Florida Department of Transportation

Bridge Inventory
2014 Annual Report

August 2014
Office of Maintenance
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Bridge Inventory - 2014 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 12,164 bridge-structures accounted for in the Florida DOT Bridge Management System. The FDOT has maintenance responsibility for 6,783 of the bridges, or 55.76%. County governments maintain 3,874 bridges (31.85%), city and towns maintain 1,217 bridges (10.0%), with the remaining 290 bridges (2.38%) maintained by others (see Figures 1 & 2).

The 6,783 bridges maintained by FDOT are divided by district and shown in Figures 3 & 4. District 2 has the most bridges, with 1,220 (17.99%), followed by District 5 (1039 bridges – 15.32%), District 1 (929 bridges – 13.70%), District 3 (800 bridges – 11.79%), District 4 (766 bridges - 11.29%), Turnpike District (698 bridges – 10.29%), District 7 (723 bridges – 10.66%), and District 6 (603 bridges – 8.89%). The number of bridges shown includes the 125 bridges maintained by the Dade County Expressway Authority (MDX) and 288 bridges maintained by the Orlando Orange County Expressway Authority (OOCEA).

