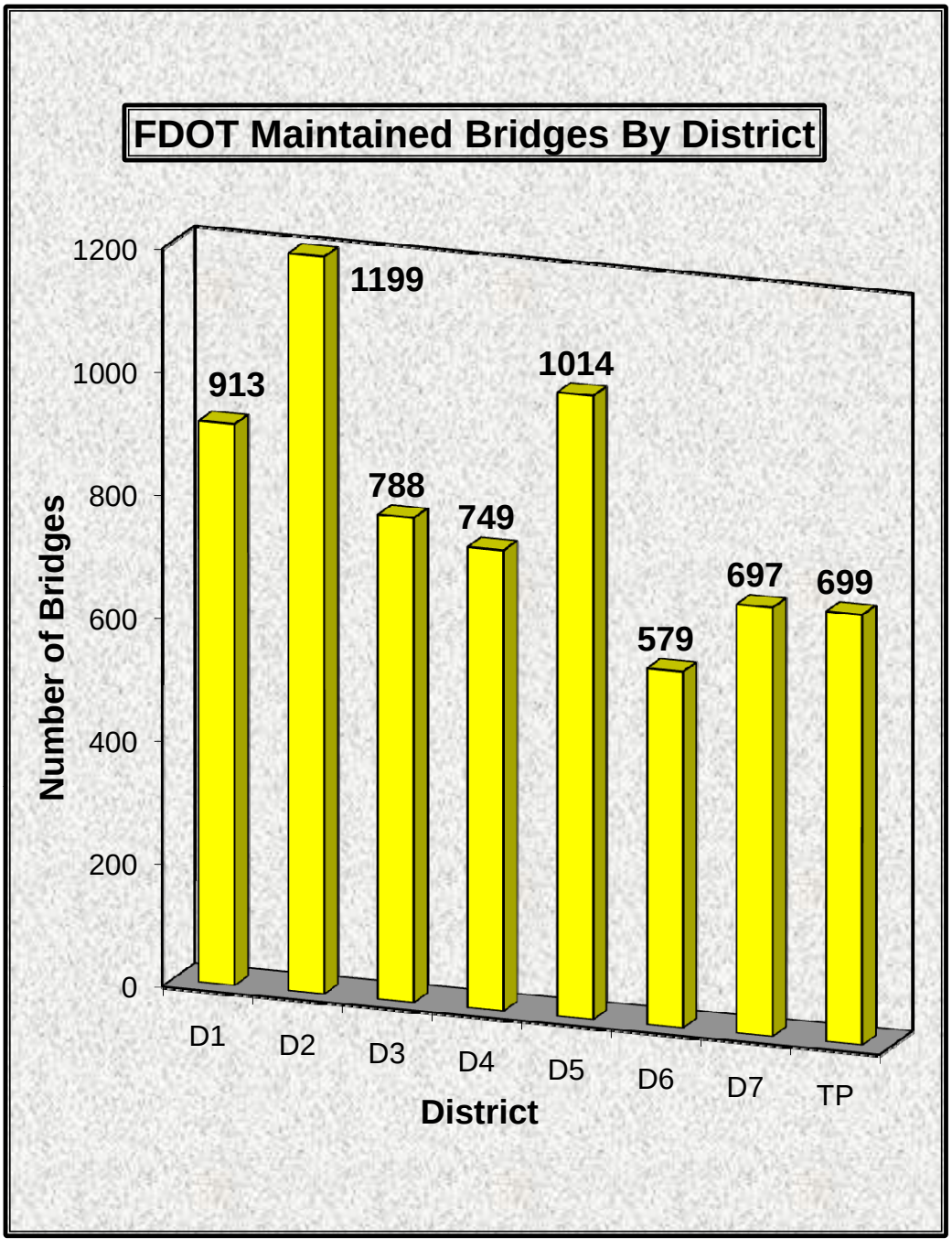

Figure 4

NOTE: The number of bridges includes 127 MDX bridges and 270 OOCEA bridges.

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Age of Bridges

While the industry is now designing bridges to last for 75 years, most bridges built in the past were designed for a service life of 50 years. Looking at bridge age is the most common and simplest method of forecasting long-term budget requirements. This might lead one to conclude that bridges constructed before 1960 are at the end of the service life. Fortunately, advances in material science, design practices, and construction methods, along with a generally favorable climate, inspection and maintenance practices have contributed in many bridges functioning well past their original design life, despite the tremendous growth in traffic volume over the years. The strategy of bridge maintenance is to leverage these advances using an aggressive maintenance program to extend the useful life of the bridges, thereby minimizing the need to replace a large number of bridges within a short time period (see Table 1).

For the 6,638 bridges maintained by FDOT, approximately 14.79% were constructed prior to 1960, about 42.38% were constructed in the 1960's and 1970's, with the remaining 42.83% having been built since 1980 (see Figure 5).

Similar results can be seen with the statewide bridge inventory of county government maintained bridges with 19.63% constructed prior to 1960, 36.16% constructed in the 1960's and 1970's, and 44.2% since 1980 (see Figure 6).

The city and town maintained bridges are very similar as well, with 18.9% constructed prior to 1960, 40.89% constructed in the 1960's and 1970's, and 40.22% since 1980 (see Figure 7).

An examination of the distribution of the decade of construction by FDOT District, for the 6,638 FDOT maintained bridges show that the older bridge populations are concentrated in the rural and older urban areas, as one would expect (see Tables 2 & 3). The percentage of District bridge inventories built prior to the 1960's are as follows: District 2 – 22.6%, District 1 – 24.32%, District 3 – 18.78%, District 5 – 9.66%, District 7 – 11.05%, District 4 – 7.21%, District 6 – 10.96%, and the Turnpike District – 7.01%. While expansion and growth in South Florida has led to relatively younger bridge inventories for Districts 4 & 6, and the Turnpike, one would anticipate that the older bridge inventories, especially in Districts 1 and 2, would require a larger share of resources as their bridges reach the end of their service life. See Figure 8 for a graphic comparison of the FDOT Districts.

Bridge Inventory By Decade Built								
	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
Statewide								
>1930s	163	104	46	0	0	4	0	317
1940s	222	144	24	2	0	0	0	392
1950s	597	499	156	7	0	0	0	1259
1960s	1529	852	211	22	8	0	0	2622
1970s	1284	524	278	7	14	0	4	2111
1980s	900	516	211	19	27	0	3	1676
1990s	903	654	145	40	31	0	2	1775
2000s	991	475	115	54	10	0	5	1650
2010s	49	37	10	2	6	0	0	104
Total	6638	3805	1196	153	96	4	14	11906

Table 1

NOTE: The number of bridges includes 127 MDX bridges and 270 OOCEA bridges.

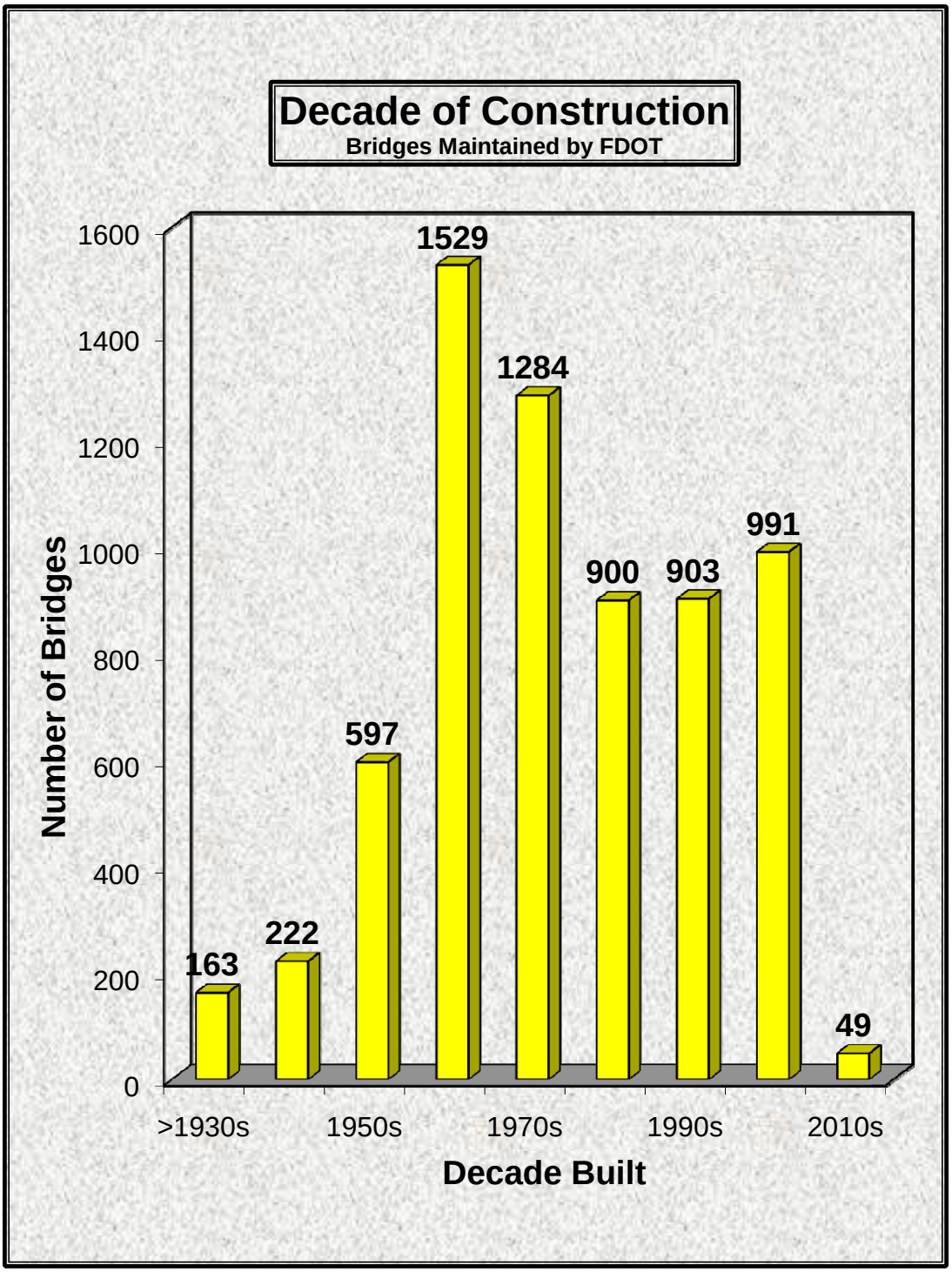

Figure 5

NOTE: The number of bridges includes 127 MDX bridges and 270 OOCEA bridges.

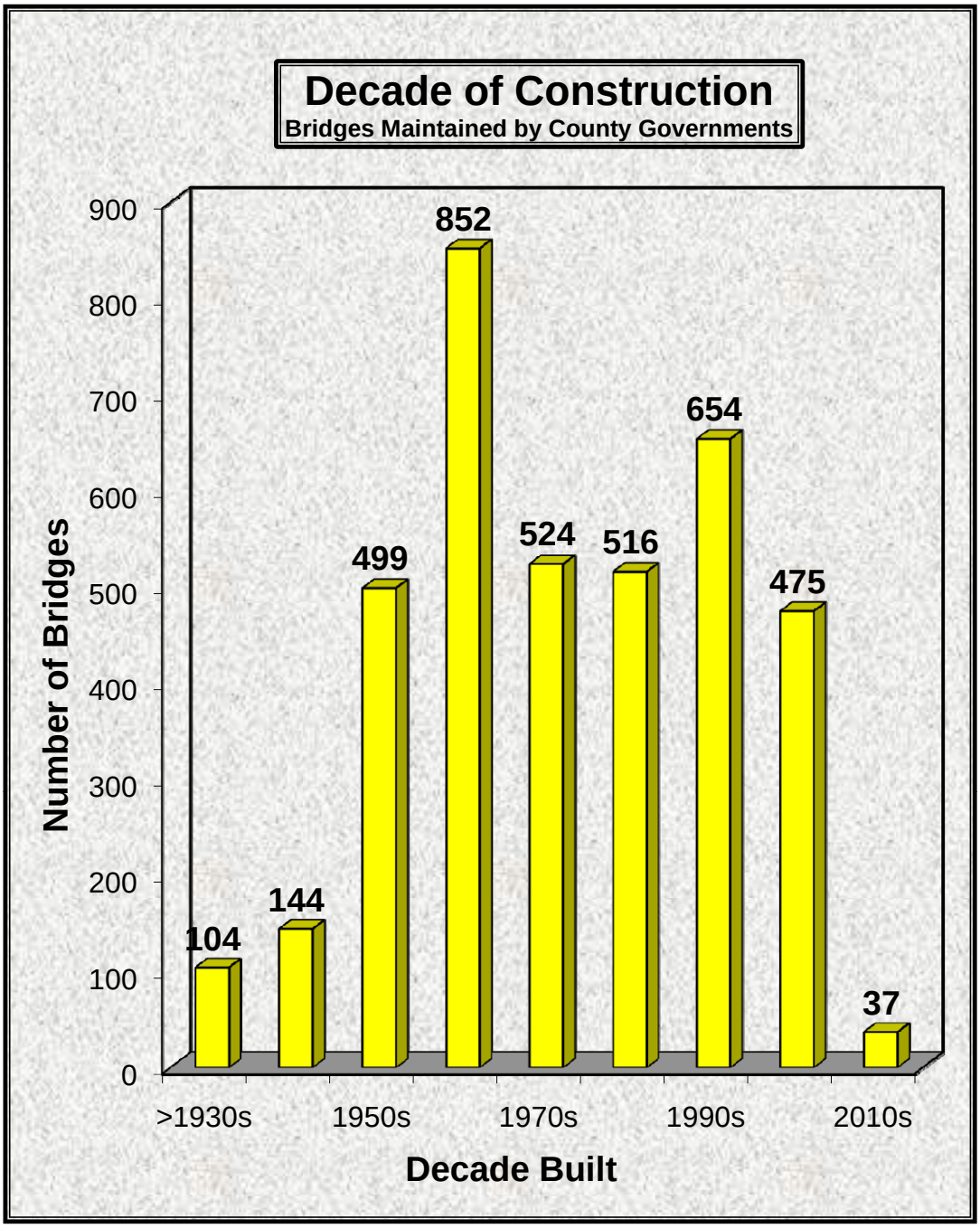
Decade of Construction
Bridges Maintained by County Governments
Number of Bridges
900
800
700
600
500
400
300
200
100
0
104
144
499
852
524
516
654
475
37
>1930s
1950s
1970s
1990s
2010s
Decade Built

Figure 6

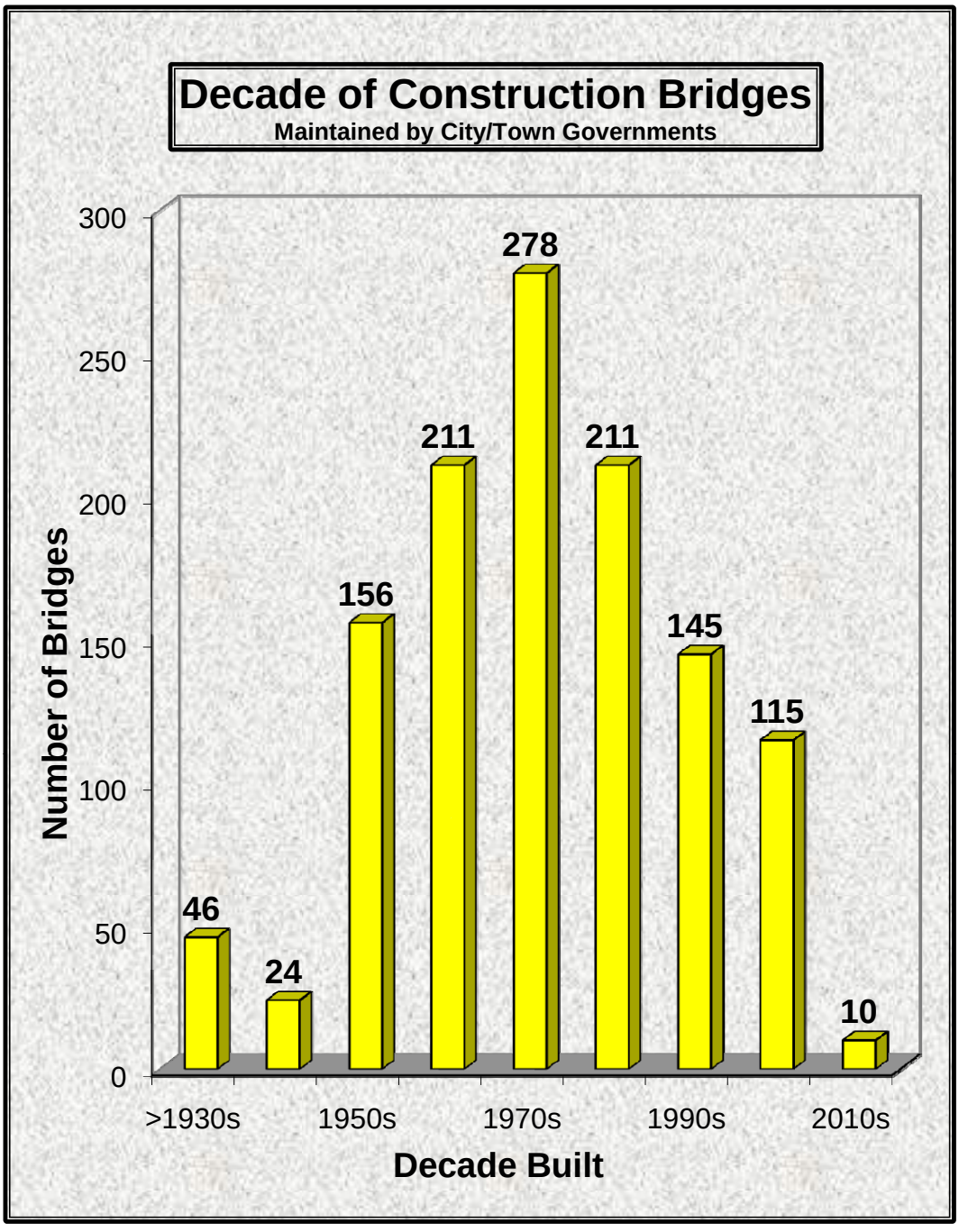
Decade of Construction Bridges
Maintained by City/Town Governments
Number of Bridges
300
250
200
150
100
50
0
46
24
156
211
278
211
145
115
10
>1930s
1950s
1970s
1990s
2010s
Decade Built

Figure 7

Bridge Inventory by Decade (Districts 1 thru 4)								
	Maintenance Responsibility							
	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
District 1								
>1930s	25	11	7	0	0	0	0	43
1940s	61	26	3	1	0	0	0	91
1950s	136	104	13	1	0	0	0	254
1960s	117	226	38	7	6	0	0	394
1970s	160	137	87	0	3	0	0	387
1980s	178	137	48	1	5	0	0	369
1990s	137	134	26	5	8	0	0	310
2000s	95	98	19	0	0	0	0	212
2010s	4	14	2	0	0	0	0	20
Total	913	887	243	15	22	0	0	2080
District 2								
>1930s	60	20	6	0	0	0	0	86
1940s	62	53	3	0	0	0	0	118
1950s	149	125	37	6	0	0	0	317
1960s	424	101	38	1	0	0	0	564
1970s	193	41	29	3	0	0	1	267
1980s	44	46	25	1	0	0	0	116
1990s	100	49	19	3	0	0	0	171
2000s	152	53	34	3	0	0	1	243
2010s	15	1	1	0	0	0	0	17
Total	1199	489	192	17	0	0	2	1899
District 3								
>1930s	10	26	0	0	0	0	0	36
1940s	63	36	2	1	0	0	0	102
1950s	75	146	5	0	0	0	0	226
1960s	116	175	5	7	0	0	0	303
1970s	291	109	6	4	2	0	0	412
1980s	58	81	8	16	0	0	1	164
1990s	103	201	12	28	0	0	0	344
2000s	70	153	6	46	1	0	0	276
2010s	2	6	0	1	0	0	0	9
Total	788	933	44	103	3	0	1	1872
District 4								
>1930s	6	5	6	0	0	0	0	17
1940s	4	3	6	0	0	0	0	13
1950s	44	48	62	0	0	0	0	154
1960s	77	77	64	2	0	0	0	220
1970s	165	76	68	0	0	0	0	309
1980s	229	74	54	0	0	0	0	357
1990s	96	105	16	0	0	0	0	217
2000s	127	52	11	0	0	0	0	190
2010s	1	2	3	0	0	0	0	6
Total	749	442	290	2	0	0	0	1483

Table 2

Bridge Inventory by Decade (Districts 5 thru 8)								
	Maintenance Responsibility							
	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
District 5								
>1930s	24	12	2	0	0	0	0	38
1940s	14	14	3	0	0	0	0	31
1950s	60	31	5	0	0	0	0	96
1960s	294	67	12	2	1	0	0	376
1970s	143	40	48	0	4	0	3	238
1980s	82	81	39	1	19	0	2	224
1990s	153	61	27	3	22	0	2	268
2000s	236	60	23	5	7	0	4	335
2010s	8	7	4	0	6	0	0	25
Total	1014	373	163	11	59	0	11	1631
District 6								
>1930s	5	20	9	0	0	4	0	38
1940s	9	7	4	0	0	0	0	20
1950s	49	25	14	0	0	0	0	88
1960s	243	97	17	3	1	0	0	361
1970s	80	34	16	0	0	0	0	130
1980s	68	26	17	0	0	0	0	111
1990s	49	14	10	1	0	0	0	74
2000s	72	22	8	0	0	0	0	102
2010s	4	3	0	1	0	0	0	8
Total	579	248	95	5	1	4	0	932
District 7								
>1930s	33	10	16	0	0	0	0	59
1940s	9	5	3	0	0	0	0	17
1950s	35	20	20	0	0	0	0	75
1960s	137	109	37	0	0	0	0	283
1970s	115	87	24	0	5	0	0	231
1980s	172	71	20	0	3	0	0	266
1990s	63	90	35	0	1	0	0	189
2000s	122	37	14	0	2	0	0	175
2010s	11	4	0	0	0	0	0	15
Total	697	433	169	0	11	0	0	1310
District 8								
>1930s	0	0	0	0	0	0	0	0
1940s	0	0	0	0	0	0	0	0
1950s	49	0	0	0	0	0	0	49
1960s	121	0	0	0	0	0	0	121
1970s	137	0	0	0	0	0	0	137
1980s	69	0	0	0	0	0	0	69
1990s	202	0	0	0	0	0	0	202
2000s	117	0	0	0	0	0	0	117
2010s	4	0	0	0	0	0	0	4
Total	699	0	0	0	0	0	0	699

Table 3

NOTE: The number of FDOT bridges includes 127 MDX bridges and 270 OOCEA bridges.

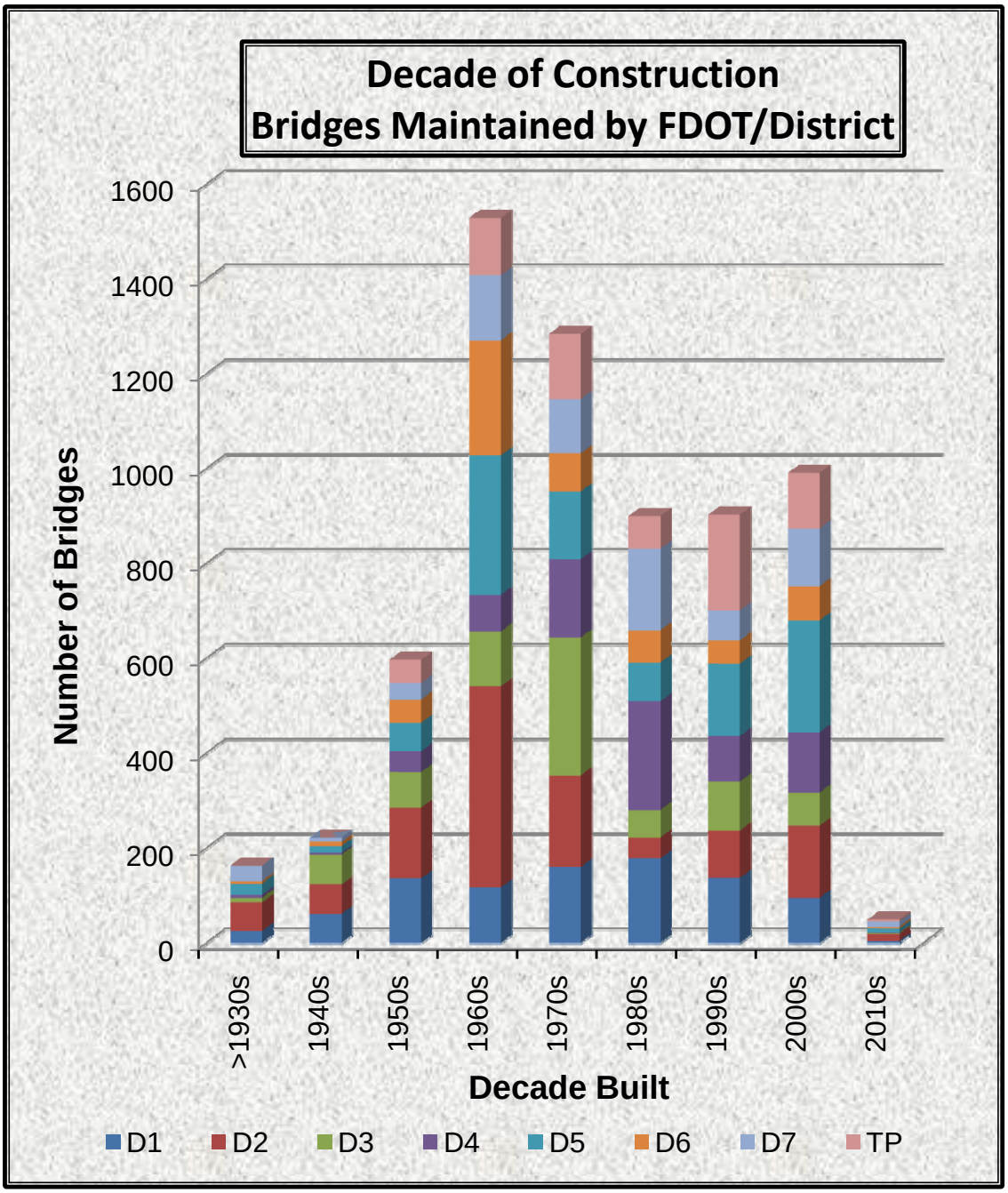
Decade of Construction
Bridges Maintained by FDOT/District
Number of Bridges
1600
1400
1200
1000
800
600
400
200
0
>1930s
1940s
1950s
1960s
1970s
1980s
1990s
2000s
2010s
Decade Built
D1
D2
D3
D4
D5
D6
D7
TP

Figure 8

Types of Bridge Superstructures

With the exception of historic, gateway, or "signature" bridges, the type of bridge superstructure is generally of little interest to most people. However, the superstructure type is the most common method used by bridge engineers to categorize bridges. Superstructures are the unsupported component of a bridge that carries the intended loads across the span opening. Superstructure types are generally described by their structural configuration along with their material of construction. As a result, superstructure types can accurately define a bridge's service life, performance, and maintainability. In the broadest sense there are three types of structural configurations for categorizing bridge superstructures. These are shells, which would include the arch culvert superstructure type. The second category is plates including slabs, orthotropic plates, and box culverts. Also included in the plate category is a special type of plate, called a beam. Superstructure types for a beam would include girders, boxes, and movable superstructure spans. The third category is the truss. The material of construction is generally concrete, steel, or timber. For recording purposes these superstructure and material types have been reduced to twelve specific categories with a thirteenth (other) category for unusual and seldom used superstructure types (see Table 4).

Slabs

These would include both Reinforced Concrete Slabs and Prestressed Concrete Slabs. These superstructure types are characterized by having a generally constant, rectangular cross-section using concrete as the main building component.
Slab bridges maintained by the state represent 16.62% of the total inventory. Similarly, slab bridges maintained by counties are 35.64%, and by cities and towns are 55.02%.

Beams and Girders

Most of the bridges in Florida can be considered as beam or girder bridges. These superstructure types are composed of either singular or groups of individual linear elements positioned either in the direction of traffic or transverse to the direction of traffic. The categories used for this type include Reinforced Concrete Beam, Prestressed Concrete Beam, Steel Beam, Timber Beam, Reinforced Concrete Box, Prestressed Concrete Box, Steel Box, and Movable Spans. Beam and Girder type bridges comprise 61.96% of the state maintained inventory, 35.01% of the county bridges, and 25.50% of the city/town bridges.

Trusses

The members of a truss work in either tension or compression. Bending is assumed not to occur in this type of bridge superstructure. The external loads from the deck and traffic are applied only at the joints of a truss.
At present 0.05% of the state maintained bridges use truss superstructures. Likewise, 0.37% of the county bridges and 0.08% of the city/town bridges use trusses.

Culverts

A culvert is typically a buried drainage structure. When the overall opening of the culvert is at least 20 feet it is considered a bridge by the Federal Government, and hence is treated like a bridge for inspection and maintenance purposes. Culverts represent 16.54% of the state maintained bridges. County inventories include 26.68% culverts, and city/towns include 16.64% culverts.

Movables

The general classification known as movable bridge includes the specific superstructure type describing the way it moves. This could be either a bascule, swing, or lift bridge. The movable bridge can either stand alone, or include fixed approach spans. Movable bridges represent 1.42% of the total state bridge inventory. County inventories include 1.10% movables, and city/towns include 0.67% movable bridges.

Figures

Figures 9 through 12 present graphic views of Table 4, which shows superstructure type by maintenance responsibility.

Bridge Inventory by Superstructure Type								
	Maintenance Responsibility							
Statewide	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
RC Slab	781	647	220	12	9	0	0	1669
PSC Slab	322	709	438	9	19	4	4	1505
RC Beam	100	127	80	1	0	0	1	309
PSC Beam	3366	650	180	14	51	0	6	4267
Steel Beam	646	146	24	29	6	0	1	852
Timber Beam	1	409	21	40	0	0	0	471
RC Box	6	1	0	0	0	0	0	7
PSC Box	96	2	0	0	0	0	0	98
Steel Box	113	7	4	0	0	0	0	124
Truss	3	14	1	37	0	0	0	55
Movable	94	42	8	0	1	0	0	145
Culvert	1098	1015	199	3	9	0	2	2326
Other	12	36	21	8	1	0	0	78
Total	6638	3805	1196	153	96	4	14	11906

Table 4

NOTE: The number of FDOT bridges includes 127 MDX bridges and 270 OOCEA bridges.

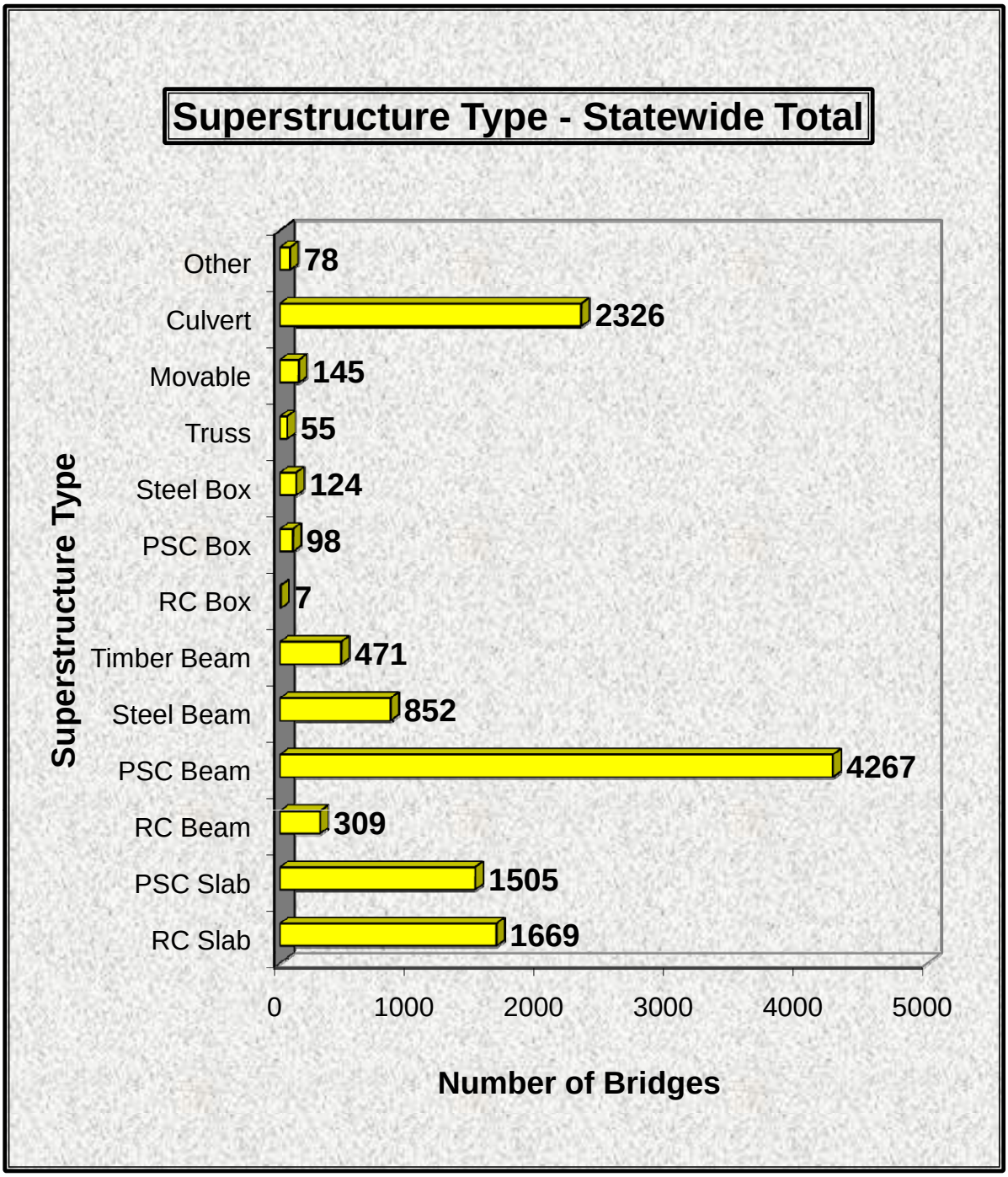
Superstructure Type - Statewide Total
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
78
2326
145
55
124
98
7
471
852
4267
309
1505
1669
0
1000
2000
3000
4000
5000
Number of Bridges

Figure 9

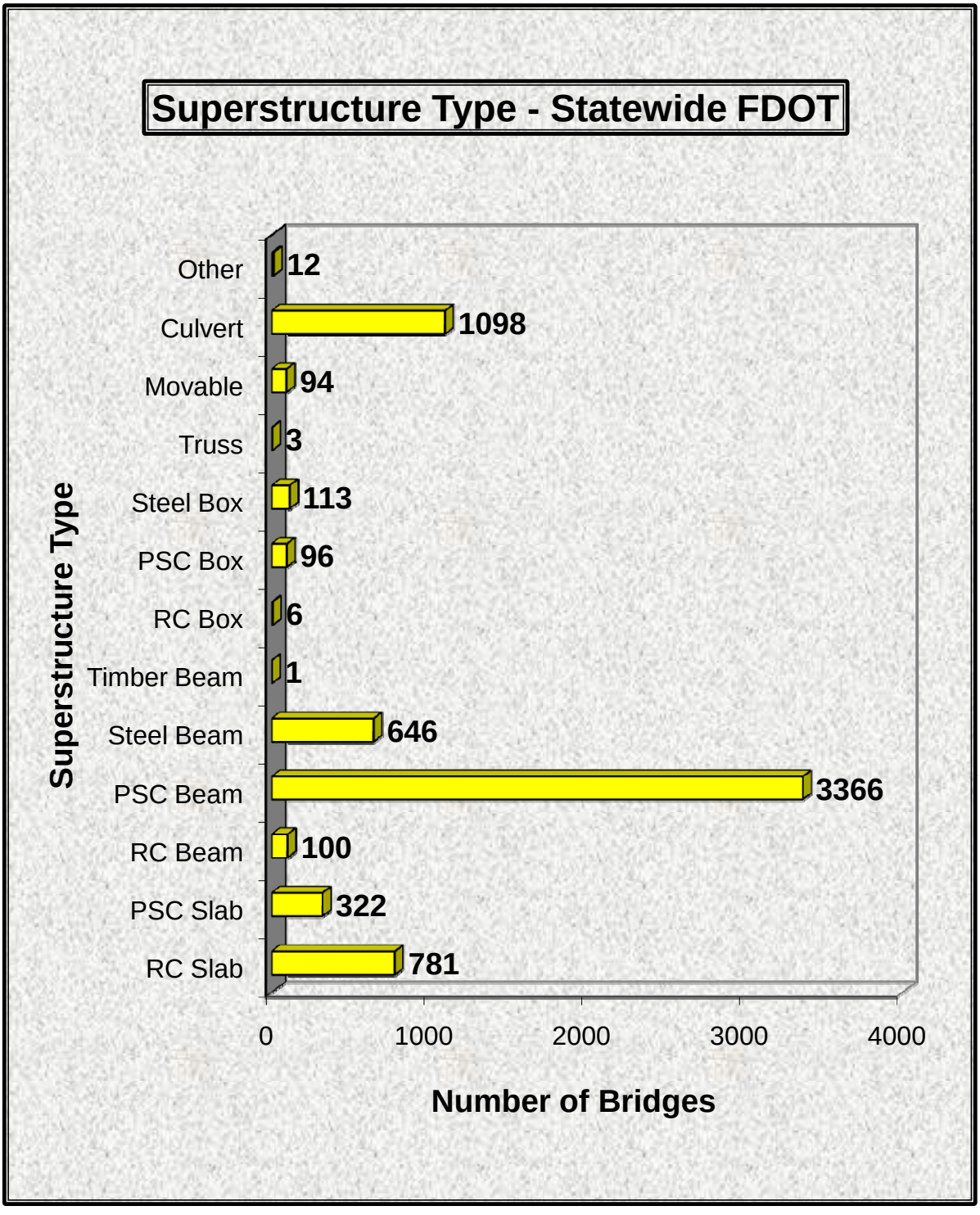
Superstructure Type - Statewide FDOT
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
12
1098
94
3
113
96
6
1
646
3366
100
322
781
0
1000
2000
3000
4000
Number of Bridges

Figure 10

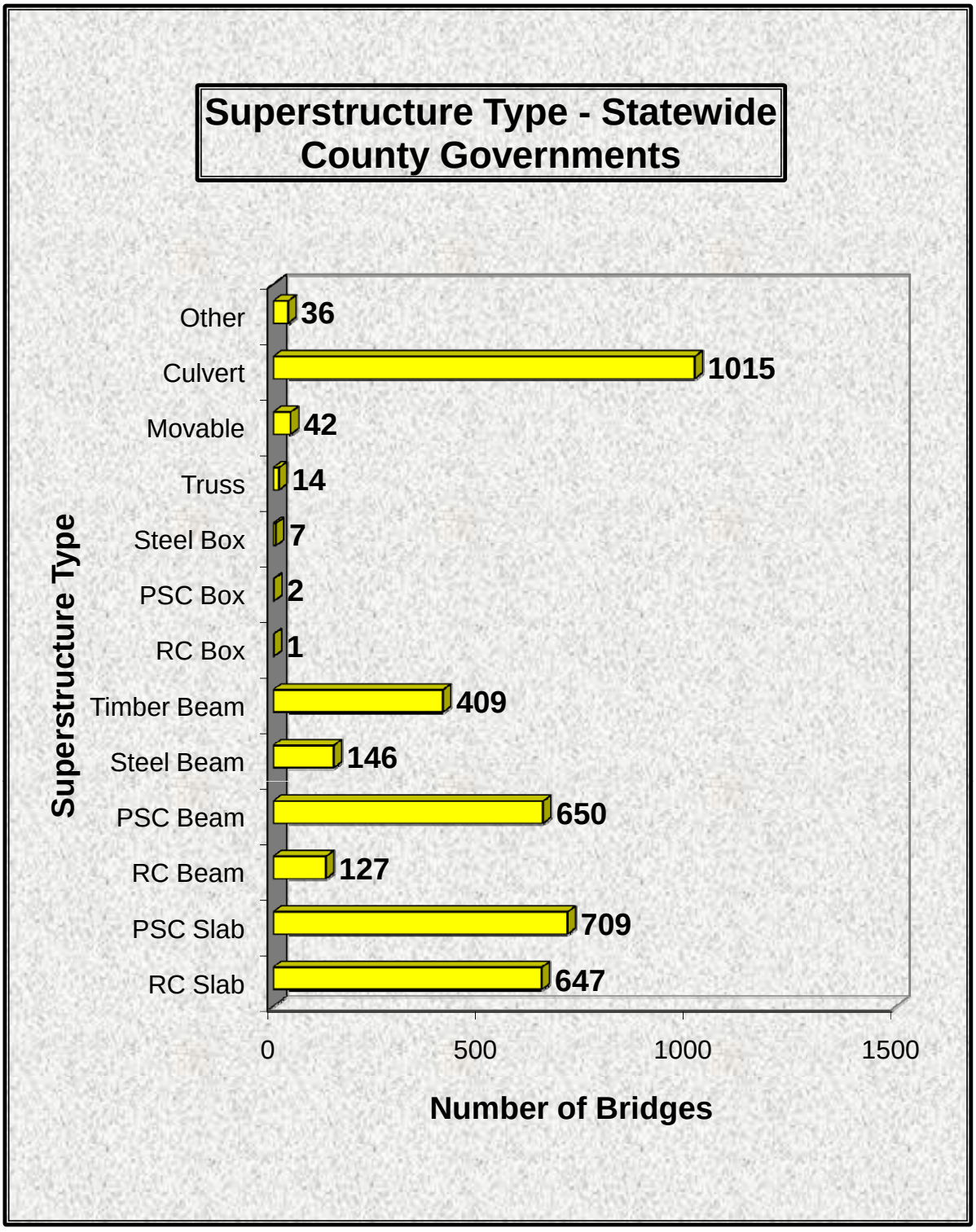
Superstructure Type - Statewide
County Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
36
1015
42
14
7
2
1
409
146
650
127
709
647
0
500
1000
1500
Number of Bridges

Figure 11

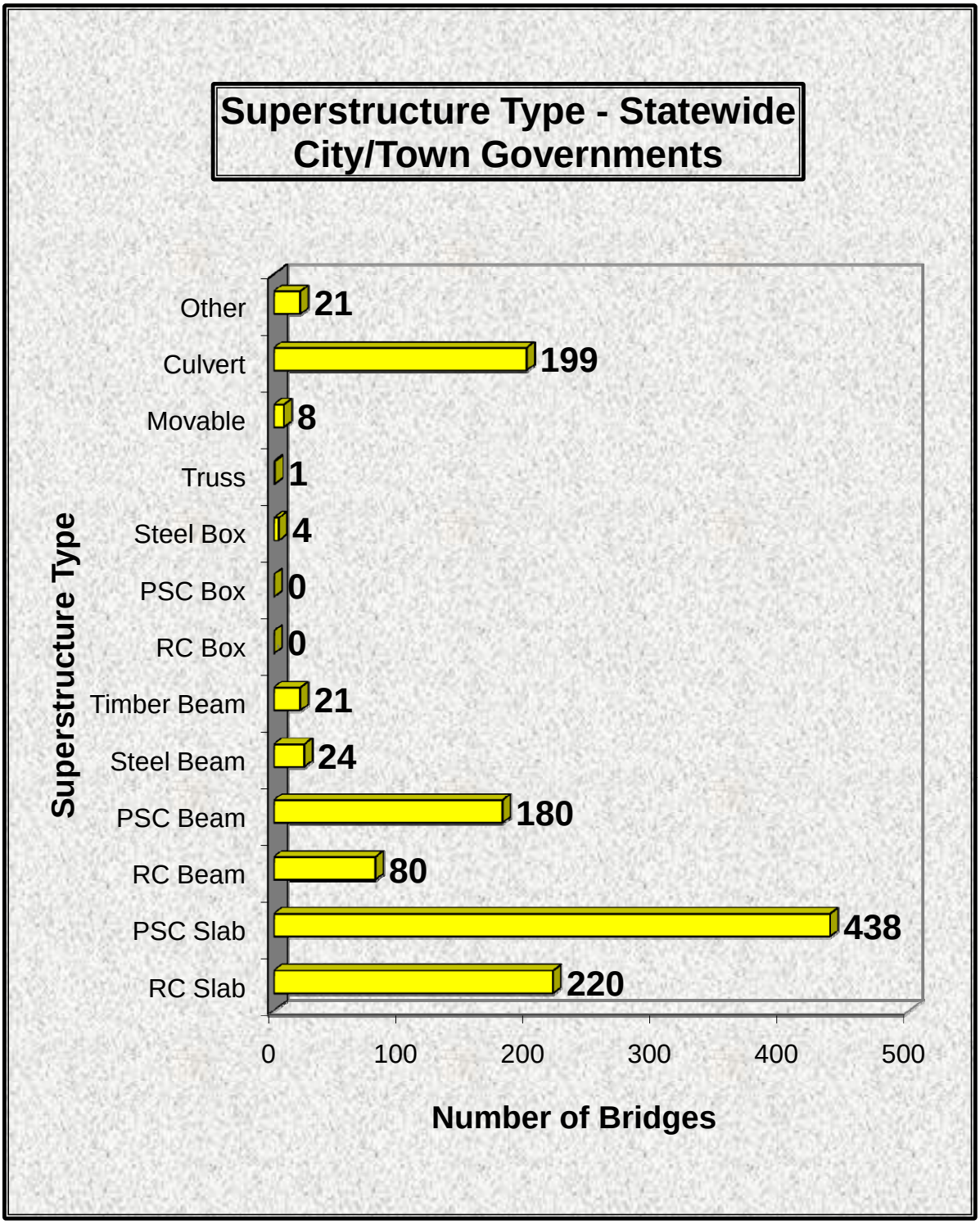
Superstructure Type - Statewide
City/Town Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
21
199
8
1
4
0
0
21
24
180
80
438
220
0
100
200
300
400
500
Number of Bridges

Figure 12

Deck Area of the Bridge Inventory

Most bridges are one-of-a-kind structures. However, to simplify categorizing and evaluation, a method often used to compare bridges relies on the area of the deck or riding surface. Rather than listing bridges individually, this method groups bridges in ranges based on total deck area. Table 5 presents these deck area ranges by maintenance responsibility.

FDOT Bridges Statewide

Figure 13 presents the 5,536 FDOT bridges grouped by the deck area ranges (culverts and other miscellaneous structures are not included in this group). The range with the largest number of bridges is the 10,000 to 20,000 square foot range, with 1,625 bridges, 29.35% of the total. 15.26% of the FDOT bridges fall into the 0 to 5,000 square foot range; 32.57% are in the 5,000 to 10,000 square foot range; and 22.81% of the bridges have deck areas greater than 20,000 square feet.

County and City/Town Bridges

As one might expect, bridges maintained by county governments are generally smaller than those maintained by FDOT. The statewide county maintenance responsibility group has 71.15% of their bridges under 5,000 square feet; with 16.15% between 5,000 and 10,000 square feet; 7.45% between 10,000 to 20,000 square feet; and only 5.25% over 20,000 square feet (see Figure 14). The results for the City/Town group are similar; with 77.70% of these bridges less than 5,000 square feet (see Figure 15 & 16).

FDOT Bridges by District

Tables 6 and 7 present the statewide data sorted by FDOT District. Figure 17 allows graphic comparison between the FDOT Districts for the FDOT maintained bridges. For example, 31.98% of the District 1 bridges are less than 5,000 square feet and only 14.33% of their bridges are over 20,000 square feet. In contrast, only 13.73% of District 4 bridges are less than 5,000 square feet, while 32.21% are over 20,000 square feet.

Bridge Inventory By Deck Area (Statewide)								
	Maintenance Responsibility							
Area (S.F.)	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
<= 1,000	25	546	135	95	3	0	0	804
1,000-2,500	179	770	356	35	14	4	4	1362
2,500-5,000	641	662	279	12	16	0	3	0
5,000-7,500	951	287	87	2	20	0	0	1347
7,500-10,000	852	162	40	1	12	0	1	1068
10,000-20,000	1625	207	53	3	11	0	4	1903
20,000-40,000	691	86	23	0	2	0	0	802
40,000-80,000	305	38	13	1	6	0	0	363
80,000-160,000	154	14	5	1	3	0	0	177
>160,000	113	8	0	0	0	0	0	121
Total	5536	2780	991	150	87	4	12	9560

Table 5

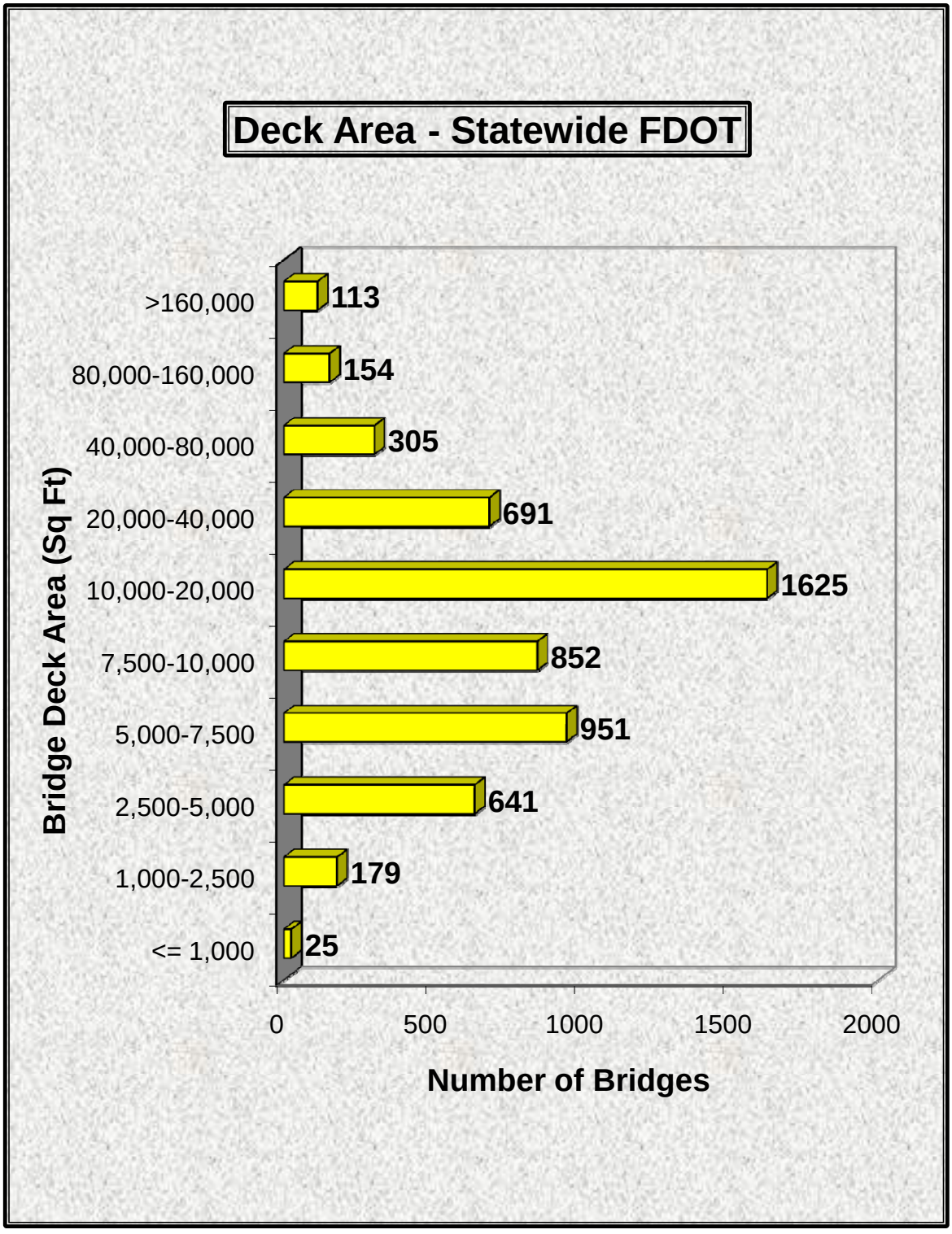
Deck Area - Statewide FDOT
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
113
154
305
691
1625
852
951
641
179
25
0
500
1000
1500
2000
Number of Bridges

Figure 13

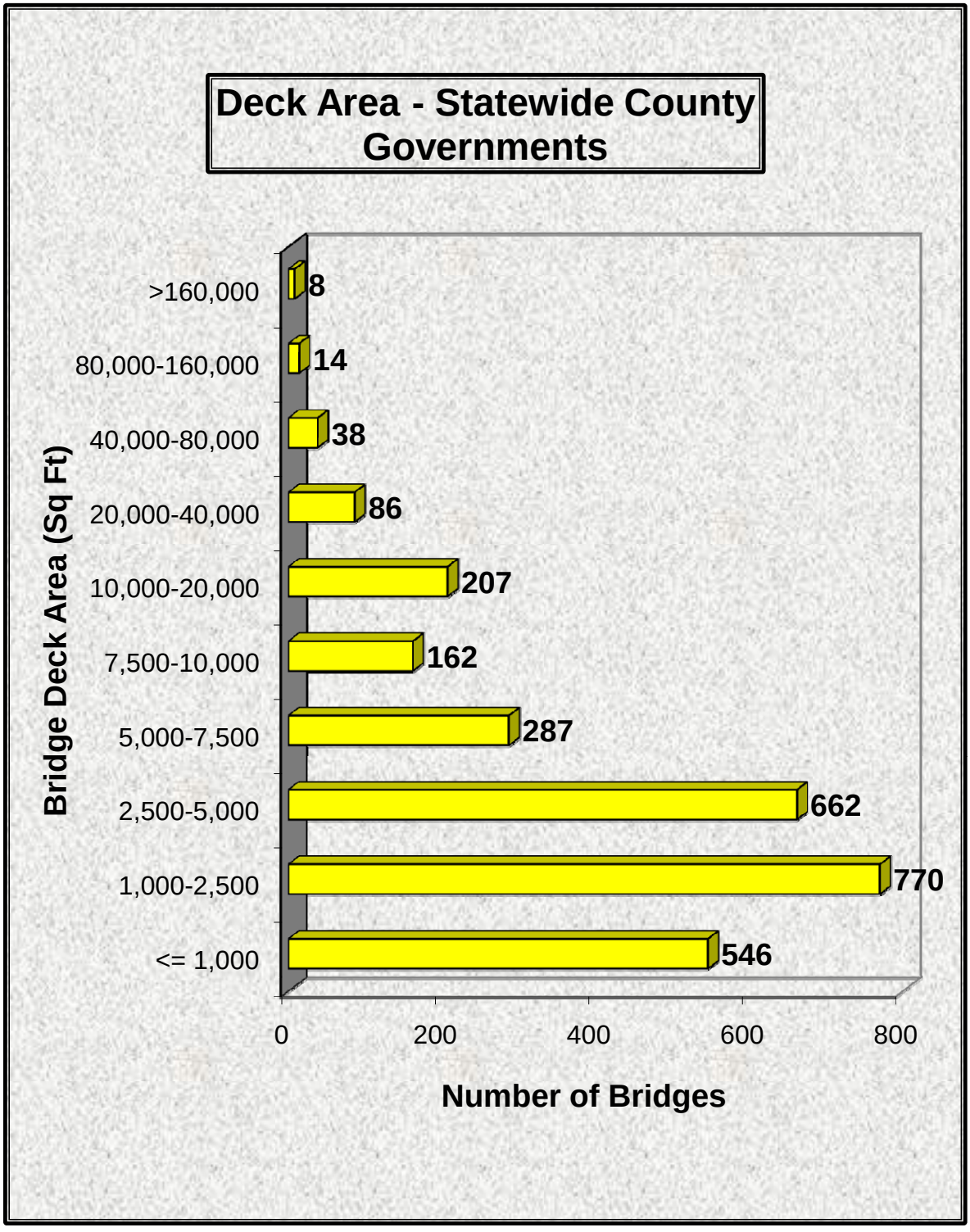
Deck Area - Statewide County Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
8
14
38
86
207
162
287
662
770
546
0
200
400
600
800
Number of Bridges

Figure 14

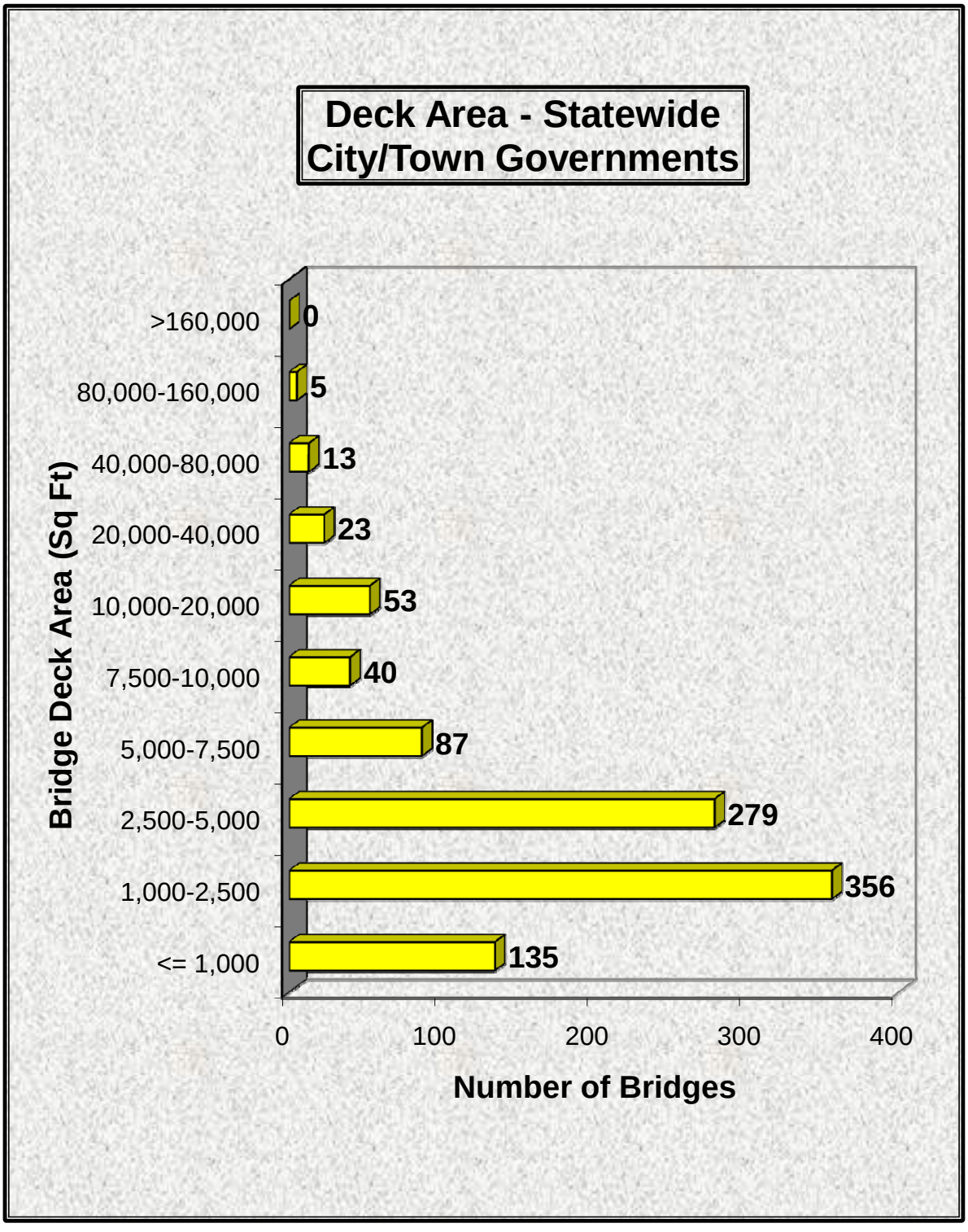
Deck Area - Statewide
City/Town Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
5
13
23
53
40
87
279
356
135
0
100
200
300
400
Number of Bridges

Figure 15

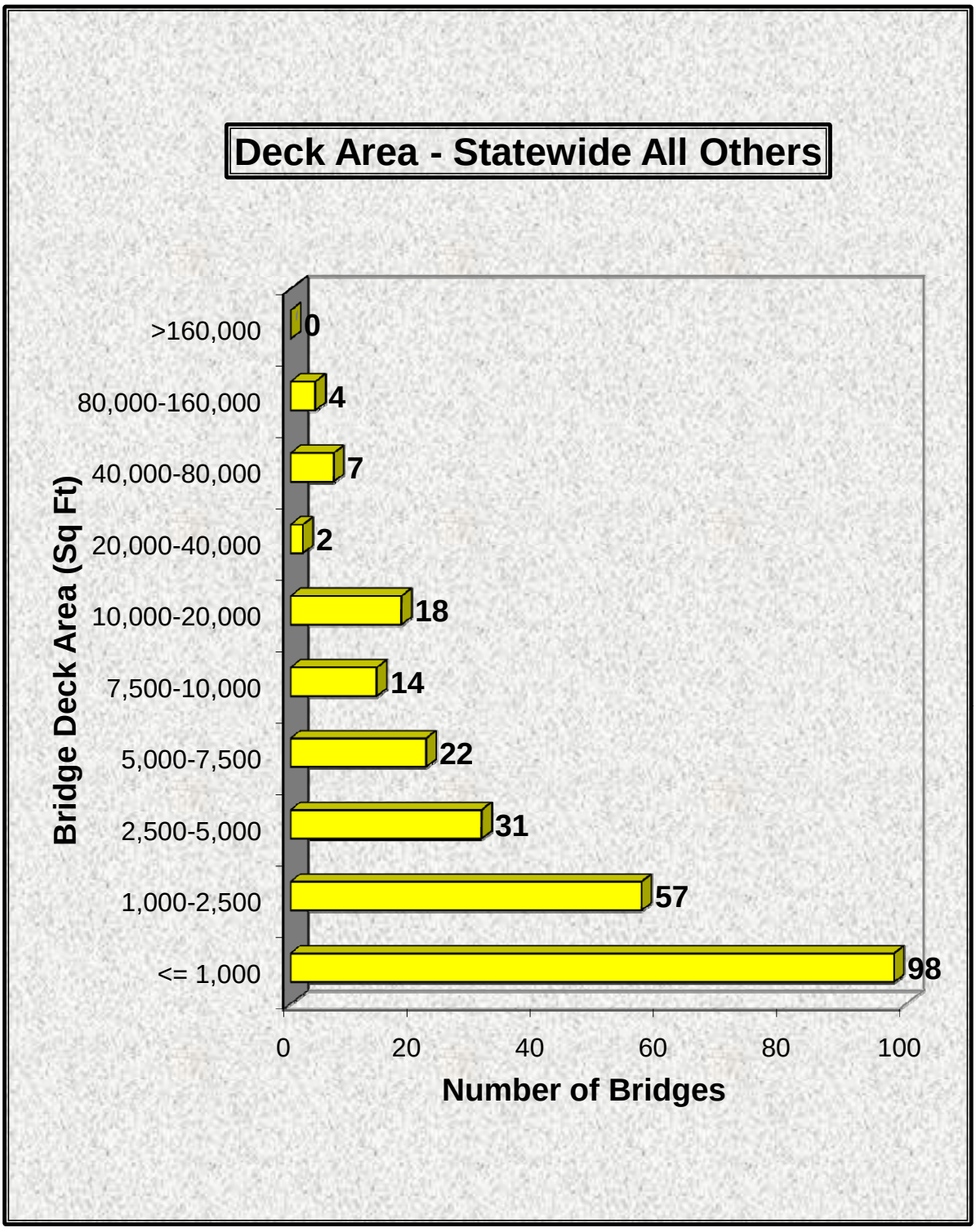
Deck Area - Statewide All Others
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
4
7
2
18
14
22
31
57
98
0
20
40
60
80
100
Number of Bridges

Figure 16

Bridge Inventory By Deck Area (District)

	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
District 1								
<= 1,000	8	114	28	5	0	0	0	155
1,000-2,500	78	198	61	4	10	0	0	351
2,500-5,000	135	169	74	5	8	0	0	391
5,000-7,500	114	51	26	0	3	0	0	194
7,500-10,000	100	32	4	0	0	0	0	136
10,000-20,000	157	31	6	0	0	0	0	194
20,000-40,000	55	14	0	0	0	0	0	69
40,000-80,000	21	6	0	0	0	0	0	27
80,000-160,000	10	5	0	0	0	0	0	15
>160,000	13	1	0	0	0	0	0	14
Total	691	621	199	14	21	0	0	1546
District 2								
<= 1,000	5	61	12	12	0	0	0	90
1,000-2,500	26	62	61	2	0	0	0	151
2,500-5,000	93	65	27	1	0	0	0	186
5,000-7,500	167	25	13	0	0	0	0	205
7,500-10,000	164	10	14	0	0	0	0	188
10,000-20,000	267	14	7	0	0	0	2	290
20,000-40,000	91	5	6	0	0	0	0	102
40,000-80,000	42	1	3	1	0	0	0	47
80,000-160,000	34	0	0	1	0	0	0	35
>160,000	20	1	0	0	0	0	0	21
Total	909	244	143	17	0	0	2	1315
District 3								
<= 1,000	5	263	7	73	1	0	0	349
1,000-2,500	9	203	10	24	0	0	0	246
2,500-5,000	60	121	10	5	0	0	0	196
5,000-7,500	105	50	2	0	0	0	0	157
7,500-10,000	96	25	0	1	0	0	0	122
10,000-20,000	148	23	2	0	0	0	0	173
20,000-40,000	62	11	1	0	0	0	0	74
40,000-80,000	28	3	2	0	0	0	0	33
80,000-160,000	19	3	1	0	2	0	0	25
>160,000	23	0	0	0	0	0	0	23
Total	555	702	35	103	3	0	0	1398
District 4								
<= 1,000	0	19	54	0	0	0	0	73
1,000-2,500	22	106	109	0	0	0	0	237
2,500-5,000	76	136	88	1	0	0	0	301
5,000-7,500	76	62	12	1	0	0	0	151
7,500-10,000	55	22	6	0	0	0	0	83
10,000-20,000	255	47	12	0	0	0	0	314
20,000-40,000	135	24	1	0	0	0	0	160
40,000-80,000	59	4	0	0	0	0	0	63
80,000-160,000	21	1	1	0	0	0	0	23
>160,000	15	0	0	0	0	0	0	15
Total	714	421	283	2	0	0	0	1420

Table 6

Bridge Inventory By Deck Area (District)								
	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
District 5								
<= 1,000	0	24	12	3	2	0	0	41
1,000-2,500	13	55	41	4	3	0	4	120
2,500-5,000	88	63	27	0	8	0	3	189
5,000-7,500	193	24	17	1	13	0	0	248
7,500-10,000	156	32	9	0	9	0	1	207
10,000-20,000	236	34	17	1	10	0	2	300
20,000-40,000	95	12	2	0	2	0	0	111
40,000-80,000	35	8	4	0	5	0	0	52
80,000-160,000	22	1	2	0	1	0	0	26
>160,000	13	0	0	0	0	0	0	13
Total	851	253	131	9	53	0	10	1307
District 6								
<= 1,000	1	21	4	2	0	0	0	28
1,000-2,500	13	70	33	1	0	4	0	121
2,500-5,000	62	61	32	0	0	0	0	155
5,000-7,500	69	33	8	0	0	0	0	110
7,500-10,000	62	16	4	0	0	0	0	82
10,000-20,000	167	18	4	2	0	0	0	191
20,000-40,000	114	9	6	0	0	0	0	129
40,000-80,000	48	6	2	0	1	0	0	57
80,000-160,000	26	3	0	0	0	0	0	29
>160,000	13	2	0	0	0	0	0	15
Total	575	239	93	5	1	4	0	917
District 7								
<= 1,000	6	44	18	0	0	0	0	68
1,000-2,500	14	76	41	0	1	0	0	132
2,500-5,000	27	47	21	0	0	0	0	95
5,000-7,500	77	42	9	0	4	0	0	132
7,500-10,000	107	25	3	0	3	0	0	138
10,000-20,000	194	40	5	0	1	0	0	240
20,000-40,000	89	11	7	0	0	0	0	107
40,000-80,000	53	10	2	0	0	0	0	65
80,000-160,000	21	1	1	0	0	0	0	23
>160,000	12	4	0	0	0	0	0	16
Total	600	300	107	0	9	0	0	1016
District 8								
<= 1,000	0	0	0	0	0	0	0	0
1,000-2,500	4	0	0	0	0	0	0	4
2,500-5,000	100	0	0	0	0	0	0	100
5,000-7,500	150	0	0	0	0	0	0	150
7,500-10,000	112	0	0	0	0	0	0	112
10,000-20,000	201	0	0	0	0	0	0	201
20,000-40,000	50	0	0	0	0	0	0	50
40,000-80,000	19	0	0	0	0	0	0	19
80,000-160,000	1	0	0	0	0	0	0	1
>160,000	4	0	0	0	0	0	0	4
Total	641	0	0	0	0	0	0	641

Table 7

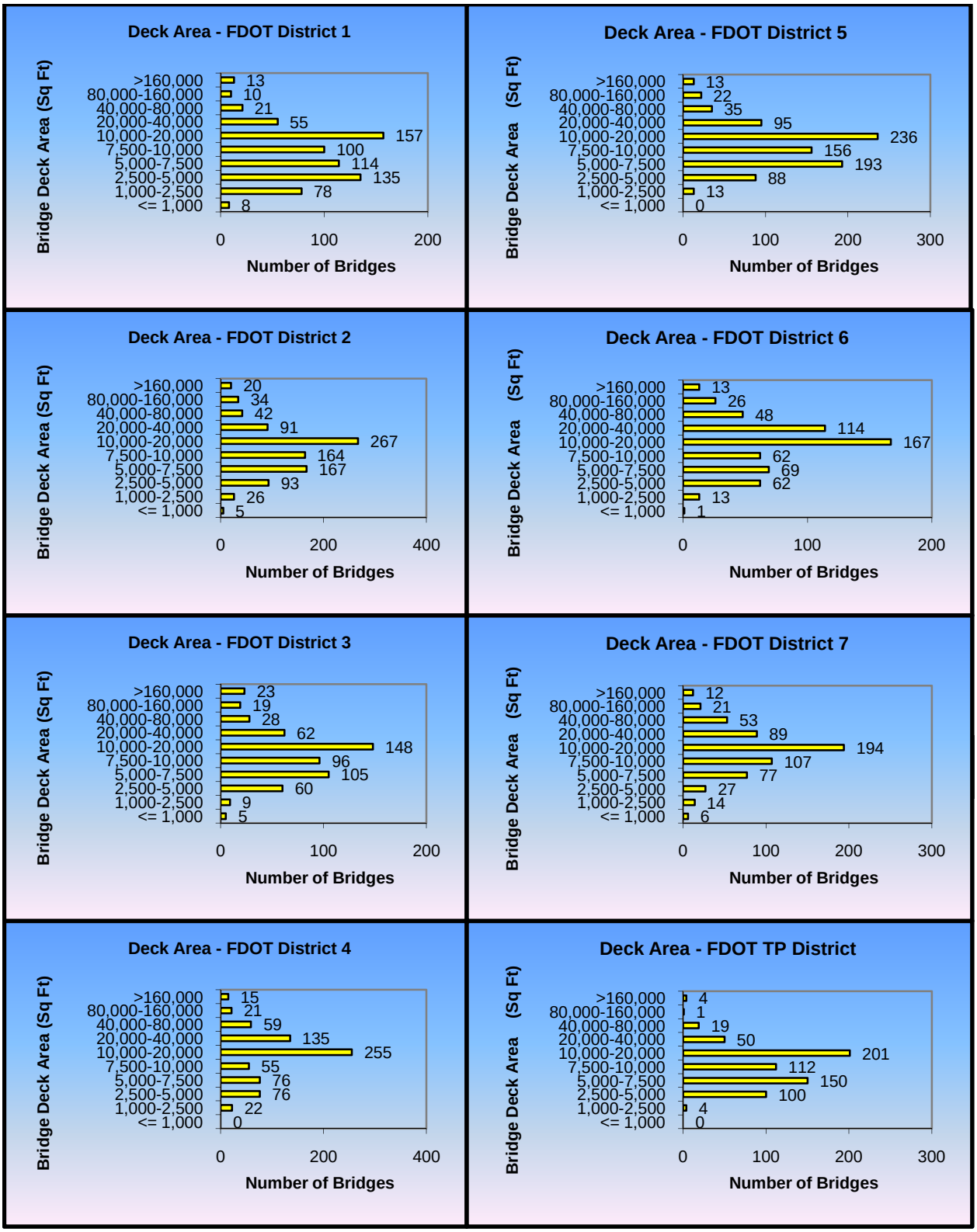
Deck Area - FDOT District 1
Bridge Deck Area (Sq Ft)
>160,000 13
80,000-160,000 10
40,000-80,000 21
20,000-40,000 55
10,000-20,000 157
7,500-10,000 100
5,000-7,500 114
2,500-5,000 135
1,000-2,500 78
<= 1,000 8
0 100 200
Number of Bridges
Deck Area - FDOT District 5
Bridge Deck Area (Sq Ft)
>160,000 13
80,000-160,000 22
40,000-80,000 35
20,000-40,000 95
10,000-20,000 236
7,500-10,000 156
5,000-7,500 193
2,500-5,000 88
1,000-2,500 13
<= 1,000 0
0 100 200 300
Number of Bridges
Deck Area - FDOT District 2
Bridge Deck Area (Sq Ft)
>160,000 20
80,000-160,000 34
40,000-80,000 42
20,000-40,000 91
10,000-20,000 267
7,500-10,000 164
5,000-7,500 167
2,500-5,000 93
1,000-2,500 26
<= 1,000 5
0 200 400
Number of Bridges
Deck Area - FDOT District 6
Bridge Deck Area (Sq Ft)
>160,000 13
80,000-160,000 26
40,000-80,000 48
20,000-40,000 114
10,000-20,000 167
7,500-10,000 62
5,000-7,500 69
2,500-5,000 62
1,000-2,500 13
<= 1,000 1
0 100 200
Number of Bridges
Deck Area - FDOT District 3
Bridge Deck Area (Sq Ft)
>160,000 23
80,000-160,000 19
40,000-80,000 28
20,000-40,000 62
10,000-20,000 148
7,500-10,000 96
5,000-7,500 105
2,500-5,000 60
1,000-2,500 9
<= 1,000 5
0 100 200
Number of Bridges
Deck Area - FDOT District 7
Bridge Deck Area (Sq Ft)
>160,000 12
80,000-160,000 21
40,000-80,000 53
20,000-40,000 89
10,000-20,000 194
7,500-10,000 107
5,000-7,500 77
2,500-5,000 27
1,000-2,500 14
<= 1,000 6
0 100 200 300
Number of Bridges
Deck Area - FDOT District 4
Bridge Deck Area (Sq Ft)
>160,000 15
80,000-160,000 21
40,000-80,000 59
20,000-40,000 135
10,000-20,000 255
7,500-10,000 55
5,000-7,500 76
2,500-5,000 76
1,000-2,500 22
<= 1,000 0
0 200 400
Number of Bridges
Deck Area - FDOT TP District
Bridge Deck Area (Sq Ft)
>160,000 4
80,000-160,000 1
40,000-80,000 19
20,000-40,000 50
10,000-20,000 201
7,500-10,000 112
5,000-7,500 150
2,500-5,000 100
1,000-2,500 4
<= 1,000 0
0 100 200 300
Number of Bridges

Figure 17

Bridge Inventory - 2011 Annual Report

Overall Structural Condition

The performance of maintenance and repair activities in a timely manner keeps bridges in good condition, avoids more expensive repair or replacement costs in the future, and ensures that the bridges are safe for use by the public. The identification of bridge work needs generally begins with the bridge inspection. Like most states, Florida's bridge inspection program began in the late 1960's. Since then, much has been learned in the field of bridge inspection. Areas of emphasis have changed and expanded as new problems became apparent, as newer bridge types became more common, and as these newer bridges aged enough to require corrective actions. Guidelines for inspection condition rating have evolved to increase uniformity and consistency of inspections. Today's program is large in scope, well organized, and professionally managed. Data collected from bridge inspections is critical input into a variety of analyses and decisions within the FDOT to determine the most cost effective mix of preventive maintenance, routine maintenance, repair, rehabilitation, replacement, and other actions over the life of the bridges.

Bridges generally consist of three components: the deck or riding surface; the superstructure for supporting the deck; and the substructure which functions to transfer the superstructure loads to the ground. Bridge inspectors assign a numerical condition rating to each of the components, from 0 being the worst to 9 being the best. The Overall Condition Rating for a bridge represents the component with the lowest rating. The ratings are divided into four categories. They are Excellent = 8 to 9; Good = 6 to 7; Fair = 5; and Poor = 4 or less. Bridge culverts use the same scale, except there is only one overall component. Grouping the bridges as excellent, good, fair, or poor, as described above, and presenting them by maintenance responsibility and FDOT District a view of the overall condition of Florida's bridges is obtained. (see Table 8)

Figure 18 shows, for each of the maintenance responsibility groups, the percentage of bridges in excellent, good, fair, and poor condition. Approximately 95.59% of the FDOT maintained bridges are in excellent or good condition. However, the number drops to 87.10% for County bridges, 87.04% for City/Town bridges, and 89.14% for Other Agency bridges. Figures 19 and 20 provide similar views of the FDOT maintained bridges, by district. An alternative view of the data from Figure 44 is presented in Figures 21, 22, and 23, for each of the three maintenance groups, shown by FDOT District.

Additional Figures 24 - 27 are provided to show a general graphical view of the location of state maintained bridges within the state based on condition category.

	Overall Structural Condition								
		Maintenance Responsibility							
		FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
Statewide	Excellent	823	324	74	15	13	0	1	1250
	Good	5522	2990	967	114	79	4	12	9688
	Fair	226	337	108	16	3	0	0	690
	Poor	67	154	47	8	1	0	1	278
	Total	6638	3805	1196	153	96	4	14	11906
District 1	Excellent	52	74	16	0	0	0	0	142
	Good	826	752	218	14	22	0	0	1832
	Fair	31	50	7	1	0	0	0	89
	Poor	4	11	2	0	0	0	0	17
	Total	913	887	243	15	22	0	0	2080
District 2	Excellent	72	29	9	0	0	0	0	110
	Good	1058	306	146	7	0	0	1	1518
	Fair	51	103	21	7	0	0	0	182
	Poor	18	51	16	3	0	0	1	89
	Total	1199	489	192	17	0	0	2	1899
District 3	Excellent	115	76	4	14	0	0	0	209
	Good	633	712	35	78	3	0	1	1462
	Fair	22	89	3	7	0	0	0	121
	Poor	18	56	2	4	0	0	0	80
	Total	788	933	44	103	3	0	1	1872
District 4	Excellent	155	43	9	1	0	0	0	208
	Good	572	366	221	1	0	0	0	1160
	Fair	11	29	51	0	0	0	0	91
	Poor	11	4	9	0	0	0	0	24
	Total	749	442	290	2	0	0	0	1483
District 5	Excellent	118	50	16	0	11	0	1	196
	Good	837	285	140	10	46	0	10	1328
	Fair	51	29	6	1	2	0	0	89
	Poor	8	9	1	0	0	0	0	18
	Total	1014	373	163	11	59	0	11	1631
District 6	Excellent	110	22	10	0	0	0	0	142
	Good	449	195	67	4	0	4	0	719
	Fair	18	21	7	0	1	0	0	47
	Poor	2	10	11	1	0	0	0	24
	Total	579	248	95	5	1	4	0	932
District 7	Excellent	109	30	10	0	2	0	0	151
	Good	553	374	140	0	8	0	0	1075
	Fair	31	16	13	0	0	0	0	60
	Poor	4	13	6	0	1	0	0	24
	Total	697	433	169	0	11	0	0	1310
District 8	Excellent	92	0	0	0	0	0	0	
	Good	594	0	0	0	0	0	0	594
	Fair	11	0	0	0	0	0	0	11
	Poor	2	0	0	0	0	0	0	2
	Total	699	0	0	0	0	0	0	699

Table 8

NOTE: The number of FDOT bridges includes 127 MDX bridges and 270 OOCEA bridges.

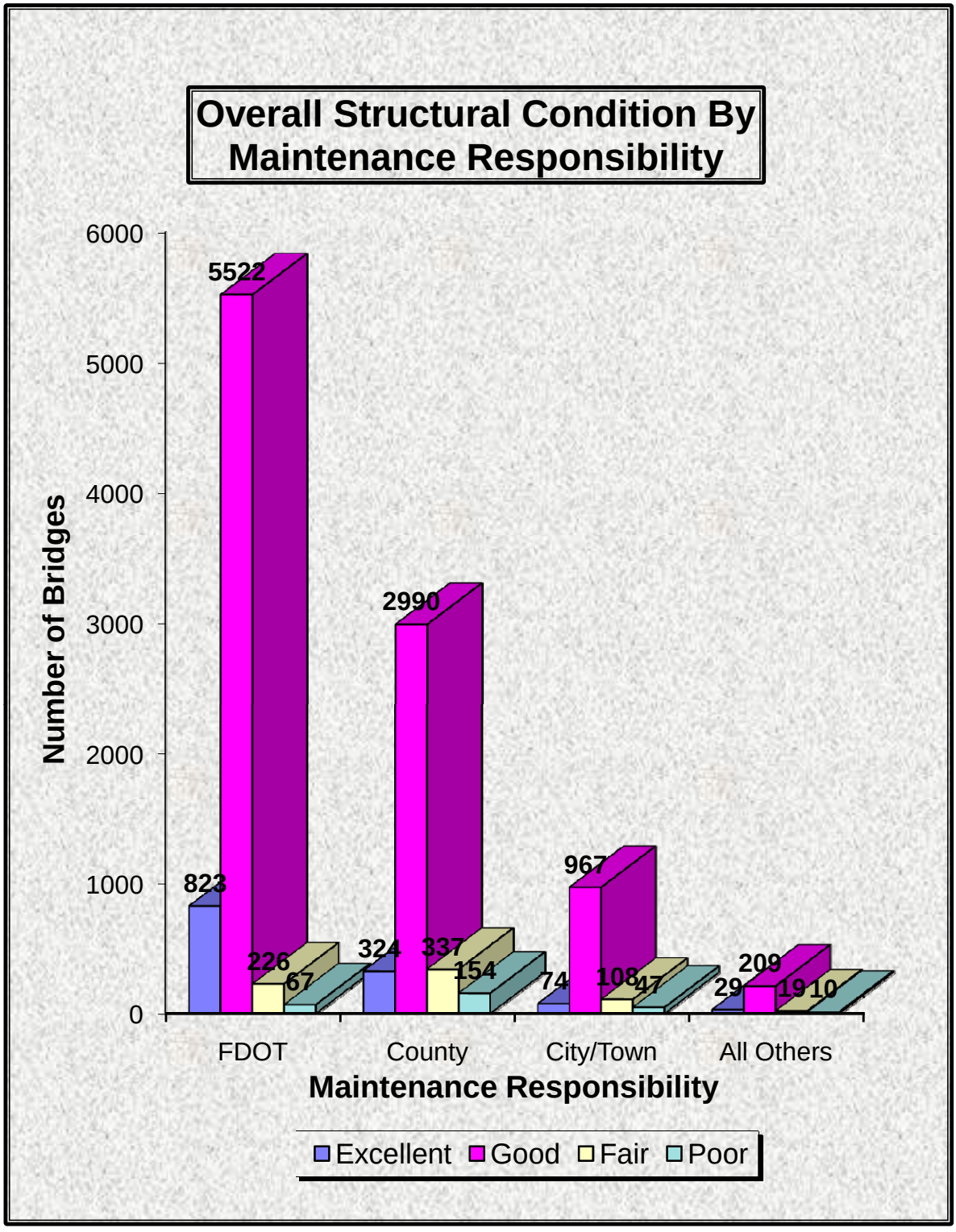
Overall Structural Condition By Maintenance Responsibility
Number of Bridges
6000
5000
4000
3000
2000
1000
0
5522
2990
967
823
226
67
324
337
154
74
108
47
209
29
19
10
FDOT
County
City/Town
All Others
Maintenance Responsibility
Excellent
Good
Fair
Poor

Figure 18

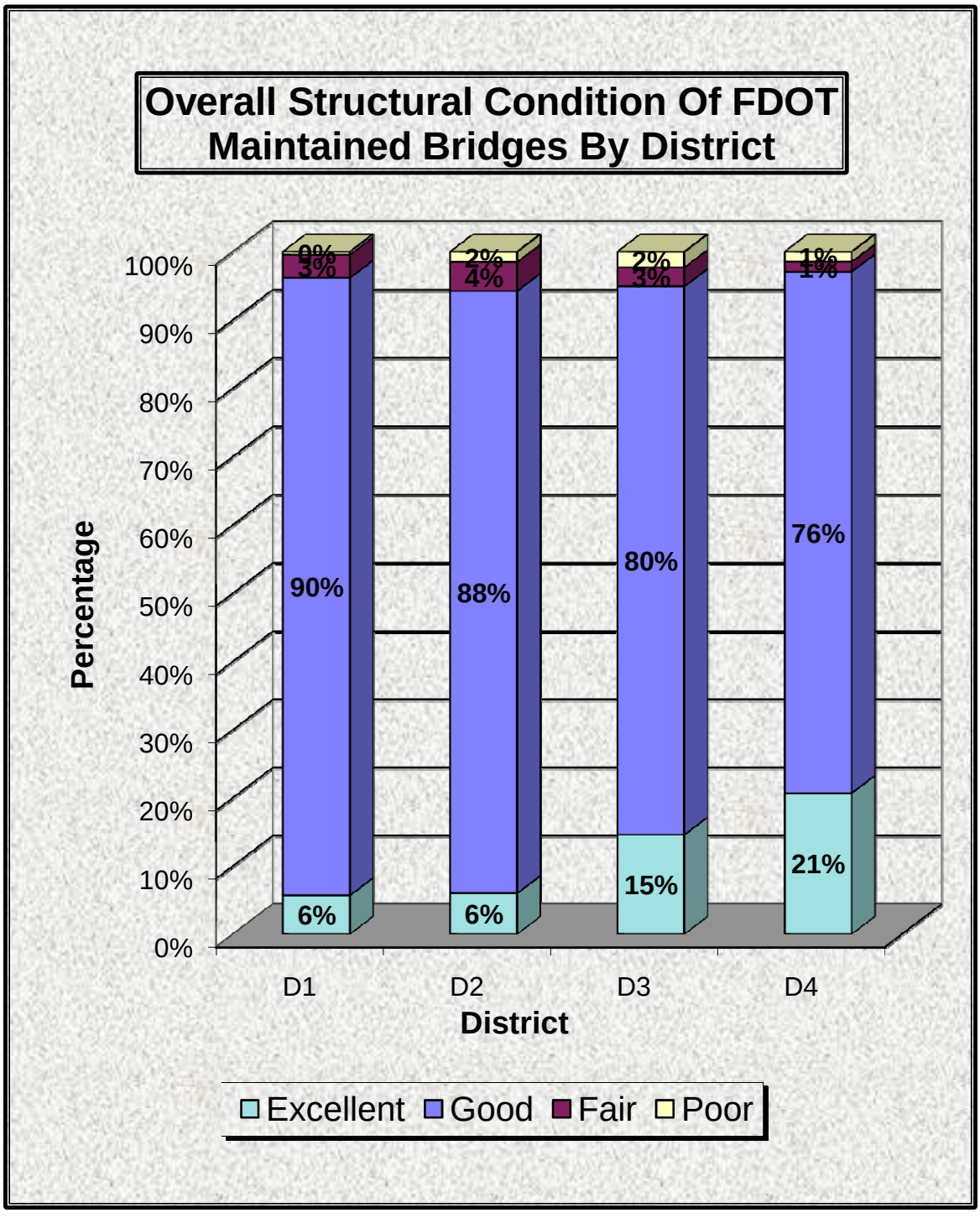
Overall Structural Condition Of FDOT Maintained Bridges By District
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
90%
3%
0%
6%
88%
4%
2%
6%
80%
3%
2%
15%
76%
1%
1%
21%
D1
D2
D3
D4
District
Excellent
Good
Fair
Poor

Figure 19

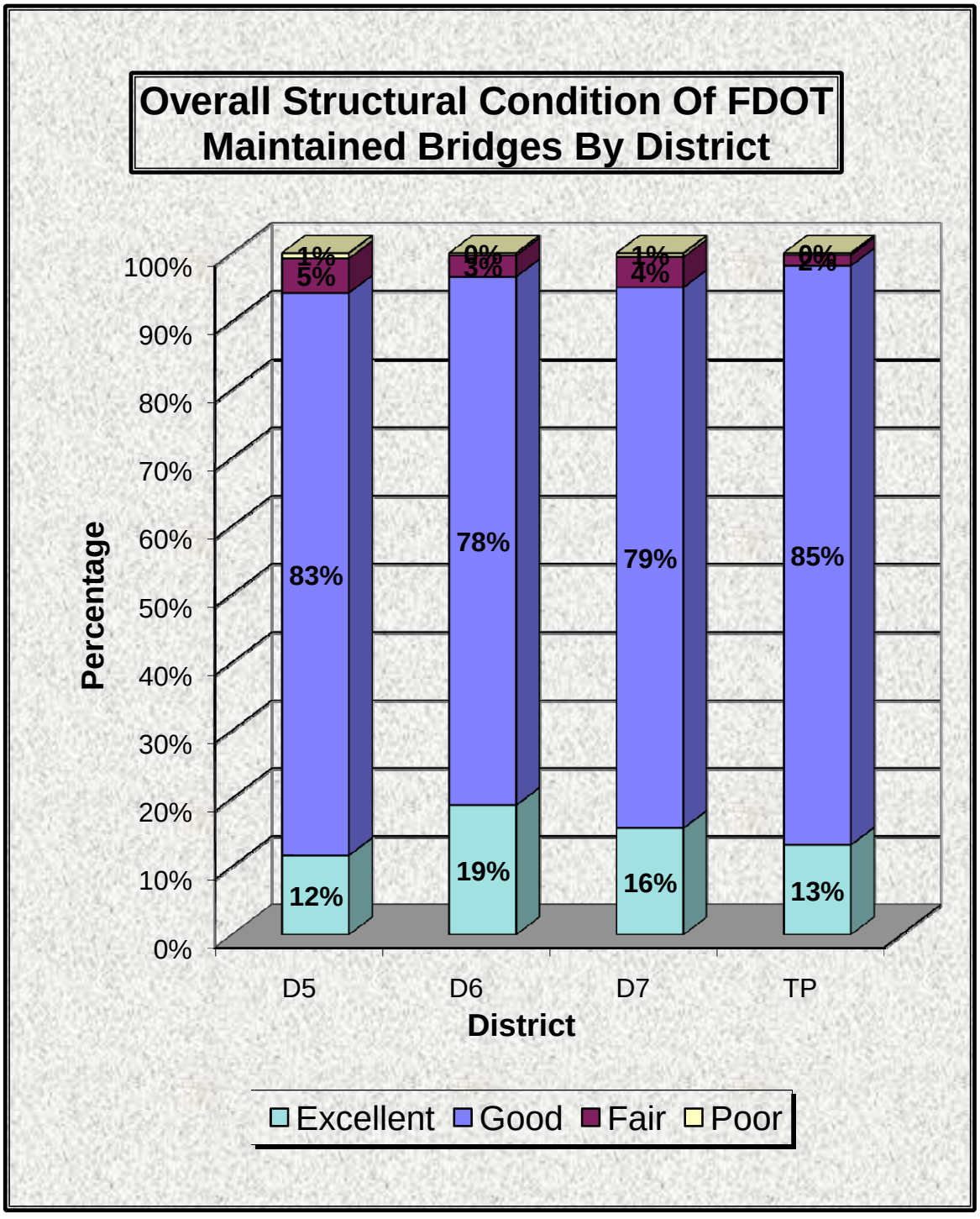
Overall Structural Condition Of FDOT Maintained Bridges By District
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1%
5%
83%
12%
0%
3%
78%
19%
1%
4%
79%
16%
0%
2%
85%
13%
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor

Figure 20

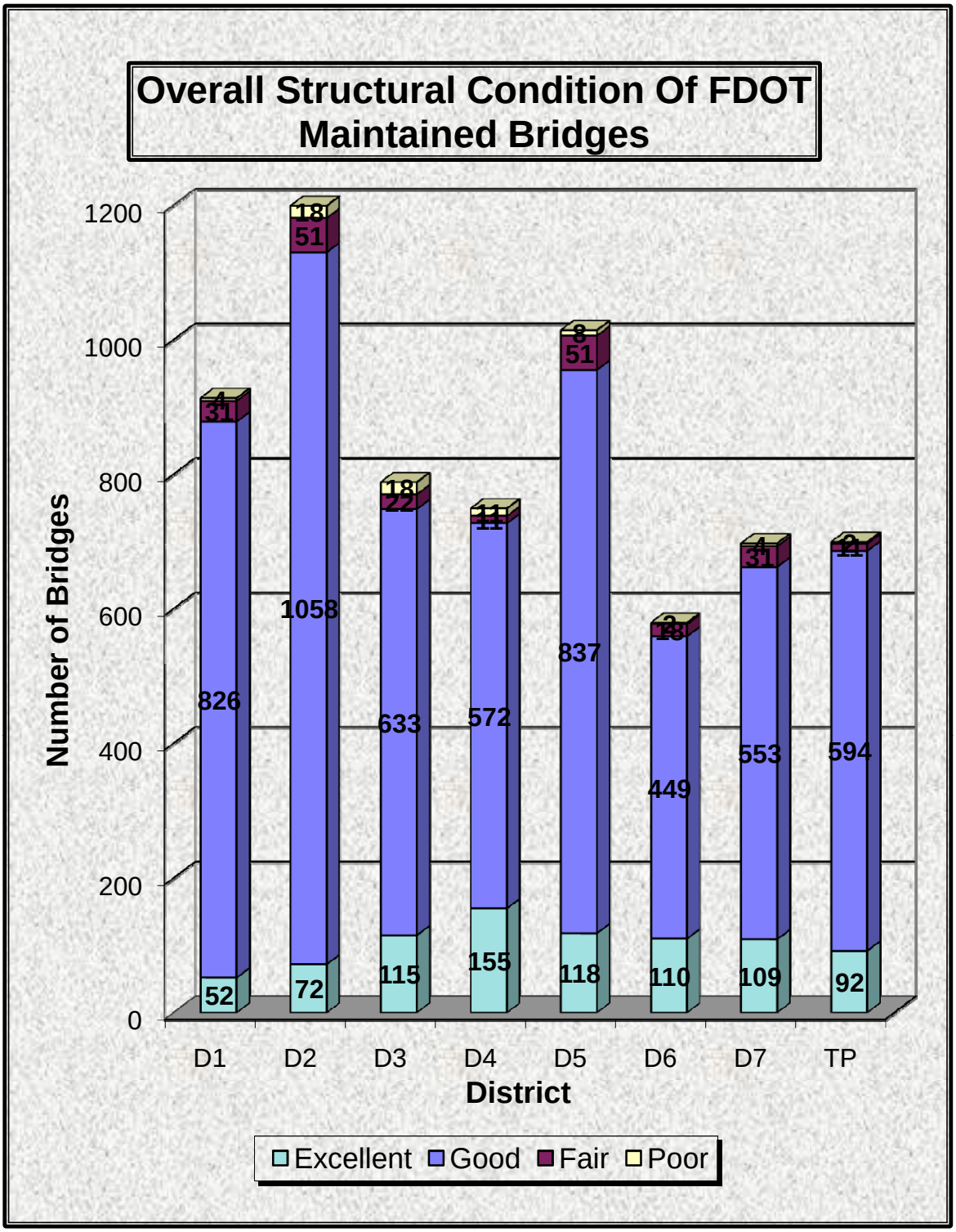
Overall Structural Condition Of FDOT Maintained Bridges
Number of Bridges
0
200
400
600
800
1000
1200
D1
D2
D3
D4
D5
D6
D7
TP
District
826
1058
633
572
837
449
553
594
52
72
115
155
118
110
109
92
Excellent
Good
Fair
Poor

Figure 21

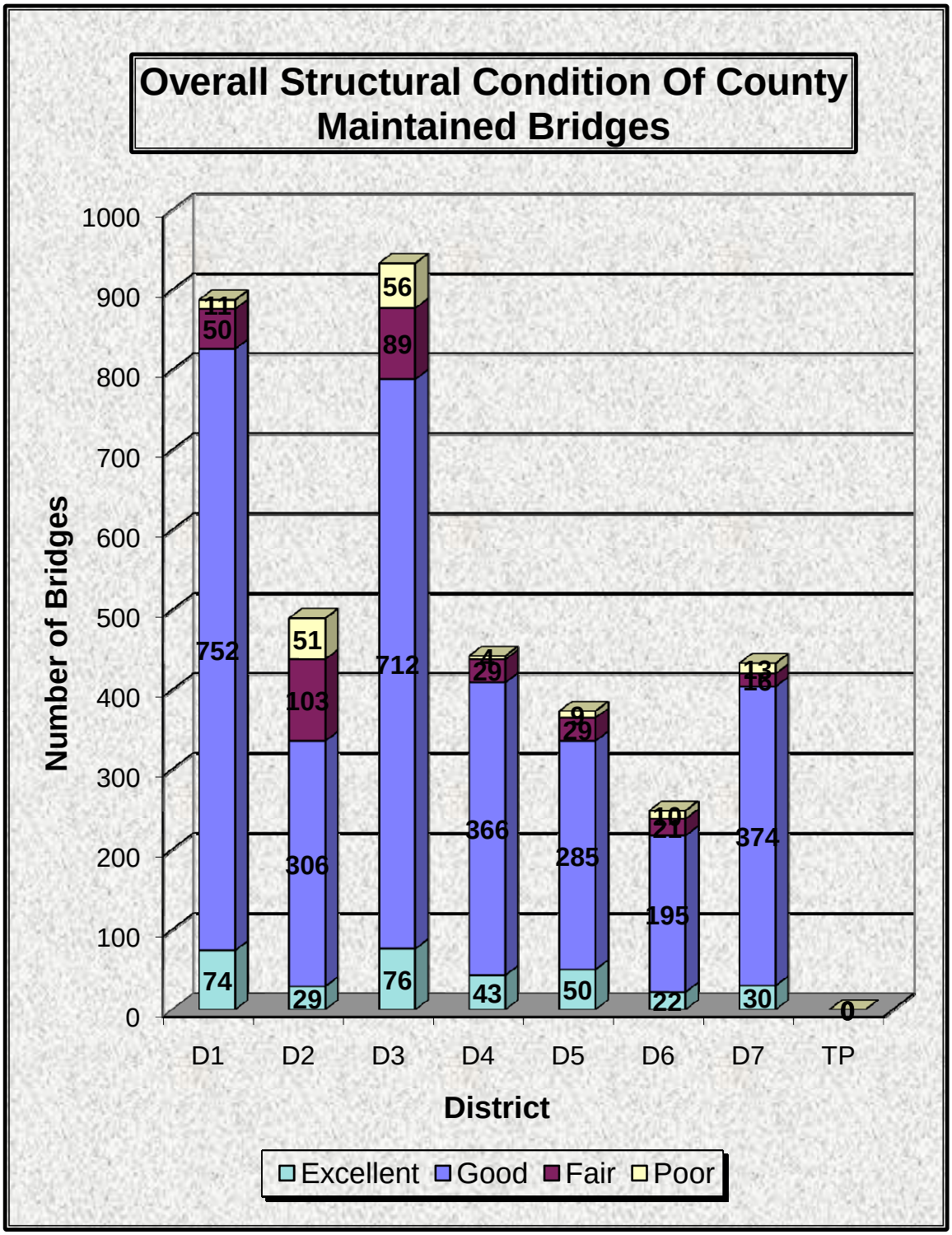
Overall Structural Condition Of County Maintained Bridges
Number of Bridges
1000
900
800
700
600
500
400
300
200
100
0
752
50
11
306
103
51
712
89
56
366
29
4
285
29
9
195
21
10
374
18
13
74
29
76
43
50
22
30
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor

Figure 22

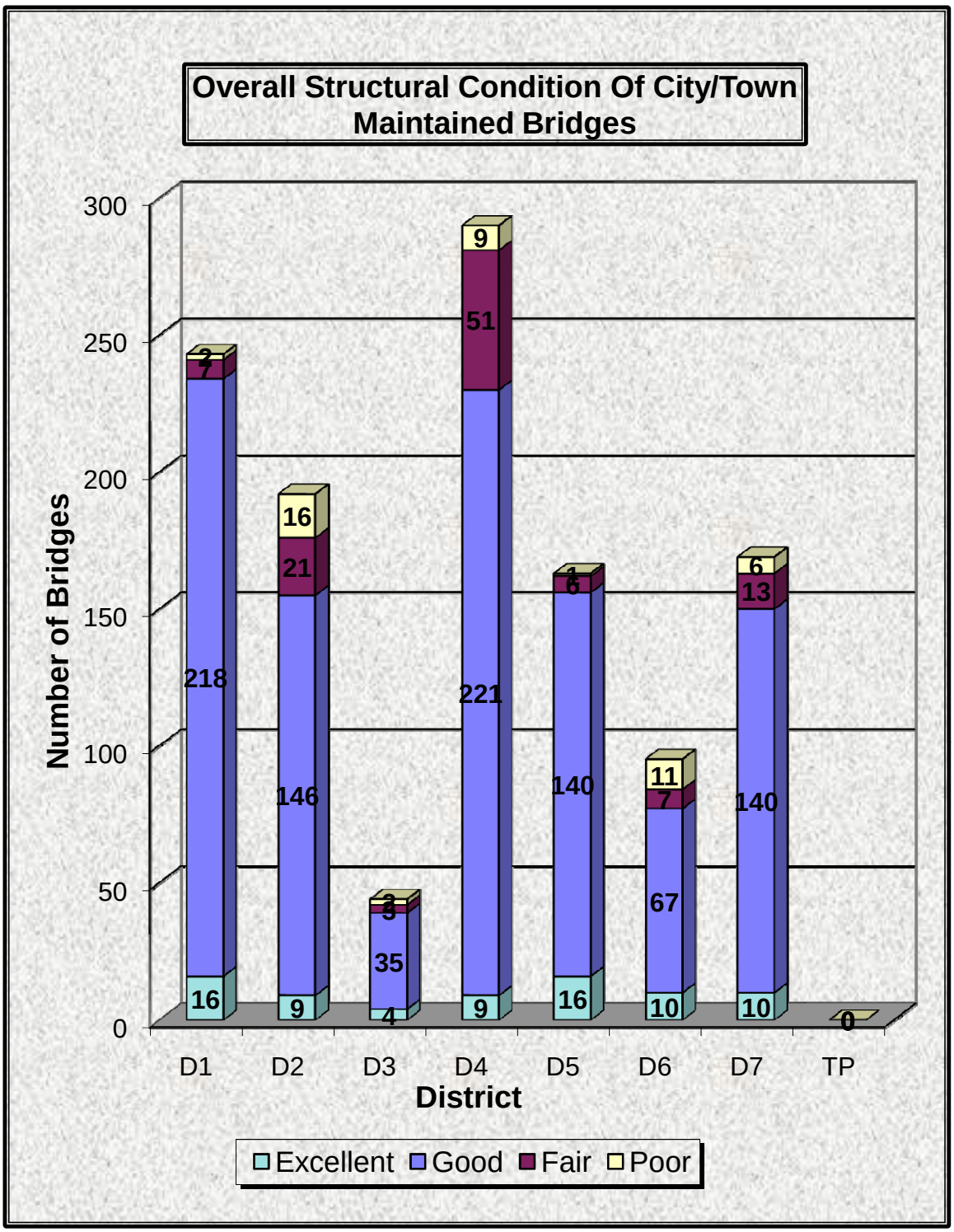
Overall Structural Condition Of City/Town Maintained Bridges
Number of Bridges
300
250
200
150
100
50
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
16
218
7
2
9
146
21
16
4
35
3
3
9
221
51
9
16
140
6
1
10
67
7
11
10
140
13
6
0

Figure 23

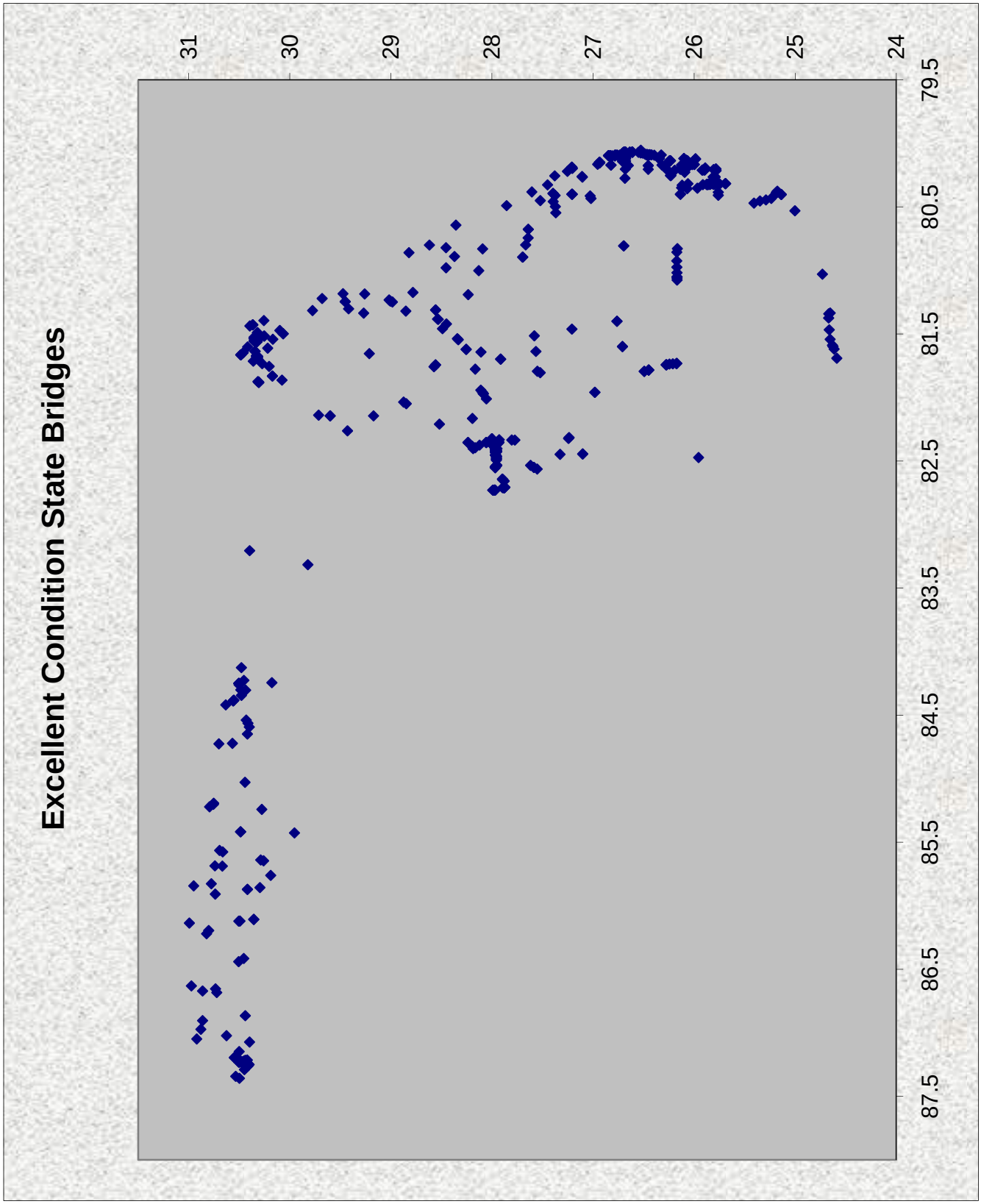
Excellent Condition State Bridges
31
30
29
28
27
26
25
24
79.5
80.5
81.5
82.5
83.5
84.5
85.5
86.5
87.5

Figure 24

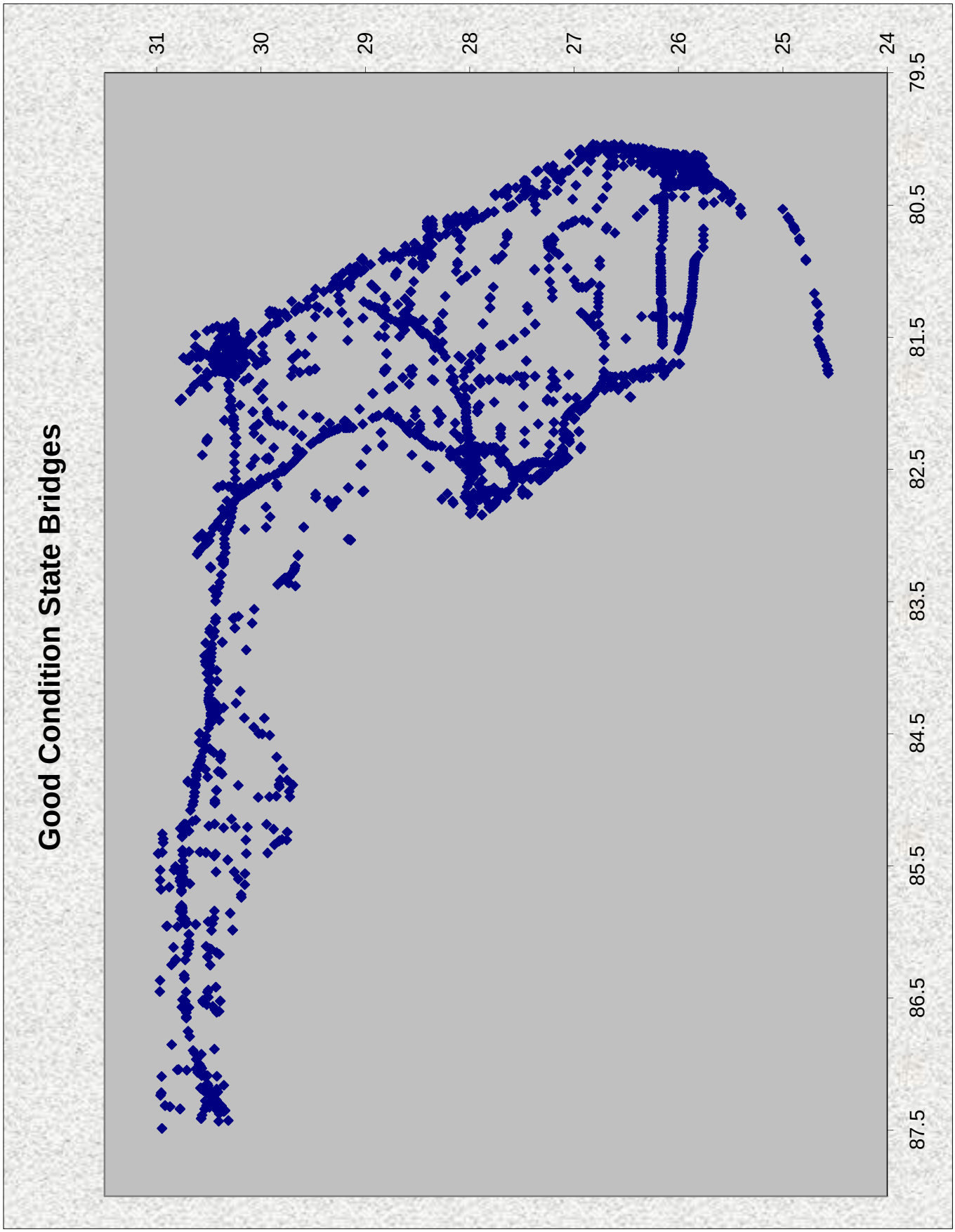
Good Condition State Bridges
31
30
29
28
27
26
25
24
79.5
80.5
81.5
82.5
83.5
84.5
85.5
86.5
87.5

Figure 25

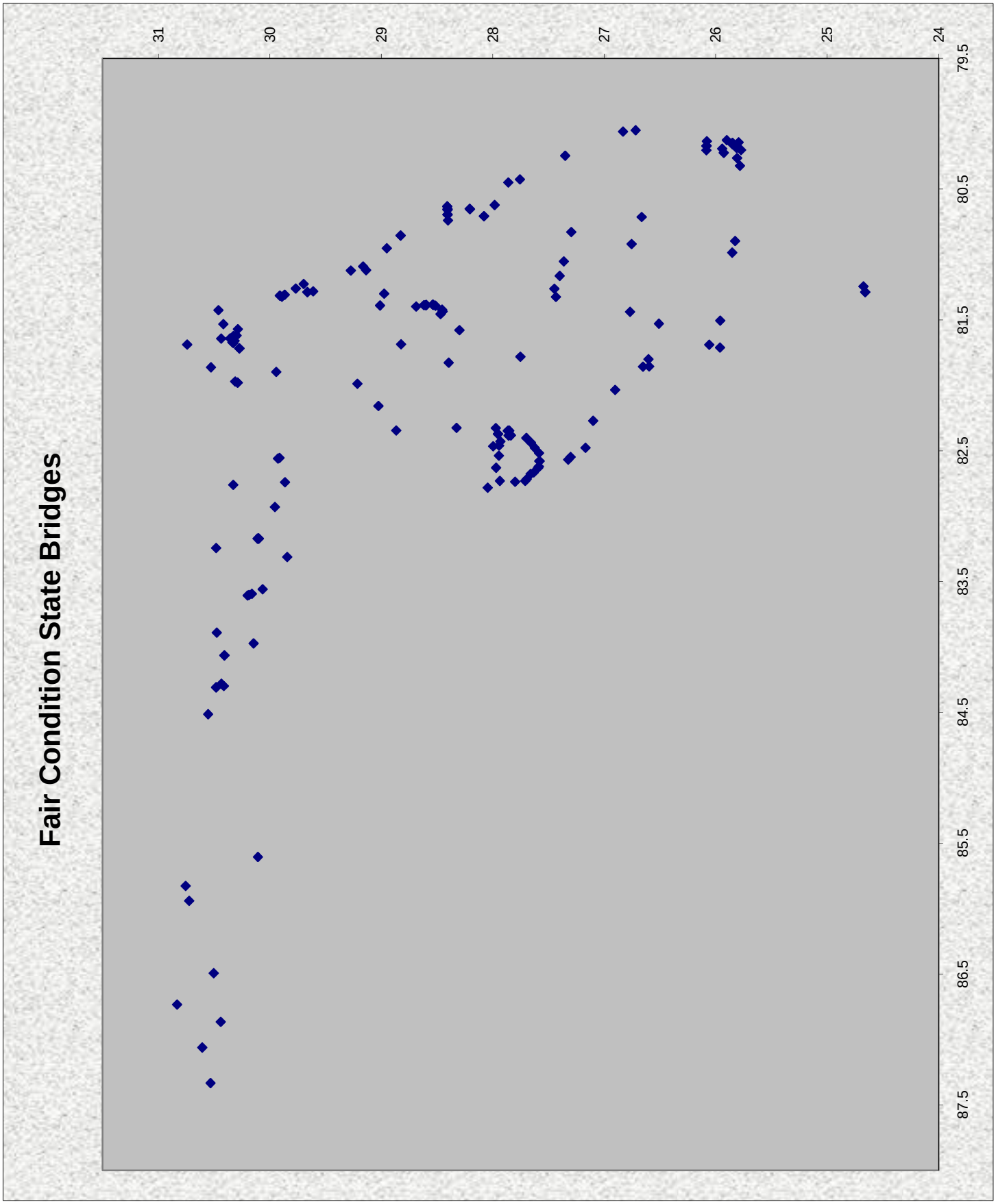
Fair Condition State Bridges
31
30
29
28
27
26
25
24
79.5
80.5
81.5
82.5
83.5
84.5
85.5
86.5
87.5

Figure 26

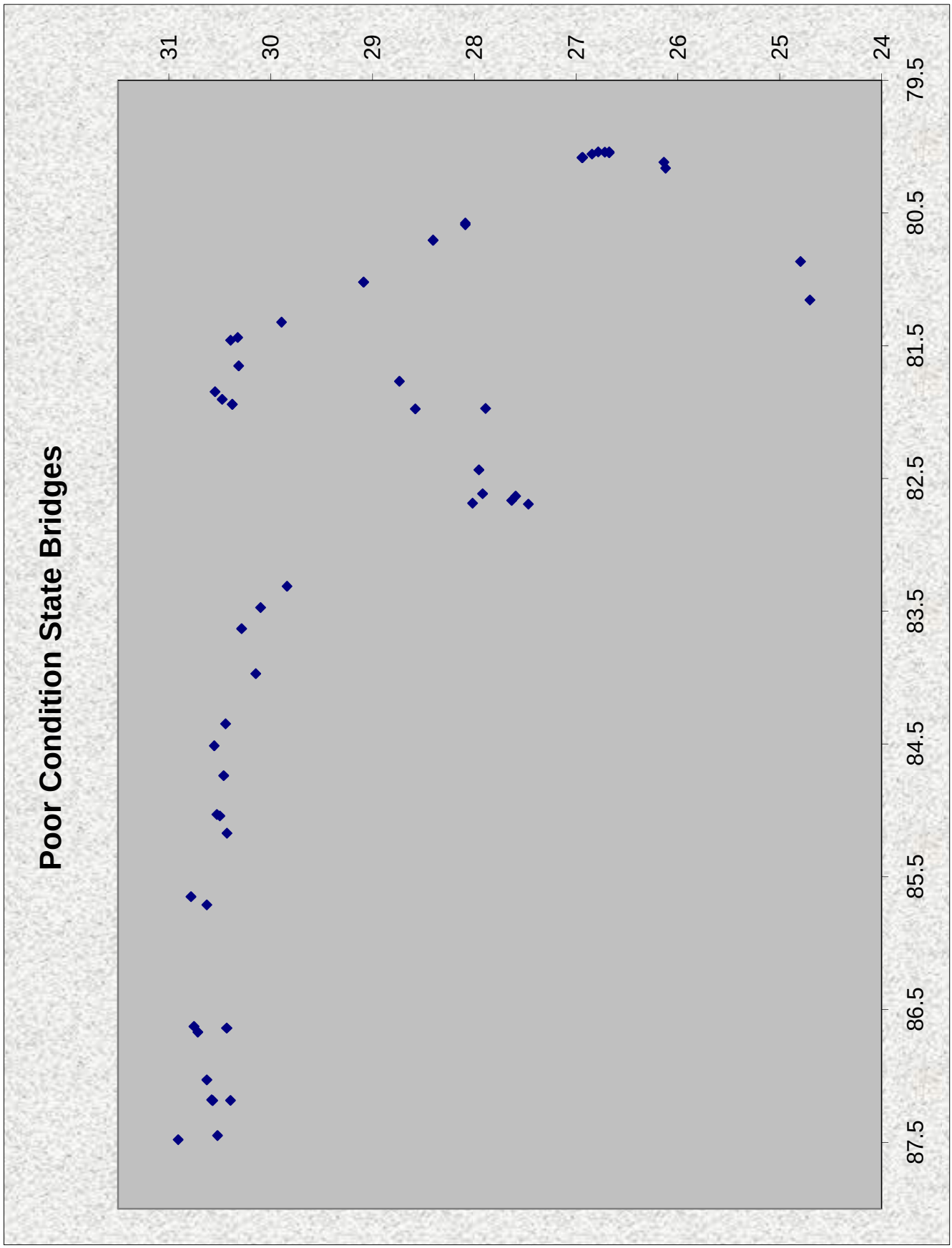
Poor Condition State Bridges
31
30
29
28
27
26
25
24
79.5
80.5
81.5
82.5
83.5
84.5
85.5
86.5
87.5

Figure 27

Structurally Deficient Bridges

The FDOT follows the Federal Highway Administration's (FHWA) definition to identify structurally deficient bridges. A bridge can have structural deterioration but not be considered structurally deficient, mostly due to the material safety factors and conservatism inherent in bridge design practices. The FHWA defines a structurally deficient bridge to have a poor (numerical rating of 4), or worse, condition rating for the deck, superstructure, or substructure component, or culvert. Additionally, if the bridge is considered intolerable with regards to its ability to carry legal loads or its serviceability during floods, it is also considered to be structurally deficient. FDOT's work program requires that structurally deficient bridges, once identified, have corrective actions (repair or replacement) initiated within six years. Structurally deficient bridges are not considered unsafe for public use unless the bridge is also closed.

The sufficiency rating is an FHWA defined index that provides a 0 to 100 "grade" for the overall bridge structure. Sufficiency ratings are used exclusively to determine a bridge's eligibility for use of federal bridge construction funds. Bridges with sufficiency ratings above 80 are not eligible for use of federal bridge construction funds. Bridges with sufficiency ratings less than 50 generally qualify for replacement using federal bridge construction funds. And bridges with sufficiency ratings between 50 and 80 can typically use federal bridge construction funds for rehabilitation work (see Table 9 and Figure 29).

There are currently 249 structurally deficient bridges in Florida, with over 56.63% having county maintenance responsibility. Sixty (24.10%) of the structurally deficient bridges are maintained by FDOT (see Figure 28). Refer to Figures 30, 31, and 32 for a presentation of structurally deficient bridges, by sufficiency rating, by FDOT District, for each of the maintenance responsibility groups. For the group of County Government maintained bridges, 78.01% would likely qualify for use of federal bridge construction funds to replace the bridges, while 21.28% would likely qualify for repair or rehabilitation using federal bridge construction funds. Similar results are seen for the City/Town maintenance group, with 92.68% in the replacement range and 7.32% in the repair/rehab range. Over 75.18% of the County Government maintained structurally deficient bridges are concentrated within District 2 and 3. Over 70.73% of the City/Town maintained structurally deficient bridges are concentrated within Districts 2 and 4.

Structurally Deficient Bridges (SD) Bridges By Sufficiency Rating (SR)								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
Statewide								
SD w/SR>80	0	1	0	0	0	0	0	1
SD w/50<SR<=80	23	30	3	1	0	0	0	57
SD w/SR<50	37	110	38	6	0	0	0	191
Total	60	141	41	7	0	0	0	249
District 1								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	0	0	0	0	0	0	0	0
SD w/SR<50	4	7	1	0	0	0	0	12
Total	4	7	1	0	0	0	0	12
District 2								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	7	14	1	0	0	0	0	22
SD w/SR<50	7	37	15	3	0	0	0	62
Total	14	51	16	3	0	0	0	84
District 3								
SD w/SR>80	0	1	0	0	0	0	0	1
SD w/50<SR<=80	8	12	0	1	0	0	0	21
SD w/SR<50	10	42	2	3	0	0	0	57
Total	18	55	2	4	0	0	0	79
District 4								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	3	1	0	0	0	0	0	4
SD w/SR<50	8	3	13	0	0	0	0	24
Total	11	4	13	0	0	0	0	28
District 5								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	2	2	1	0	0	0	0	5
SD w/SR<50	6	7	0	0	0	0	0	13
Total	8	9	1	0	0	0	0	18
District 6								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	1	0	1	0	0	0	0	2
SD w/SR<50	1	9	6	0	0	0	0	16
Total	2	9	7	0	0	0	0	18
District 7								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	2	1	0	0	0	0	0	3
SD w/SR<50	1	5	1	0	0	0	0	7
Total	3	6	1	0	0	0	0	10
District 8								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	0	0	0	0	0	0	0	0
SD w/SR<50	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Table 9

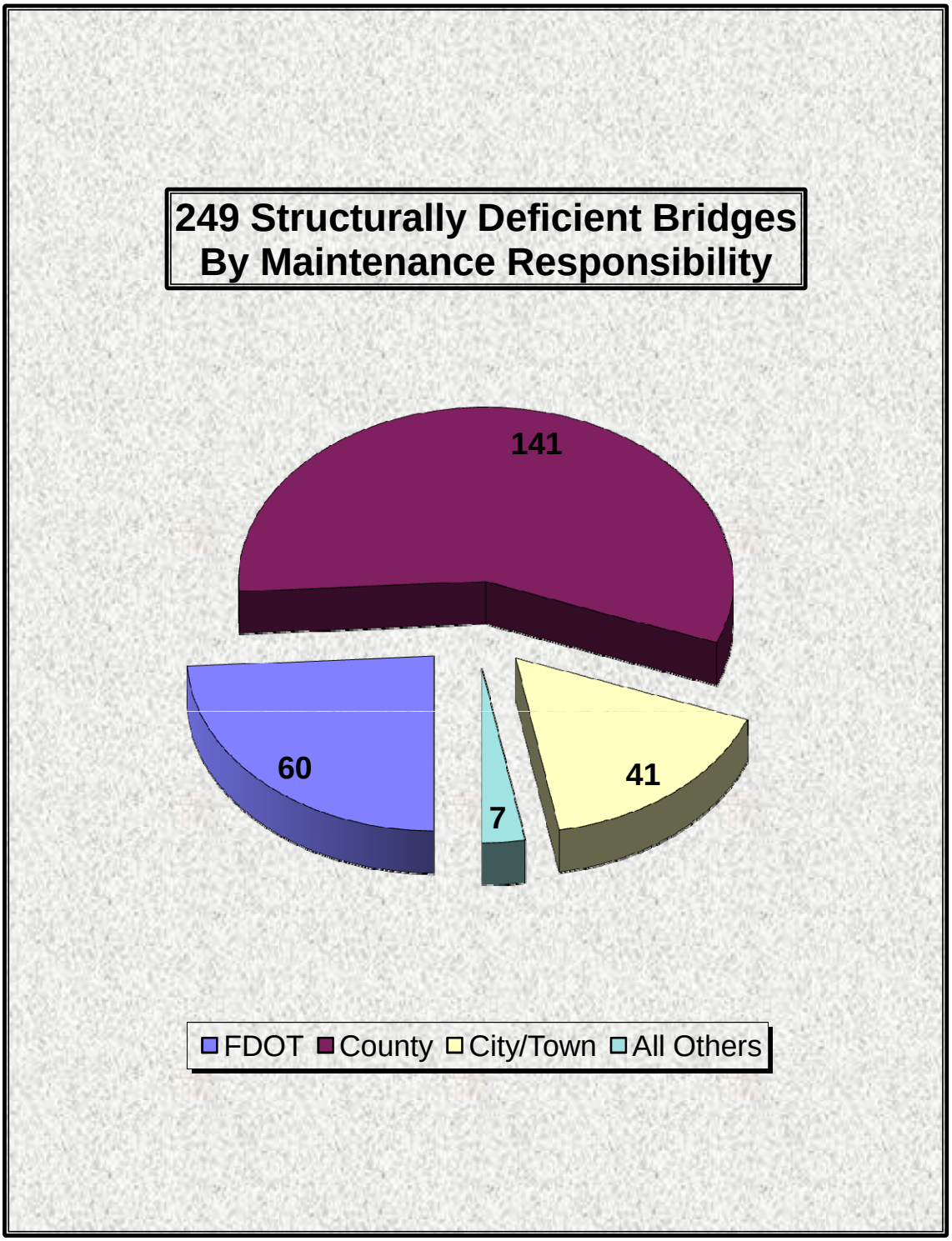
249 Structurally Deficient Bridges
By Maintenance Responsibility
141
60
7
41
FDOT
County
City/Town
All Others

Figure 28

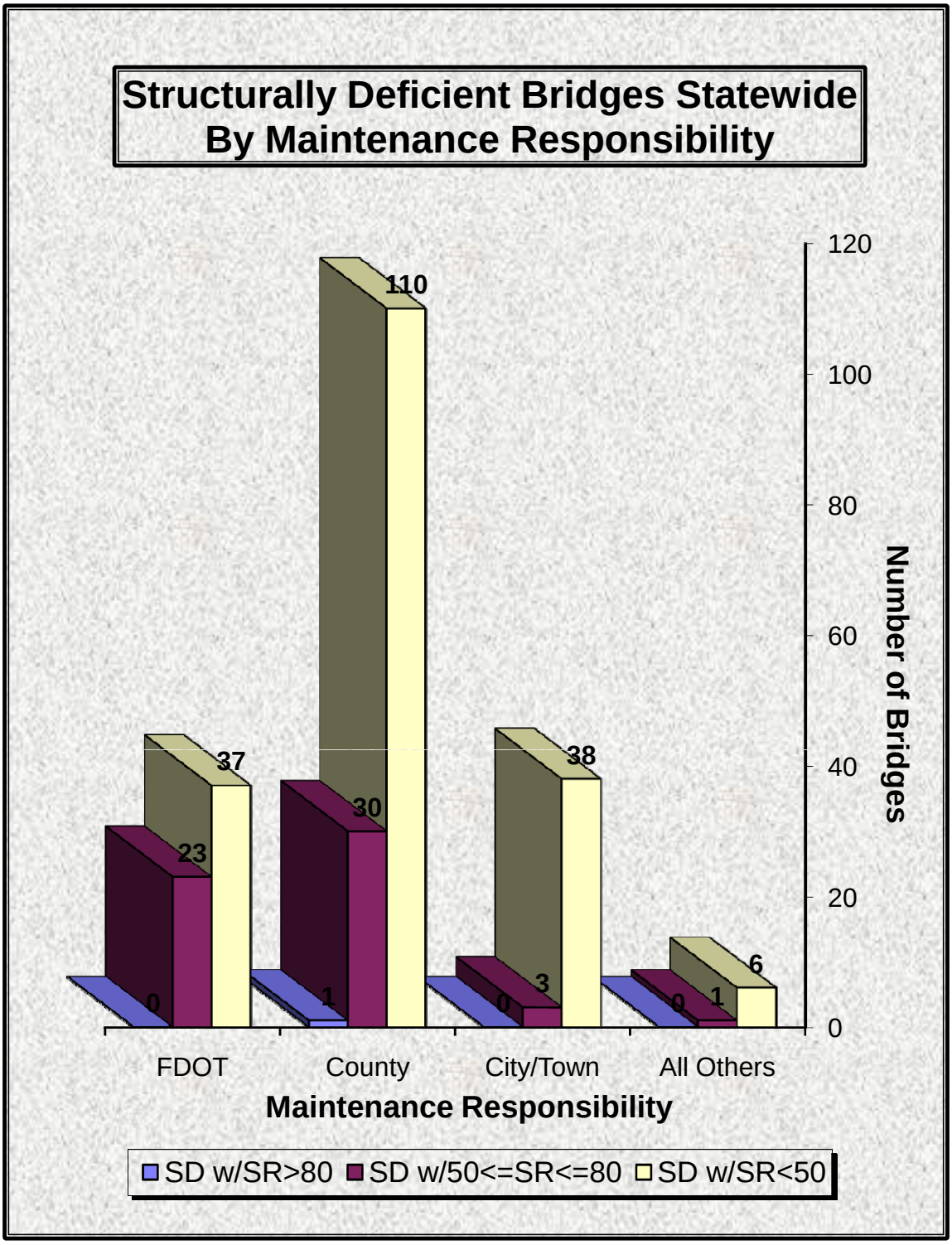
Structurally Deficient Bridges Statewide
By Maintenance Responsibility
120
100
80
60
40
20
0
Number of Bridges
110
37
23
30
38
3
6
1
0
1
0
FDOT
County
City/Town
All Others
Maintenance Responsibility
SD w/SR>80
SD w/50<=SR<=80
SD w/SR<50

Figure 29

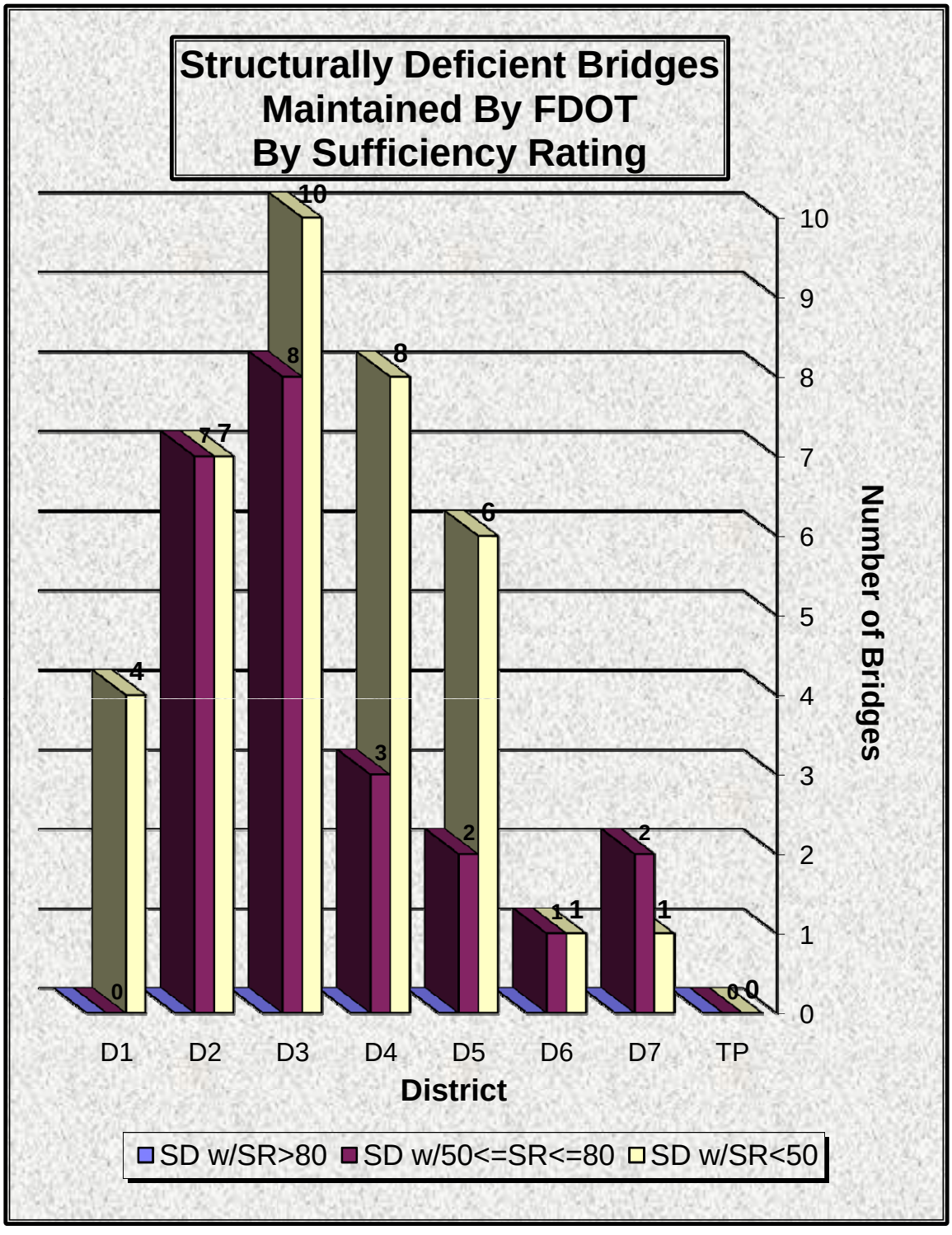
Structurally Deficient Bridges
Maintained By FDOT
By Sufficiency Rating
Number of Bridges
0
1
2
3
4
5
6
7
8
9
10
D1
D2
D3
D4
D5
D6
D7
TP
District
SD w/SR>80
SD w/50<=SR<=80
SD w/SR<50
4
0
7
7
10
8
8
3
6
2
1
1
2
1
0
0

Figure 30

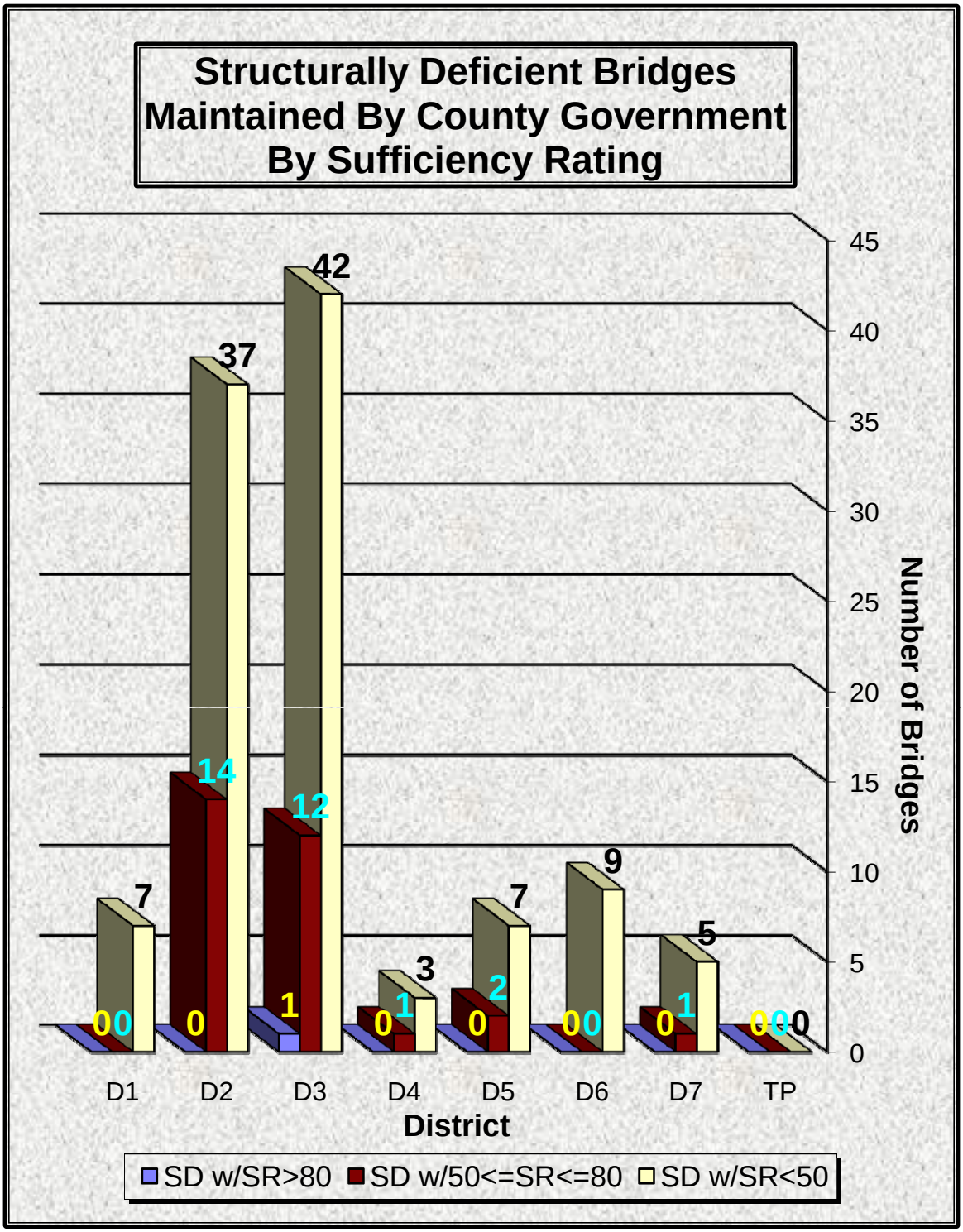
Structurally Deficient Bridges
Maintained By County Government
By Sufficiency Rating
45
40
35
30
25
20
15
10
5
0
Number of Bridges
7
37
42
3
7
9
5
0
14
12
2
1
0
0
0
0
0
0
0
0
1
1
0
D1
D2
D3
D4
D5
D6
D7
TP
District
SD w/SR>80
SD w/50<=SR<=80
SD w/SR<50

Figure 31

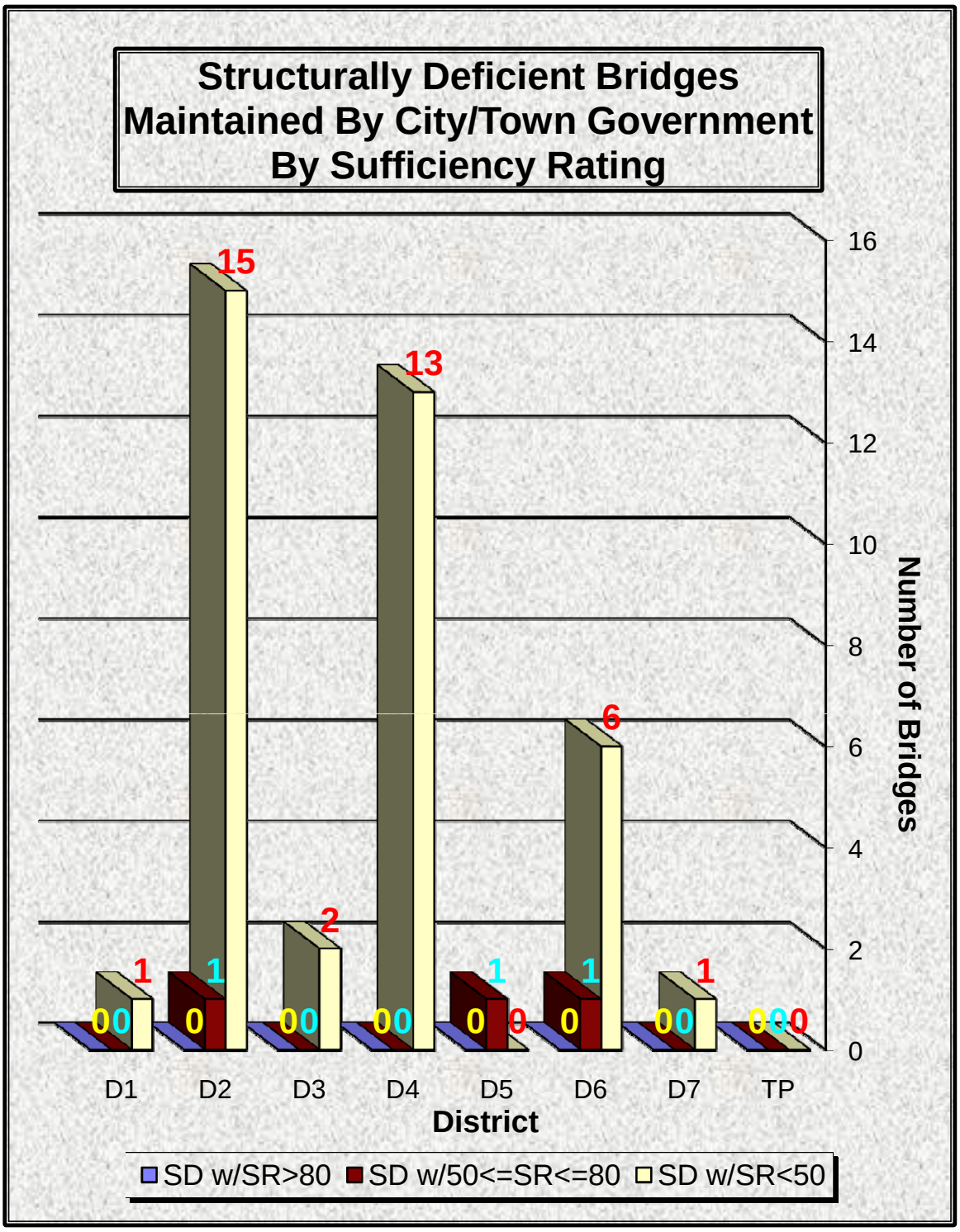
Structurally Deficient Bridges
Maintained By City/Town Government
By Sufficiency Rating
16
14
12
10
8
6
4
2
0
Number of Bridges
15
13
6
2
1
1
1
1
1
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
SD w/SR>80
SD w/50<=SR<=80
SD w/SR<50

Figure 32

Posted and Closed Bridges

The operational status of a bridge indicates whether the bridge is unrestricted or open to all traffic, closed to all traffic, or posted for some sort of traffic restriction. Posting restrictions generally refer to gross vehicular weights of truck traffic. The need to post weight restrictions at a bridge are generally caused by the inability of individual bridge members to adequately carry the applied legal loads. That inability to carry the applied legal loads can be the result of either advanced structural deterioration that results in a loss of material strength, obsolete member proportions, or a combination of these two factors. Older bridges were typically designed for smaller loads than today's standards would require, and as a result, the member sizes are often smaller in relation to what would be designed today. Like structurally deficient bridges, posted bridges receive the highest priority in the FDOT bridge construction program. Construction to replace the bridge or rehabilitation to strengthen the bridge must be initiated within six years from the time the posting requirement is first determined.

Table 10 presents the number of posted and closed bridges by maintenance responsibility group, for each of the FDOT Districts. There are currently 903 posted or closed bridges in Florida, with County Governments having maintenance responsibility for over 74.64% of the total. City and Town Governments are responsible for the maintenance of over 19.71% of the total, while the FDOT is responsible for only 13 of the 903 bridges (1.44%) (see Figure 33). The number of posted County bridges (674 bridges) is much greater than the number of structurally deficient County bridges (141), which indicated that the majority of County bridge posting restrictions are caused by obsolete design, rather than advanced structural deterioration (see Figure 34).

Of the 13 posted or closed bridges maintained by the FDOT, Districts 3, 5, and Turnpike had none, and District 7 and 4 constituted 46.15% of the posted or closed bridges (see Figure 35). Seventy percent (71.81%) of the posted or closed bridges maintained by County Governments are concentrated within Districts 2 and 3 (see Figure 36). Ninety-three (52.25%) of the posted or closed bridges maintained by City/Town Governments are concentrated within Districts 2 and 4 (see Figure 37). Statewide, 63.01% of all posted or closed bridges are within the boundaries of Districts 2 and 3.

Posted and Closed Bridges								
	Maintenance Responsibility							
	FDOT	County	City/Town	Other/State	Other/Local	Federal	Others	Total
Statewide								
Posted	5	664	171	34	0	0	0	874
Closed	8	10	7	4	0	0	0	29
Total	13	674	178	38	0	0	0	903
District 1								
Posted	0	86	25	3	0	0	0	114
Closed	2	0	0	0	0	0	0	2
Total	2	86	25	3	0	0	0	116
District 2								
Posted	1	131	43	6	0	0	0	181
Closed	0	3	1	1	0	0	0	5
Total	1	134	44	7	0	0	0	186
District 3								
Posted	0	347	10	20	0	0	0	377
Closed	0	3	1	2	0	0	0	6
Total	0	350	11	22	0	0	0	383
District 4								
Posted	3	25	49	0	0	0	0	77
Closed	0	0	0	0	0	0	0	0
Total	3	25	49	0	0	0	0	77
District 5								
Posted	0	33	23	4	0	0	0	60
Closed	2	1	1	0	0	0	0	4
Total	2	34	24	4	0	0	0	64
District 6								
Posted	0	19	9	1	0	0	0	29
Closed	2	3	4	1	0	0	0	10
Total	2	22	13	2	0	0	0	39
District 7								
Posted	1	23	12	0	0	0	0	36
Closed	2	0	0	0	0	0	0	2
Total	3	23	12	0	0	0	0	38
District 8								
Posted	0	0	0	0	0	0	0	0
Closed	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Table 10

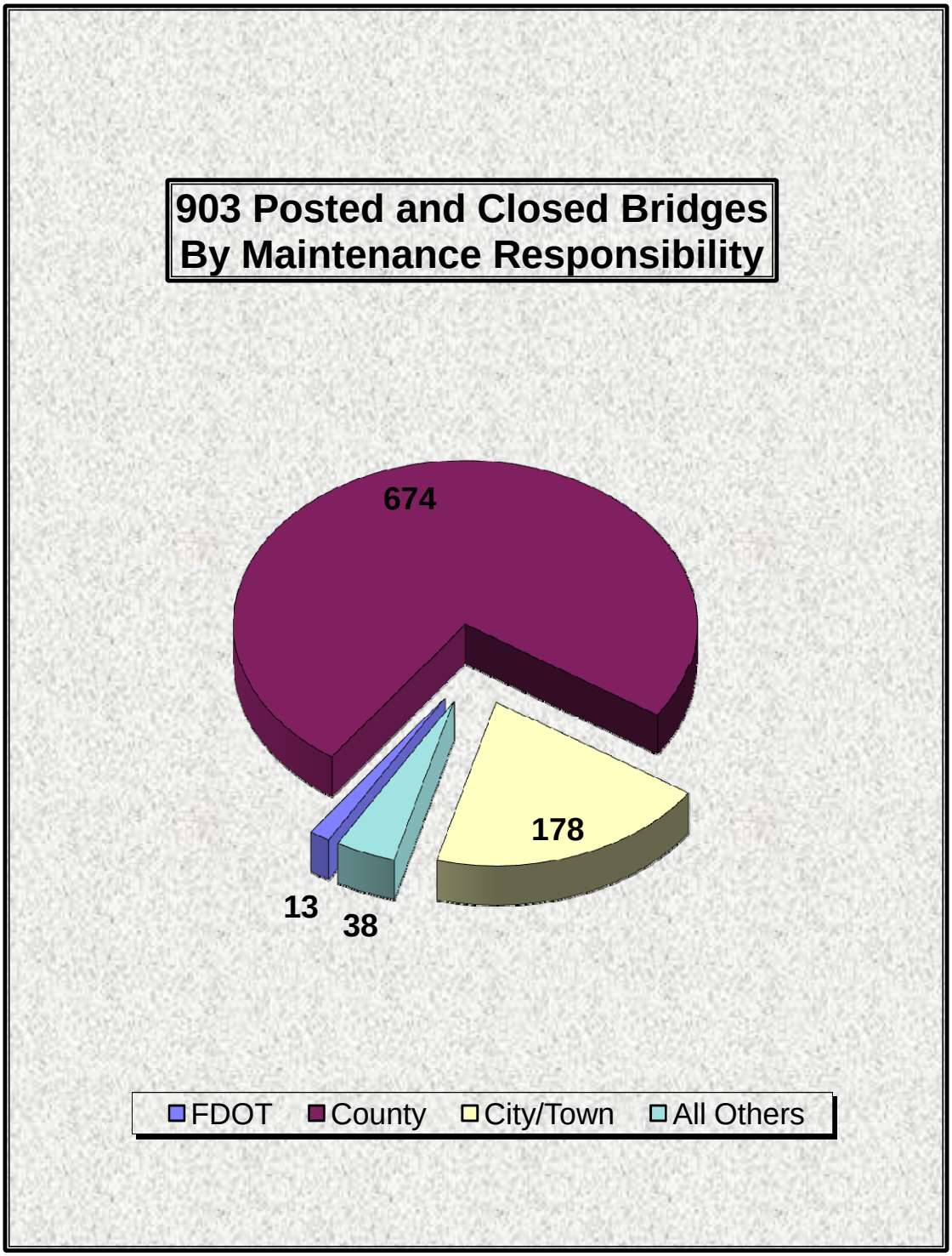
903 Posted and Closed Bridges
By Maintenance Responsibility
674
178
13
38
FDOT
County
City/Town
All Others

Figure 33

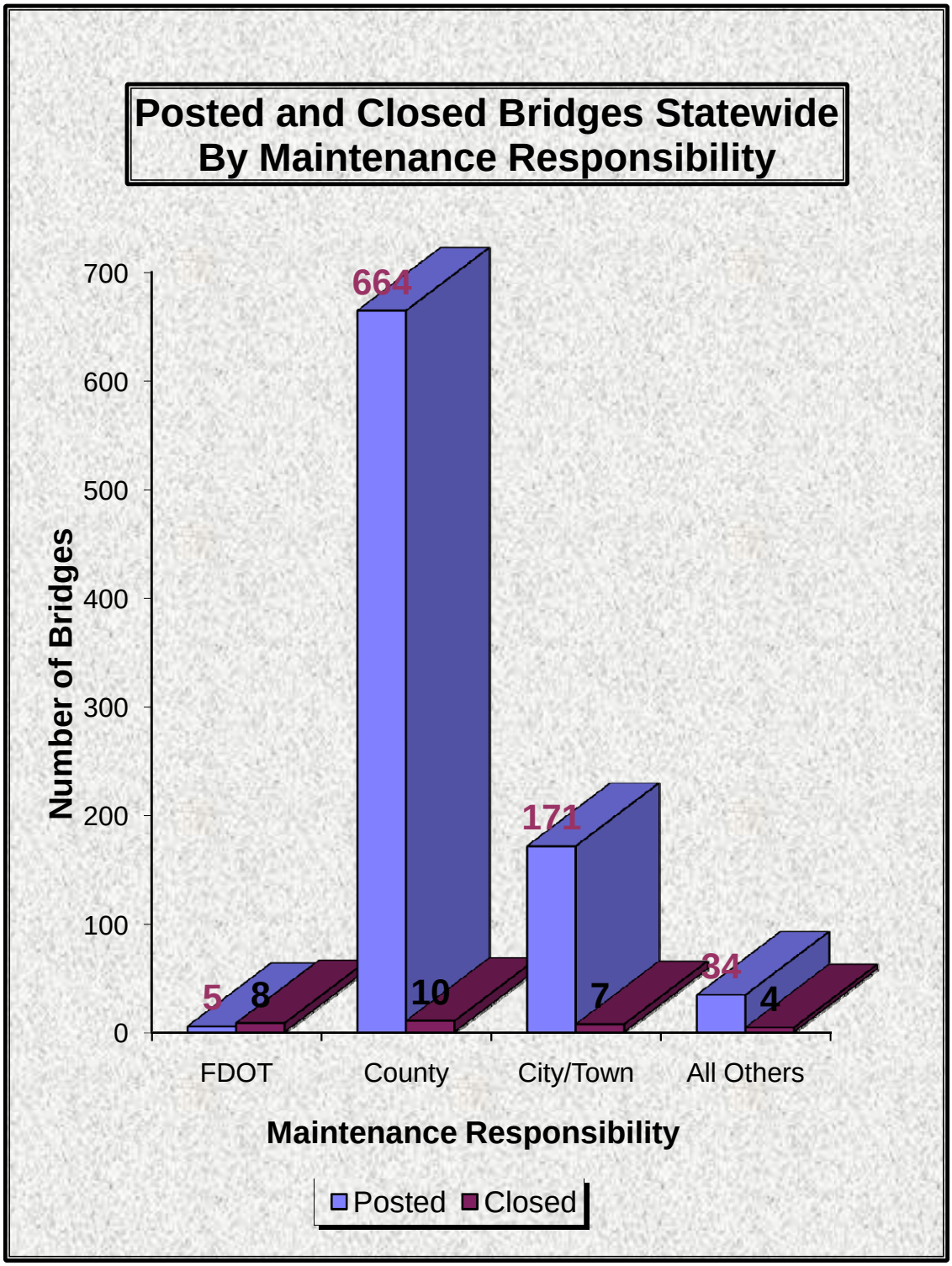
Posted and Closed Bridges Statewide
By Maintenance Responsibility
Number of Bridges
700
600
500
400
300
200
100
0
664
171
34
5
8
10
7
4
FDOT
County
City/Town
All Others
Maintenance Responsibility
Posted
Closed

Figure 34

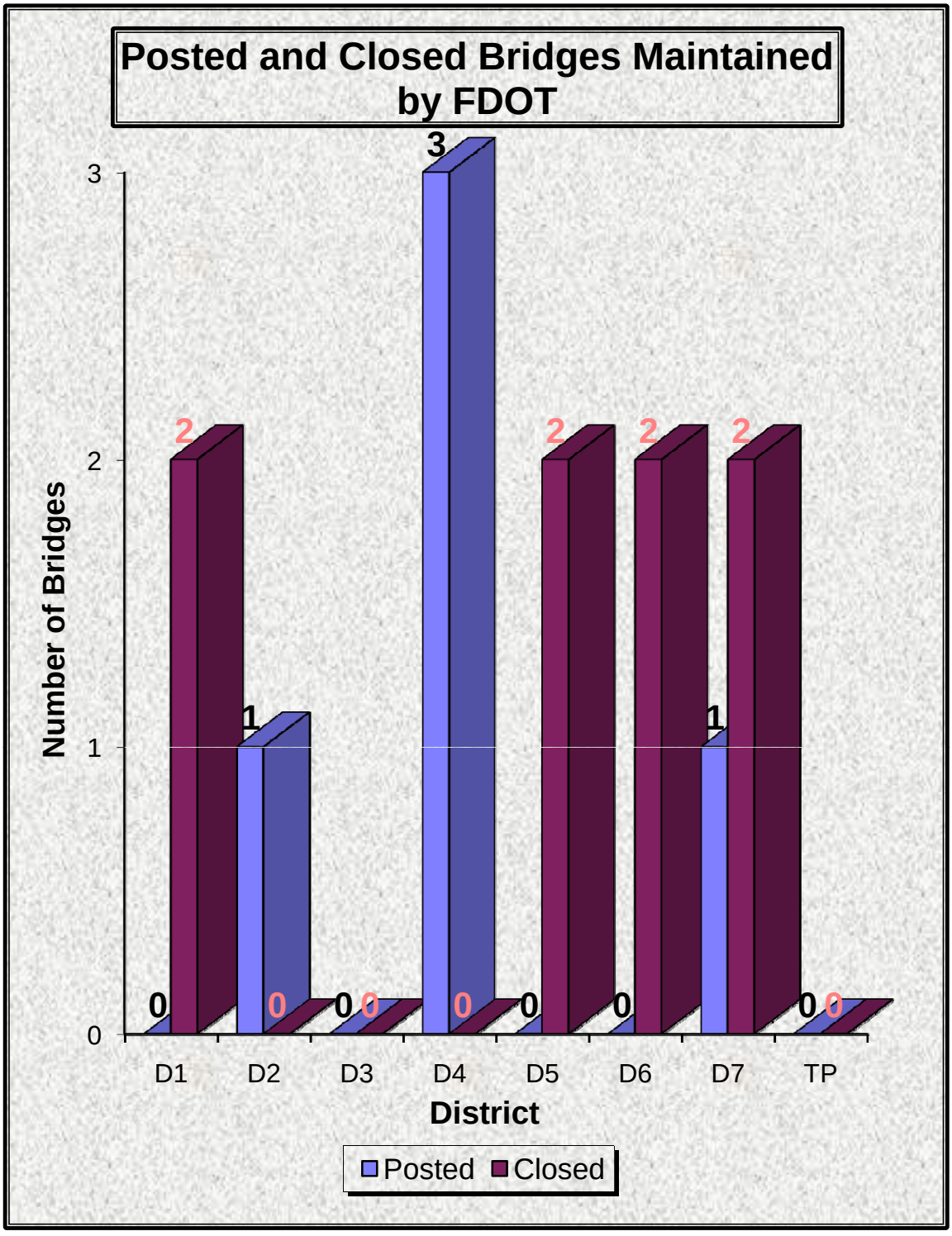
Posted and Closed Bridges Maintained by FDOT
Number of Bridges
0
1
2
3
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 35

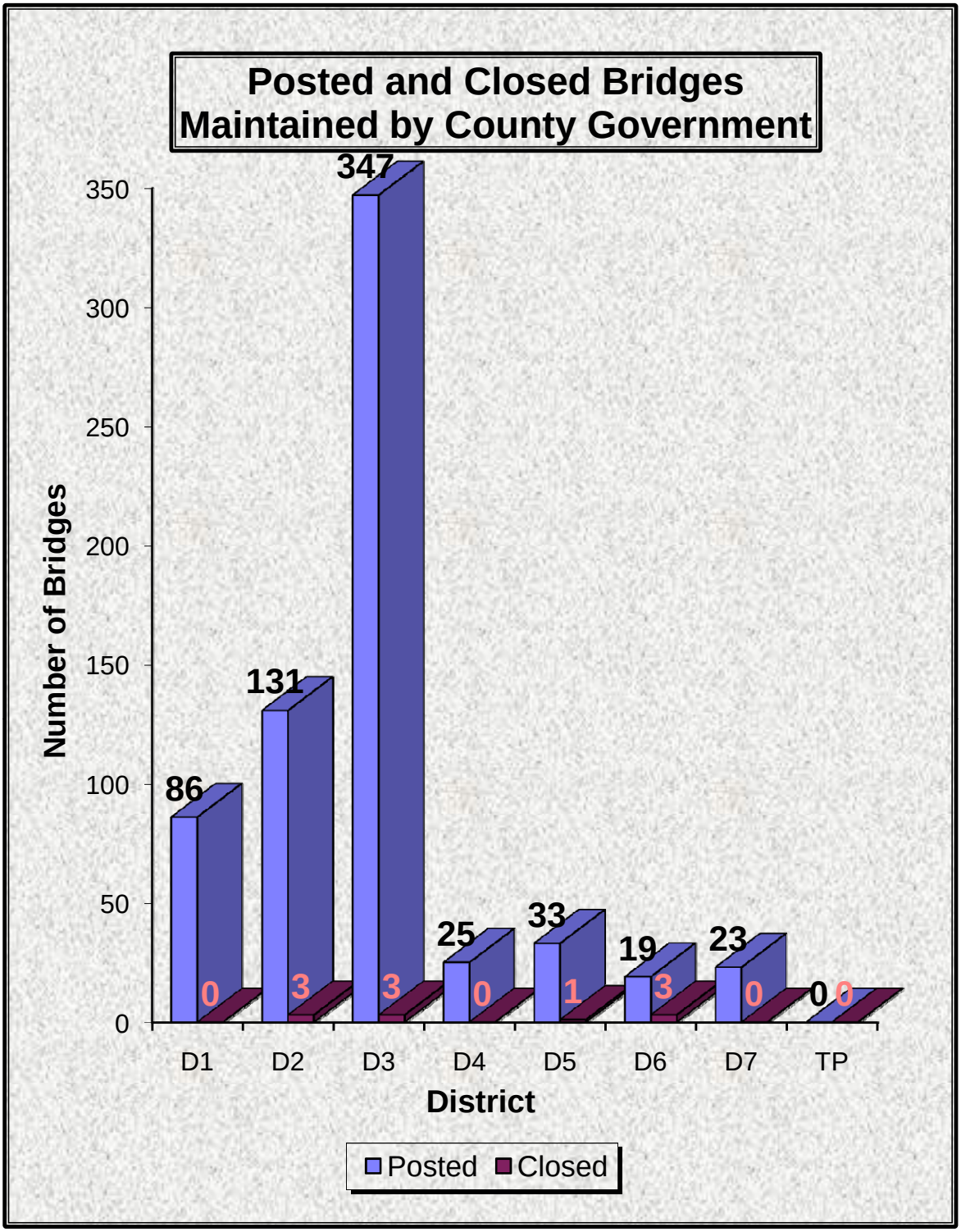
Posted and Closed Bridges
Maintained by County Government
Number of Bridges
350
300
250
200
150
100
50
0
86
0
131
3
347
3
25
0
33
1
19
3
23
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 36

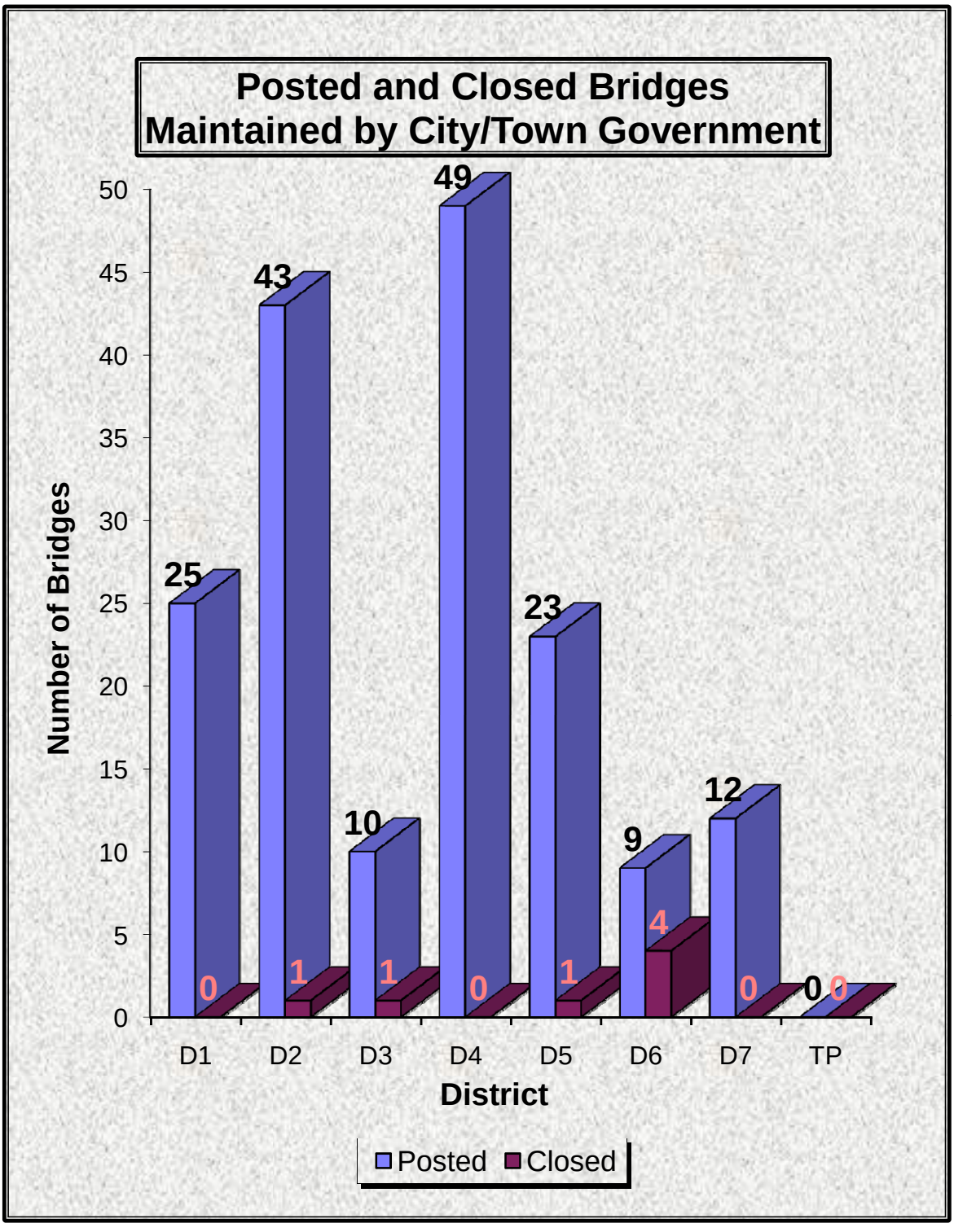
Posted and Closed Bridges
Maintained by City/Town Government
Number of Bridges
50
45
40
35
30
25
20
15
10
5
0
25
0
43
1
10
1
49
0
23
1
9
4
12
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 37

Functionally Obsolete Bridges

The FDOT follows the Federal Highway Administration's (FHWA) definition to identify functionally obsolete bridges. Functional obsolescence attempts to appraise the level of service a bridge provides in relation to the level of service for the highway the bridge is located on. As the level of service for the highway system changes, for example, an increase in traffic volume, a bridge can become functionally obsolete if it has geometric constraints that affect the flow of traffic on, or under, the bridge. Structural deterioration generally does not influence whether a bridge is considered functionally obsolete. Any bridge classified as structurally deficient is excluded from the functionally obsolete category. A functionally obsolete a bridge needs to have at least one of the following five criteria appraised as intolerable and requiring corrective action: 1) deck geometry (the curb-to-curb width of the bridge deck as it relates to number of traffic lanes, traffic volume, and highway classification); 2) vertical and horizontal under clearances (unrestricted clearances as related to highway classification); 3) approach roadway alignment (the inspector's subjective appraisal of the need to reduce vehicle operating speed as the bridge is approached from the highway); 4)structural evaluation (considers the numerical condition ratings for the deck, superstructure, or substructure bridge component, or for the culvert; load carrying capacity; and traffic volume); 5) waterway adequacy (the inspector's subjective appraisal of the bridge site's ability to accommodate the flow of flood water).

The sufficiency rating is an FHWA defined index that provides a 0 to 100 "grade" for the overall bridge structure. Sufficiency ratings are used exclusively to determine a bridge's eligibility for use of federal bridge construction funds. Bridges with sufficiency ratings above 80 are not eligible for use of federal bridge construction funds. Bridges with sufficiency ratings less than 50 generally qualify for replacement using federal bridge construction funds. And bridges with sufficiency ratings between 50 and 80 can typically use federal bridge construction funds for rehabilitation work (see Table 11 and Figure 39).

There are currently 1,735 functionally obsolete bridges in Florida, about 14.57% of the total. The FDOT has maintenance responsibility for over 42.36% of all functionally obsolete bridges (see Figure 38). Refer to Figures 40, 41, and 42 for a presentation of functionally obsolete bridges, by sufficiency rating, by FDOT District, for each of the three maintenance responsibility groups.

For the FDOT group, 52.79% of the functionally obsolete bridges would likely qualify for use of federal bridge construction funds for rehabilitation work, while only 1.50% of the bridges would qualify for replacement using the federal bridge construction funds. Over 45.71% of these bridges would not qualify to use any federal funds.

For the County bridges, 76.03% of the functionally obsolete bridges would likely qualify for use of federal bridge construction funds for rehabilitation work, while 12.81% of the bridges would qualify for replacement using the federal bridge construction funds. Almost 11.17% of the bridges would not qualify to use any federal funds.

Of the City/Town functionally obsolete bridges, 70.33% would likely qualify for use of federal bridge construction funds for rehabilitation work, while 14.33% of the bridges would qualify for replacement using the federal bridge construction funds. Over 15.33% of the bridges would not qualify to use any federal funds.

Functionally Obsolete Bridges (FO) Bridges By Sufficiency Rating (SR)								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
Statewide								
FO w/SR>80	336	68	46	2	9	0	0	461
FO w/50<=SR<=80	388	463	211	57	11	0	3	1133
FO w/SR<50	11	78	43	9	0	0	0	141
Total	735	609	300	68	20	0	3	1735
District 1								
FO w/SR>80	21	16	22	0	0	0	0	59
FO w/50<=SR<=80	50	133	55	1	2	0	0	241
FO w/SR<50	1	18	5	2	0	0	0	26
Total	72	167	82	3	2	0	0	326
District 2								
FO w/SR>80	66	3	3	0	0	0	0	72
FO w/50<=SR<=80	90	22	13	2	0	0	0	127
FO w/SR<50	4	18	4	3	0	0	0	29
Total	160	43	20	5	0	0	0	228
District 3								
FO w/SR>80	10	9	0	2	0	0	0	21
FO w/50<=SR<=80	25	71	2	52	0	0	1	151
FO w/SR<50	0	27	1	1	0	0	0	29
Total	35	107	3	55	0	0	1	201
District 4								
FO w/SR>80	19	8	7	0	0	0	0	34
FO w/50<=SR<=80	34	85	58	1	0	0	0	178
FO w/SR<50	1	5	18	0	0	0	0	24
Total	54	98	83	1	0	0	0	236
District 5								
FO w/SR>80	63	6	8	0	7	0	0	84
FO w/50<=SR<=80	48	37	29	0	5	0	2	121
FO w/SR<50	0	1	9	3	0	0	0	13
Total	111	44	46	3	12	0	2	218
District 6								
FO w/SR>80	86	15	2	0	0	0	0	103
FO w/50<=SR<=80	76	60	20	1	0	0	0	157
FO w/SR<50	1	4	3	0	0	0	0	8
Total	163	79	25	1	0	0	0	268
District 7								
FO w/SR>80	30	11	4	0	2	0	0	47
FO w/50<=SR<=80	43	55	34	0	4	0	0	136
FO w/SR<50	4	5	3	0	0	0	0	12
Total	77	71	41	0	6	0	0	195
District 8								
FO w/SR>80	41	0	0	0	0	0	0	41
FO w/50<=SR<=80	22	0	0	0	0	0	0	22
FO w/SR<50	0	0	0	0	0	0	0	0
Total	63	0	0	0	0	0	0	63

Table 11

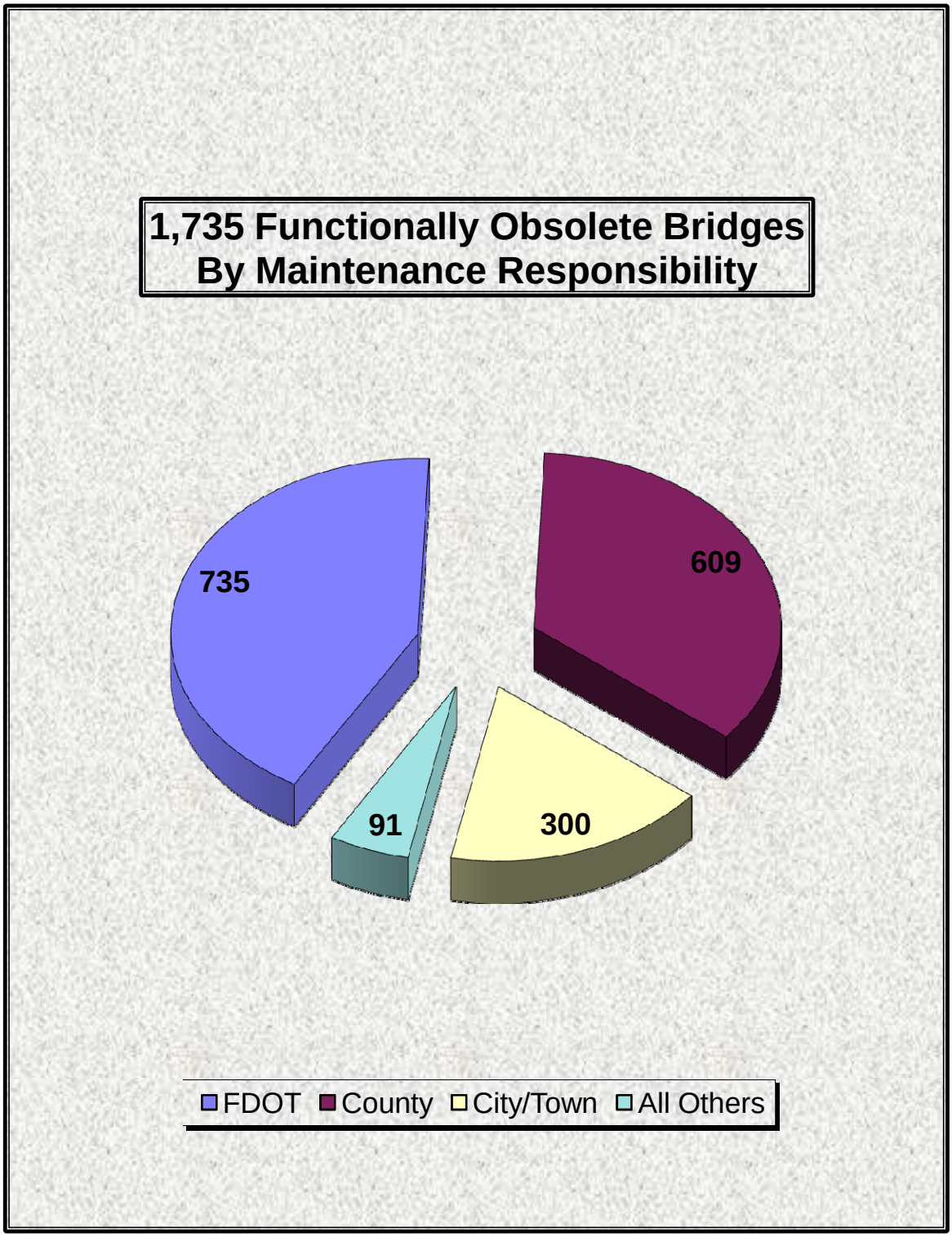
1,735 Functionally Obsolete Bridges
By Maintenance Responsibility
735
609
91
300
FDOT
County
City/Town
All Others

Figure 38

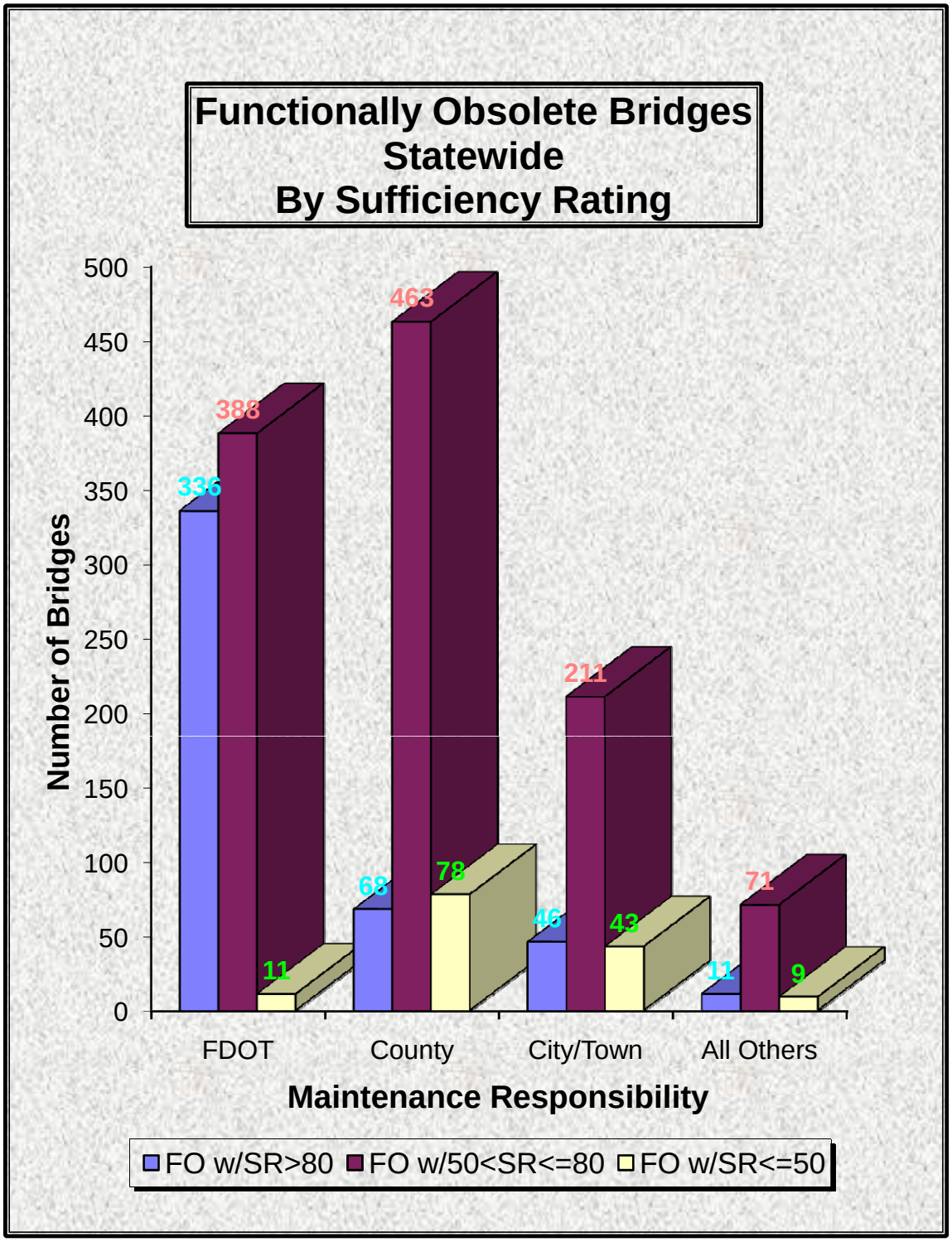
Functionally Obsolete Bridges
Statewide
By Sufficiency Rating
Number of Bridges
500
450
400
350
300
250
200
150
100
50
0
336
388
11
68
463
78
46
211
43
11
71
9
FDOT
County
City/Town
All Others
Maintenance Responsibility
FO w/SR>80
FO w/50<SR<=80
FO w/SR<=50

Figure 39

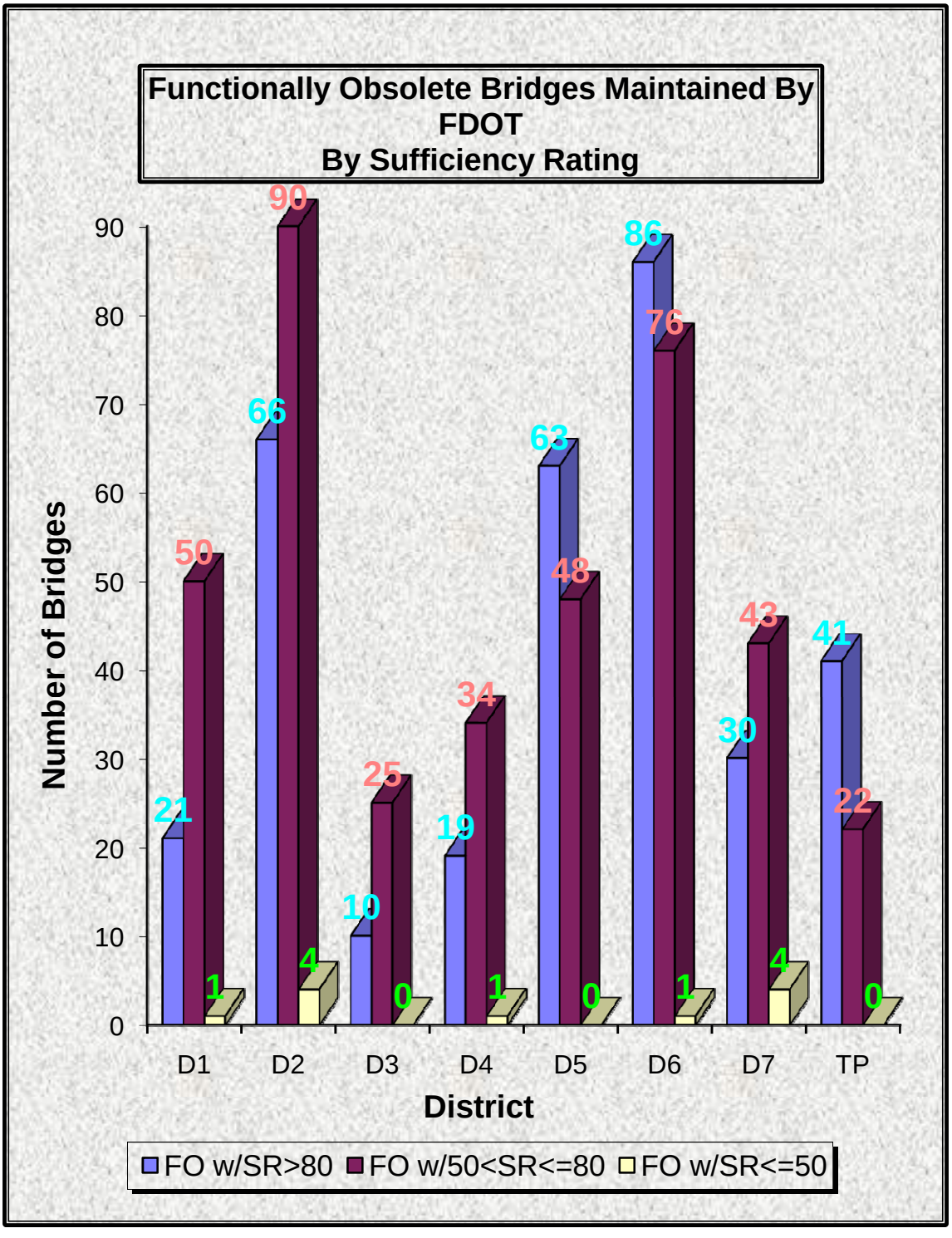
Functionally Obsolete Bridges Maintained By FDOT
By Sufficiency Rating
Number of Bridges
0
10
20
30
40
50
60
70
80
90
21
50
1
66
90
4
10
25
0
19
34
1
63
48
0
86
76
1
30
43
4
41
22
0
D1
D2
D3
D4
D5
D6
D7
TP
District
FO w/SR>80
FO w/50<SR<=80
FO w/SR<=50

Figure 40

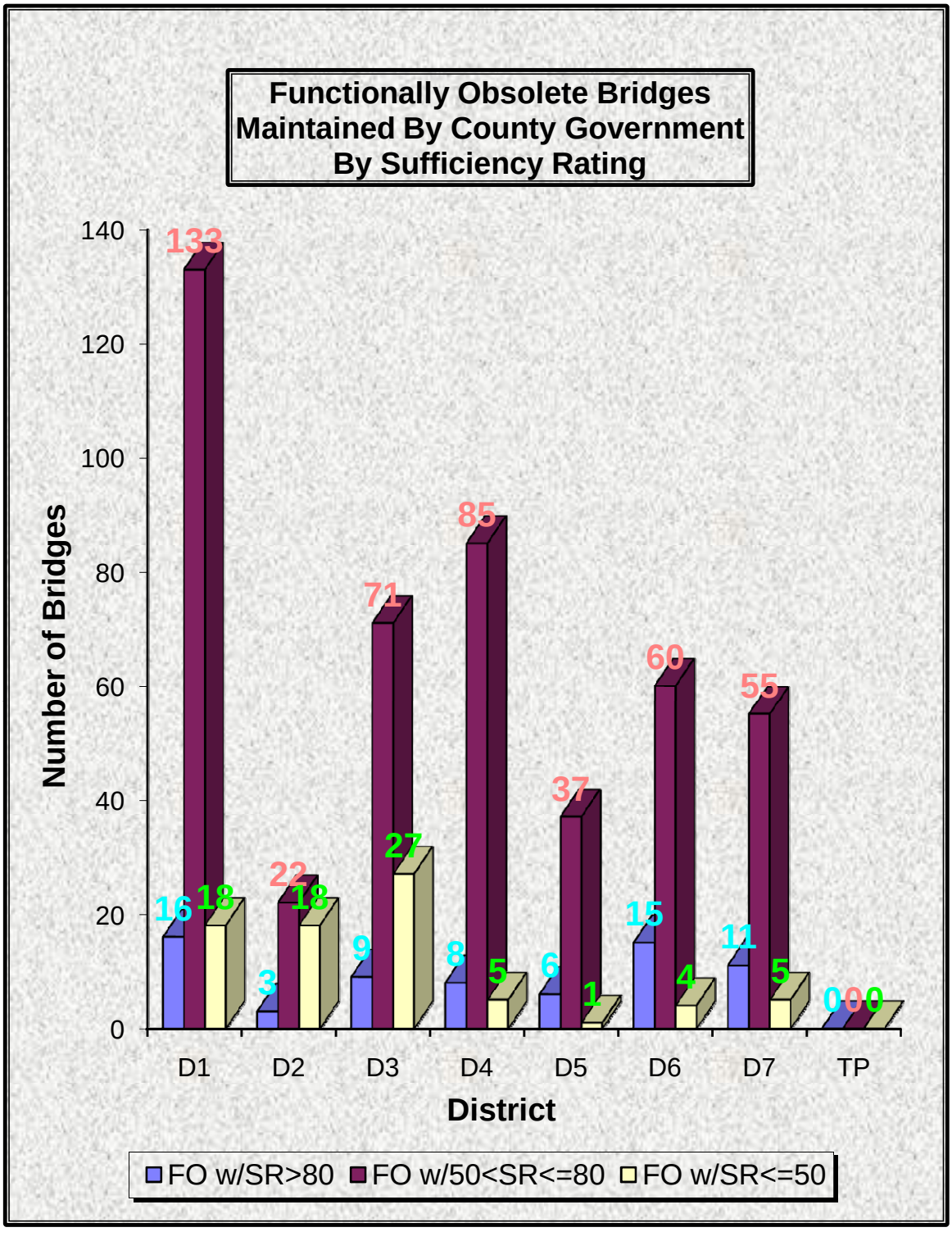
Functionally Obsolete Bridges
Maintained By County Government
By Sufficiency Rating
Number of Bridges
140
120
100
80
60
40
20
0
133
16
18
22
3
18
71
9
27
85
8
5
37
6
1
60
15
4
55
11
5
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
FO w/SR>80
FO w/50<SR<=80
FO w/SR<=50

Figure 41

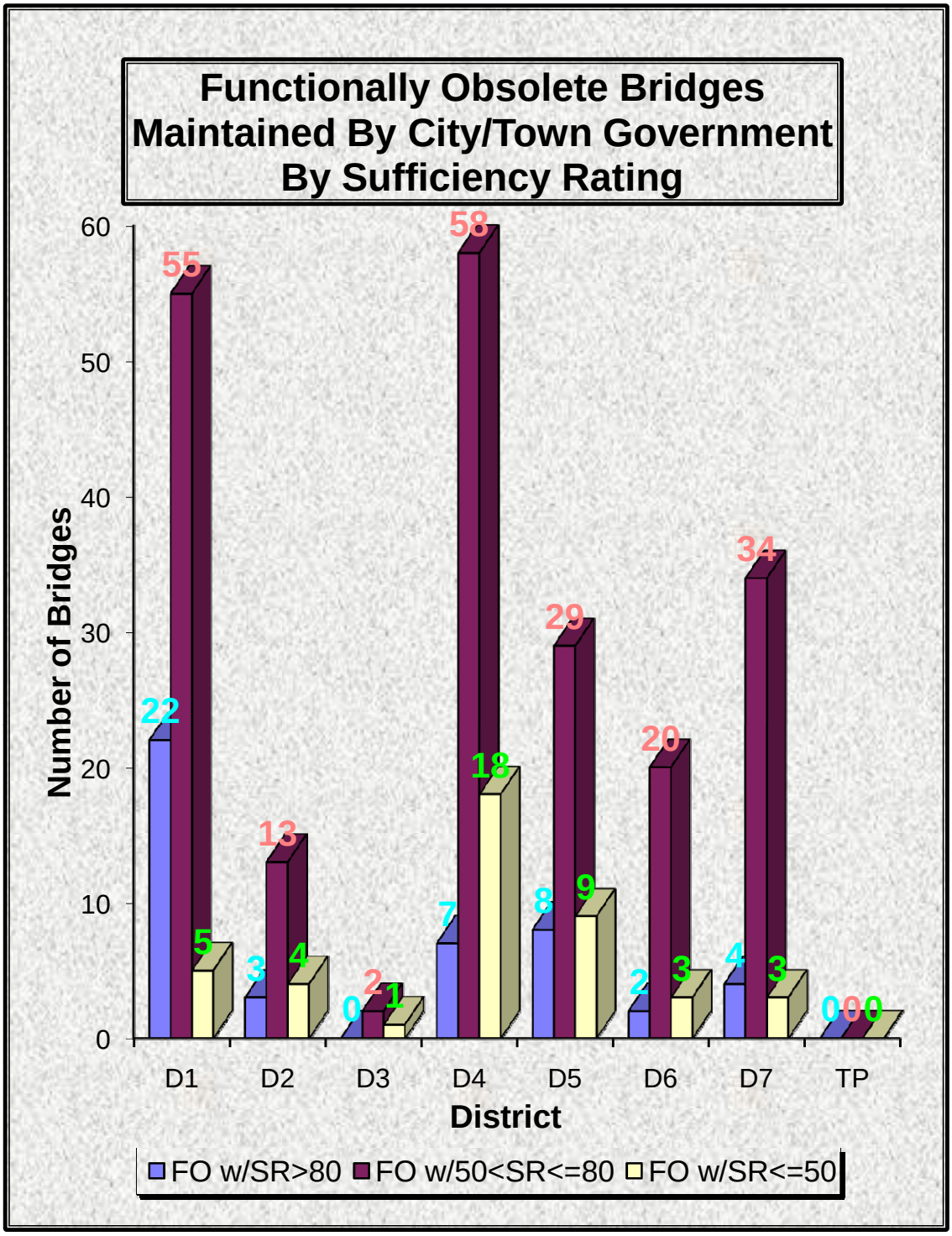
Functionally Obsolete Bridges
Maintained By City/Town Government
By Sufficiency Rating
Number of Bridges
60
50
40
30
20
10
0
22
55
5
3
13
4
0
2
1
7
58
18
8
29
9
2
20
3
4
34
3
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
FO w/SR>80
FO w/50<SR<=80
FO w/SR<=50

Figure 42

Bridge Inventory - 2011 Annual Report

Bridge Replacement Cost

This section provides a replacement cost estimate for the bridge inventory. As the unit cost values used in this estimate are based on very general assumptions, they should in no way be construed as adequate for estimating the cost of an individual bridge. However, as they are based on historical cost data, tempered with engineering judgment, these numbers should be useful for identifying relative trends in the distribution of the bridge inventory based on structure cost.

This estimate includes only construction of the structure. There are no values associated with R.O.W., approach work, design engineering, preliminary engineering, future maintenance and operation cost, or any other activity not associated with the actual construction of the bridge.

The bridge-structures (bridges) cost estimate is based on the present day replacement cost of the existing structure. This type of estimate is normally calculated based on the area of bridge deck (square feet) times a unit cost ($ per square foot) for the particular bridge type. The Maintenance Office uses a division of these bridge types by 13 categories based superstructure type. These categories were used to define the unit cost for the bridge types.

The basis for developing the unit costs was taken from the Bridge Development Report Cost Estimating Guide found in the LRFD (Load Resistance Factor Design) Structures Design Guidelines published by the FDOT Structures Design Office in Tallahassee. Using these numbers and engineering judgment average unit costs were developed that could be combined with the bridge data as stored in the bridge inventory database. This data base is managed by the FDOT Maintenance Office Bridge Maintenance System, also known as Pontis. The Pontis database records bridge superstructure type by two parameters. These are the superstructure design type and the (predominate) superstructure construction material. To summarize this process, average unit superstructure deck costs were derived from the structures guidelines. These numbers were then assigned to all possible combinations of 22 superstructure design types and 9 material types found in Pontis. Each of these combinations was then assigned an appropriate number from the 13 superstructure types as mentioned above. Then using the bridge inventory database, the assigned unit cost was multiplied by the superstructure deck area to arrive at a reasonable estimated replacement cost for each bridge.

FDOT Bridge Deck Area (Square Feet)										
	Decade Constructed									
	>1930's	**1940's**	**1950's**	**1960's**	**1970's**	**1980's**	**1990's**	**2000's**	**2010's**	**Total**
R/C Slab	58,477	254,594	607,204	710,180	652,766	665,870	1,676,588	1,098,865	49,512	5,774,055
P/C Slab	39,048	0	115,177	931,755	788,963	673,516	337,515	32,007	50,266	2,968,248
R/C Beam	236,118	228,761	590,061	0	0	0	0	31,402	52,314	1,138,657
P/C Beam	21,056	13,126	3,764,380	13,484,436	16,486,478	15,292,695	12,488,199	15,492,066	652,951	77,695,387
Steel Beam	480,295	244,350	2,319,100	4,883,559	7,051,498	2,835,106	3,172,158	3,643,334	167,017	24,796,417
Timber Beam	0	0	0	986	0	0	0	0	0	986
R/C Box	0	0	0	40,835	51,587	0	0	0	0	92,422
P/C Box	0	0	0	0	0	0	0	303,250	-11	303,239
Steel Box	0	0	0	0	110,928	1,335,642	1,529,687	1,557,244	60,723	4,594,225
Truss	223,246	0	428,297	250,885	0	0	0	0	0	902,428
Movable	328,865	86,982	721,243	638,196	659,492	1,246,479	474,164	563,187	66,677	4,785,286
Culvert	86,864	124,120	321,157	612,856	355,287	142,271	153,783	187,111	3,701	1,987,150
Other	12,483	20,743	130,729	56,995	0	6,716,653	2,916,770	4,714,498	110,683	14,679,555
Total	1,486,452	972,676	8,997,349	21,610,682	26,156,999	28,908,233	22,906,444	27,622,964	1,213,833	139,875,634

Table 12

FDOT Bridge Replacement Cost ($1000's)										
	Decade Constructed									
	>1930's	**1940's**	**1950's**	**1960's**	**1970's**	**1980's**	**1990's**	**2000's**	**2010's**	**Total**
R/C Slab	7,070	30,827	73,264	93,512	92,878	96,546	246,381	156,184	6,003	802,665
P/C Slab	5,857	0	17,277	139,763	118,344	101,027	50,627	4,801	7,540	445,237
R/C Beam	22,431	21,732	56,056	0	0	0	0	2,983	5,493	108,696
P/C Beam	2,211	1,378	395,260	1,415,866	1,737,455	1,616,909	1,366,296	1,676,231	70,684	8,282,291
Steel Beam	53,699	28,428	267,813	615,153	836,768	358,968	399,911	452,972	20,632	3,034,344
Timber Beam	0	0	0	94	0	0	0	0	0	94
R/C Box	0	0	0	6,125	7,738	0	0	0	0	13,863
P/C Box	0	0	0	0	0	0	22,849	43,971	-2	66,819
Steel Box	0	0	0	0	16,639	200,346	229,453	233,587	9,108	689,134
Truss	39,068	0	74,952	43,905	0	0	0	0	0	157,925
Movable	95,083	26,087	246,590	234,764	164,878	177,498	153,593	177,116	31,921	1,307,530
Culvert	8,252	11,791	30,510	58,221	33,752	13,516	14,609	17,776	352	188,779
Other	1,872	3,111	19,609	8,549	0	1,007,498	437,516	707,175	16,602	2,201,933
Total	235,544	123,356	1,181,331	2,615,952	3,008,453	3,572,309	2,921,235	3,472,796	168,333	17,299,309

Table 13

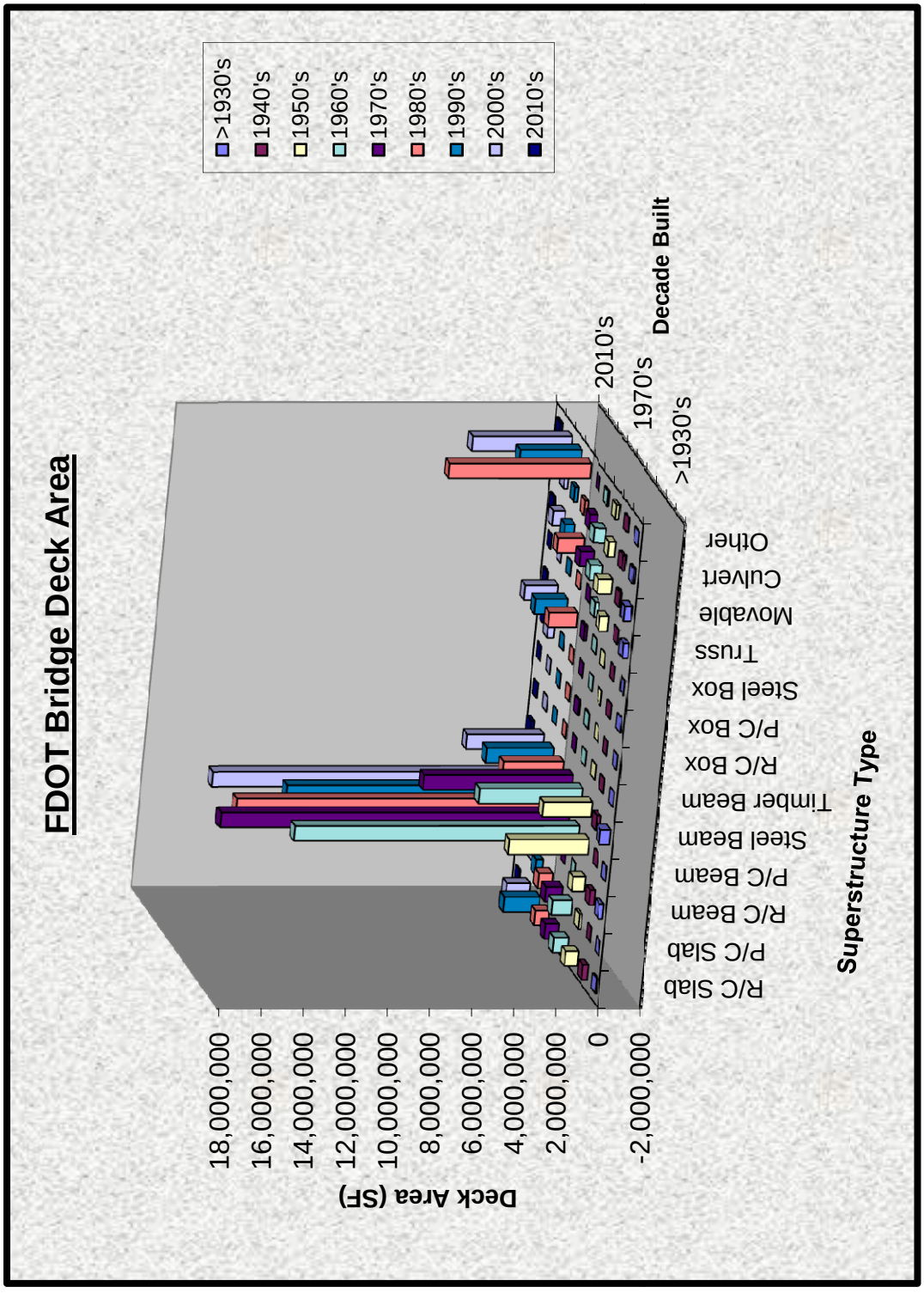
FDOT Bridge Deck Area
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
2010's
1970's
>1930's
Other
Culvert
Movable
Truss
Steel Box
P/C Box
R/C Box
Timber Beam
Steel Beam
P/C Beam
R/C Beam
P/C Slab
R/C Slab
Superstructure Type
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
-2,000,000
Deck Area (SF)

Figure 43

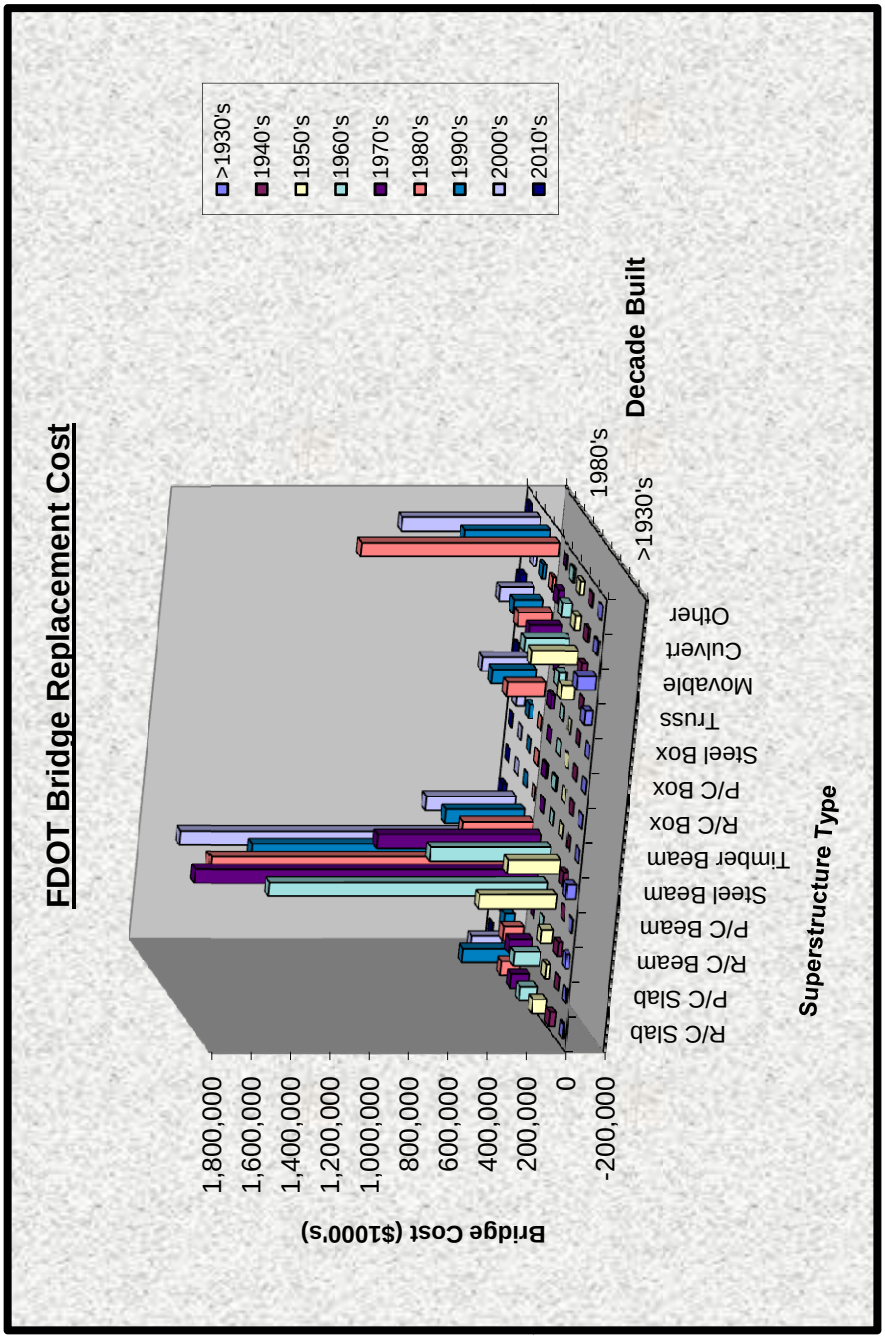
FDOT Bridge Replacement Cost
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Bridge Cost ($1000's)
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
-200,000
Decade Built
>1930's
1980's
Superstructure Type
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other

Figure 44

FDOT Bridge Deck Area (Square Feet)									
	District								
	D1	D2	D3	D4	D5	D6	D7	D8	Total
>1930's	65,687	365,110	288,090	222,294	75,240	305,855	164,177	0	1,486,452
1940's	179,394	338,824	265,927	25,485	52,043	84,209	26,794	0	972,676
1950's	1,197,751	2,155,188	783,391	563,475	633,940	1,547,907	1,489,452	626,245	8,997,349
1960's	1,502,420	5,556,425	2,174,590	1,268,893	3,910,400	4,142,675	2,262,166	793,113	21,610,682
1970's	2,155,246	5,976,845	4,365,666	4,208,144	1,516,947	2,117,390	3,908,494	1,908,268	26,156,999
1980's	3,685,391	2,374,386	2,591,771	6,515,990	1,087,291	5,671,125	5,823,180	1,159,099	28,908,233
1990's	1,866,218	2,750,902	5,286,571	3,090,801	2,357,765	1,465,537	3,283,602	2,805,048	22,906,444
2000's	2,981,171	5,317,322	4,908,701	3,702,620	3,228,189	1,309,958	4,341,805	1,833,197	27,622,964
2010's	34,765	450,895	40,255	0	348,906	49,499	223,999	49,308	1,197,627
Total	13,668,044	25,285,898	20,704,961	19,597,703	13,210,721	16,694,155	21,523,669	9,174,277	139,859,428

Table 14

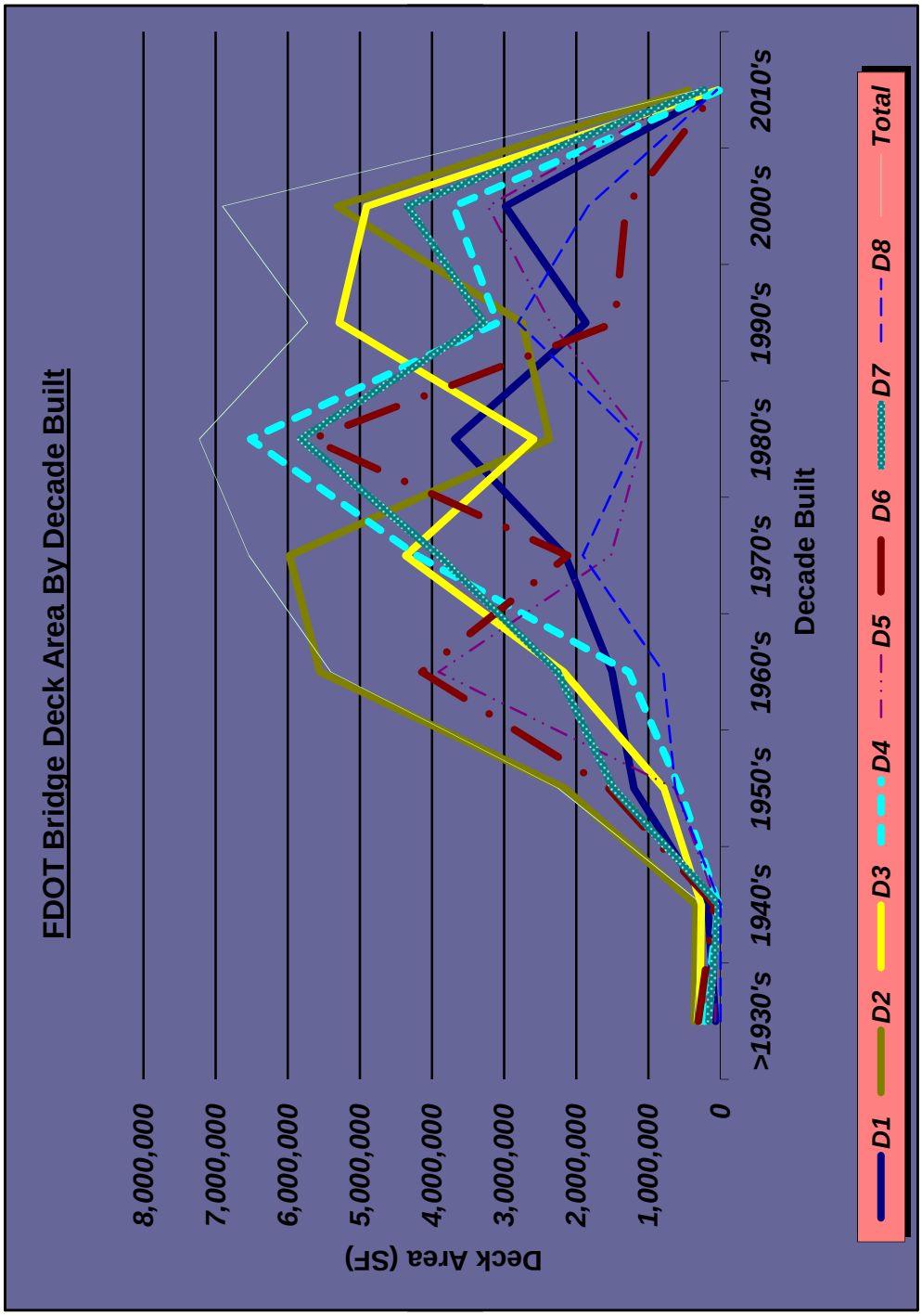
FDOT Bridge Deck Area By Decade Built
Deck Area (SF)
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
D8
Total

Figure 45

FDOT Bridge Replacement Cost ($1000's)									
	District								
	D1	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**	**D8**	**Total**
>1930's	6,698	56,150	46,265	29,731	8,395	44,787	43,518	0	235,544
1940's	31,045	43,397	29,472	2,511	5,350	8,824	2,756	0	123,356
1950's	151,189	274,001	81,838	174,244	74,488	191,986	165,515	68,069	1,181,331
1960's	193,605	641,833	256,244	234,334	442,158	488,301	268,674	90,803	2,615,952
1970's	254,207	676,294	506,862	491,604	179,015	265,809	432,873	201,788	3,008,453
1980's	425,817	307,611	328,755	803,330	134,298	714,524	731,316	126,658	3,572,309
1990's	233,964	341,228	684,860	431,422	297,046	215,682	404,859	312,173	2,921,235
2000's	379,718	616,867	593,953	525,207	381,869	166,397	602,699	206,085	3,472,796
2010's	3,891	55,095	4,227	0	41,287	21,376	35,390	5,365	166,632
Total	1,680,136	3,012,477	2,532,476	2,692,384	1,563,907	2,117,687	2,687,600	1,010,941	4,324,402

Table 15

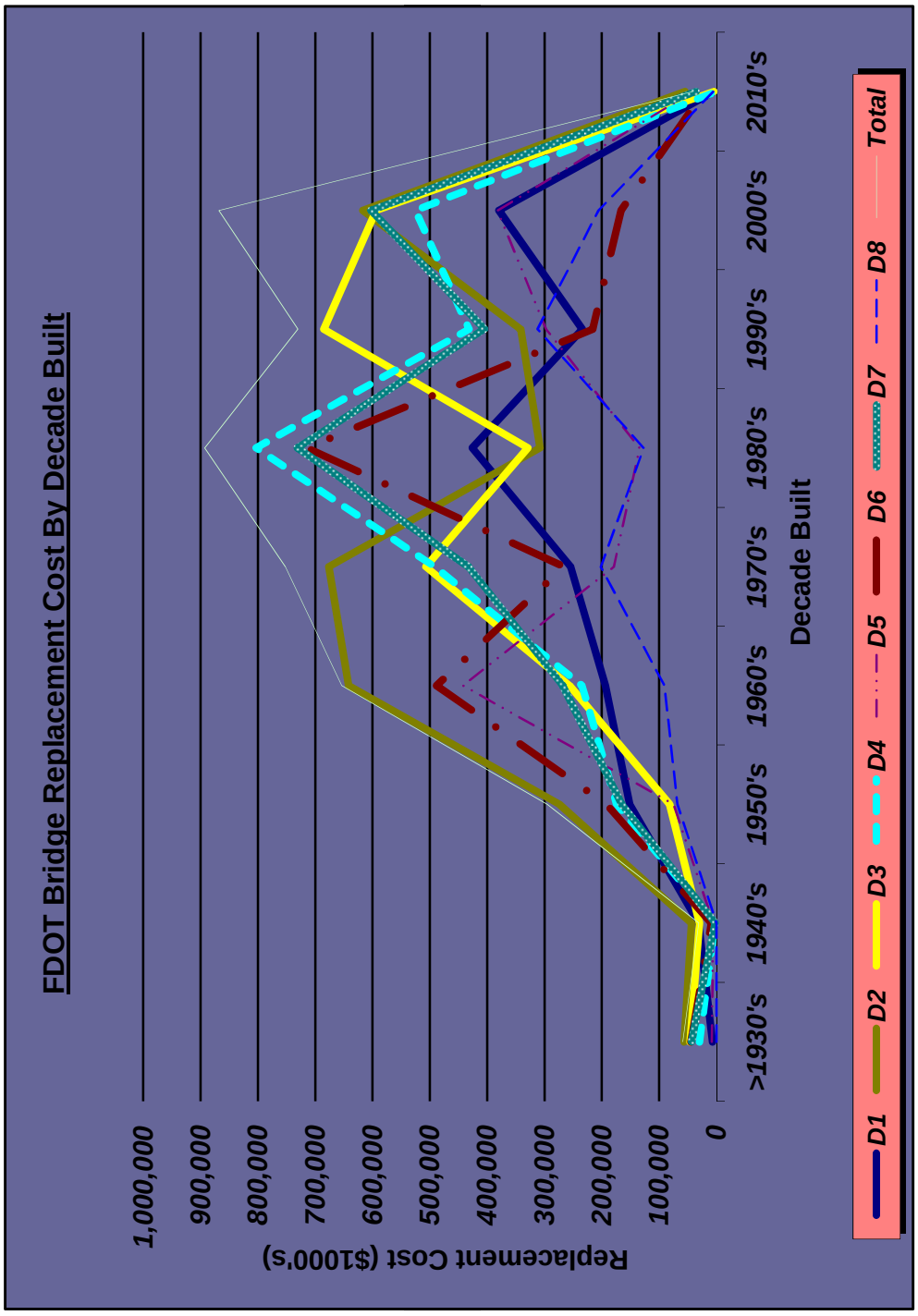
FDOT Bridge Replacement Cost By Decade Built
Replacement Cost ($1000's)
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
D8
Total

Figure 46

District	Deck Area (SF)		Bridge Cost ($1000's)	
	WC	**NWC**	**WC**	**NWC**
1	10,182,741	3,145,476	1,282,597	365,255
2	16,452,313	8,318,257	1,987,776	975,745
3	17,127,832	3,240,869	2,104,026	396,505
4	10,166,820	9,379,952	1,579,700	1,108,007
5	7,941,045	4,957,188	986,721	547,500
6	10,679,012	6,011,612	1,446,245	671,106
7	13,008,137	8,234,439	1,682,704	978,193
8	3,544,669	5,498,122	389,516	608,934
Total	89,102,569	48,785,915	11,459,284	5,651,246

FDOT Inventory of Water Crossing (WC) vs. Non-Water Crossing (NWC) Bridges

Table 16

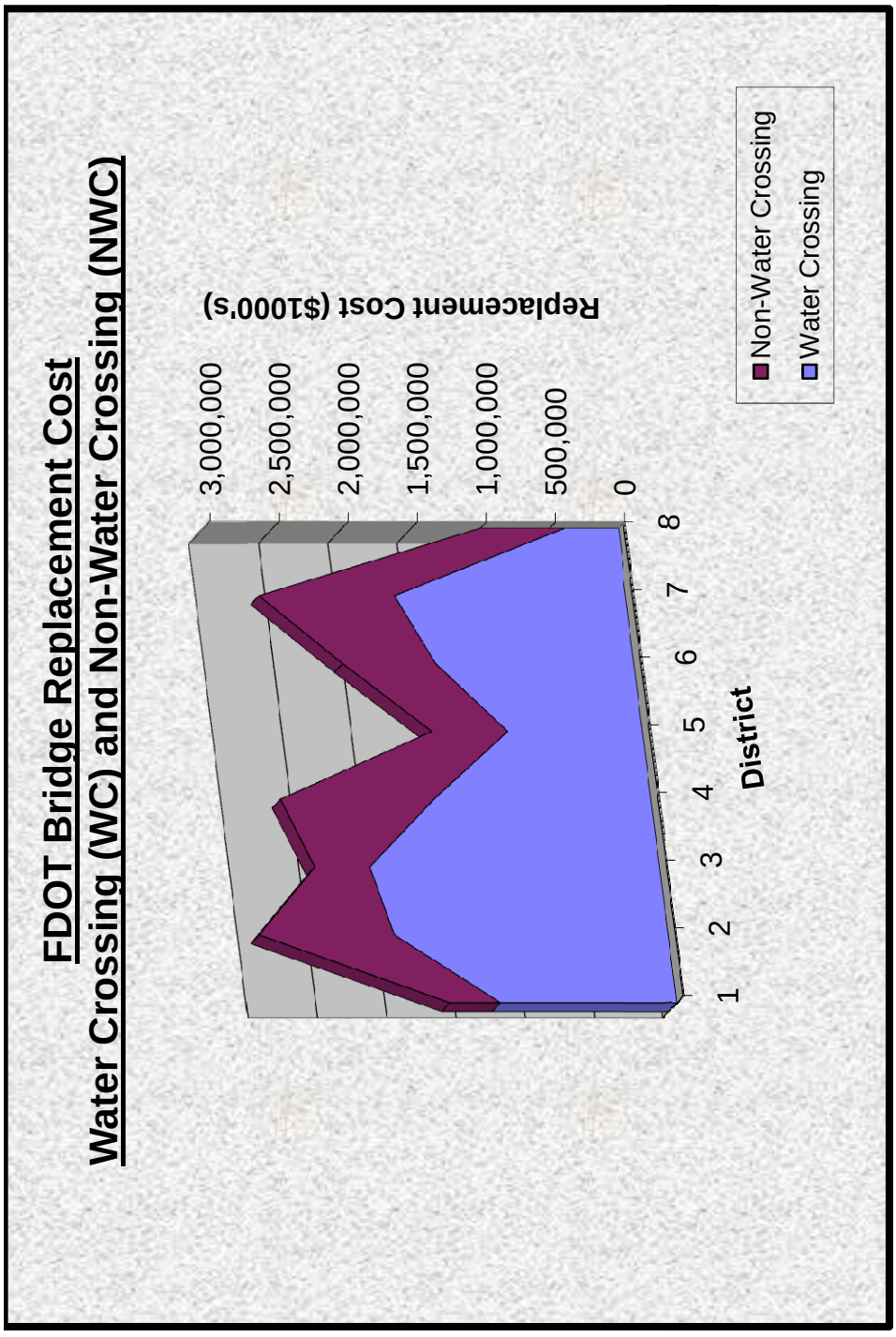
FDOT Bridge Replacement Cost
Water Crossing (WC) and Non-Water Crossing (NWC)
Replacement Cost ($1000's)
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1
2
3
4
5
6
7
8
District
Non-Water Crossing
Water Crossing

Figure 47

Conclusion

A goal of the Florida Department of Transportation is the protection of the public's investment in transportation. Bridges represent a significant portion of that investment. One of FDOT's main responsibilities is keeping the State Highway System in acceptable physical condition. To do this, FDOT resurfaces roads, repairs and replaces bridges, and performs routine maintenance activities. An awareness and understanding of the state of the bridge inventory can be used to help identify performance goals, establish resource requirements, and measure progress on meeting the above goals.

There are 11,906 bridges accounted for in Florida. The FDOT has maintenance responsibility for 6,638 of the bridges, or 55.75%. County governments maintain 3,805 bridges (31.96%), city and towns maintain 1,196 bridges (10.05%), with the remaining 267 bridges (2.24%) maintained by others. About 16.53% of all bridges currently in service in Florida were constructed prior to 1960, about 39.75% were constructed in the 1960's and 1970's, while the remaining 43.72% have been built since 1980. This distribution is relatively consistent for the three maintenance groups (FDOT, Counties, and City/Towns) used in this report. Bridges do not last forever. Through aggressive preventive maintenance, the strategy is to leverage advances in material science, design practices, and construction methods to extend the useful life of the bridges, thereby minimizing the need to replace a large number of bridges within a short time period. The challenge is to determine the most cost effective mix of preventive maintenance, routine maintenance, repair, rehabilitation, replacement, and other actions over the life of the bridges.

Florida's bridges are generally in good condition, with those maintained by the FDOT in better condition than those maintained by local governments or others. The most serious threat to bridges in Florida is the corrosion of steel reinforced concrete substructures in coastal regions. Much has been learned in recent years about corrosion in marine environments, affecting material specifications and design practices that helps new bridges built today. However, the older bridges in the coastal regions are beginning to require careful evaluation and extensive corrective actions. On-going research will continue to provide useful information to help meet this challenge. Other challenges include: confronting the increasingly extensive environmental and public health issues related to protective coatings for steel bridges with lead based paint; completing the statewide bridge scour evaluation program to identify scour critical bridges (bridges that could fail during floods) and to provide scour countermeasures as corrective action where required; to stay on top of movable bridge maintenance and rehabilitation; and to improve preventive maintenance on the large population (39.75% of the inventory) of bridges built during the 1960's and 1970's.

Comments on this report should be directed to:

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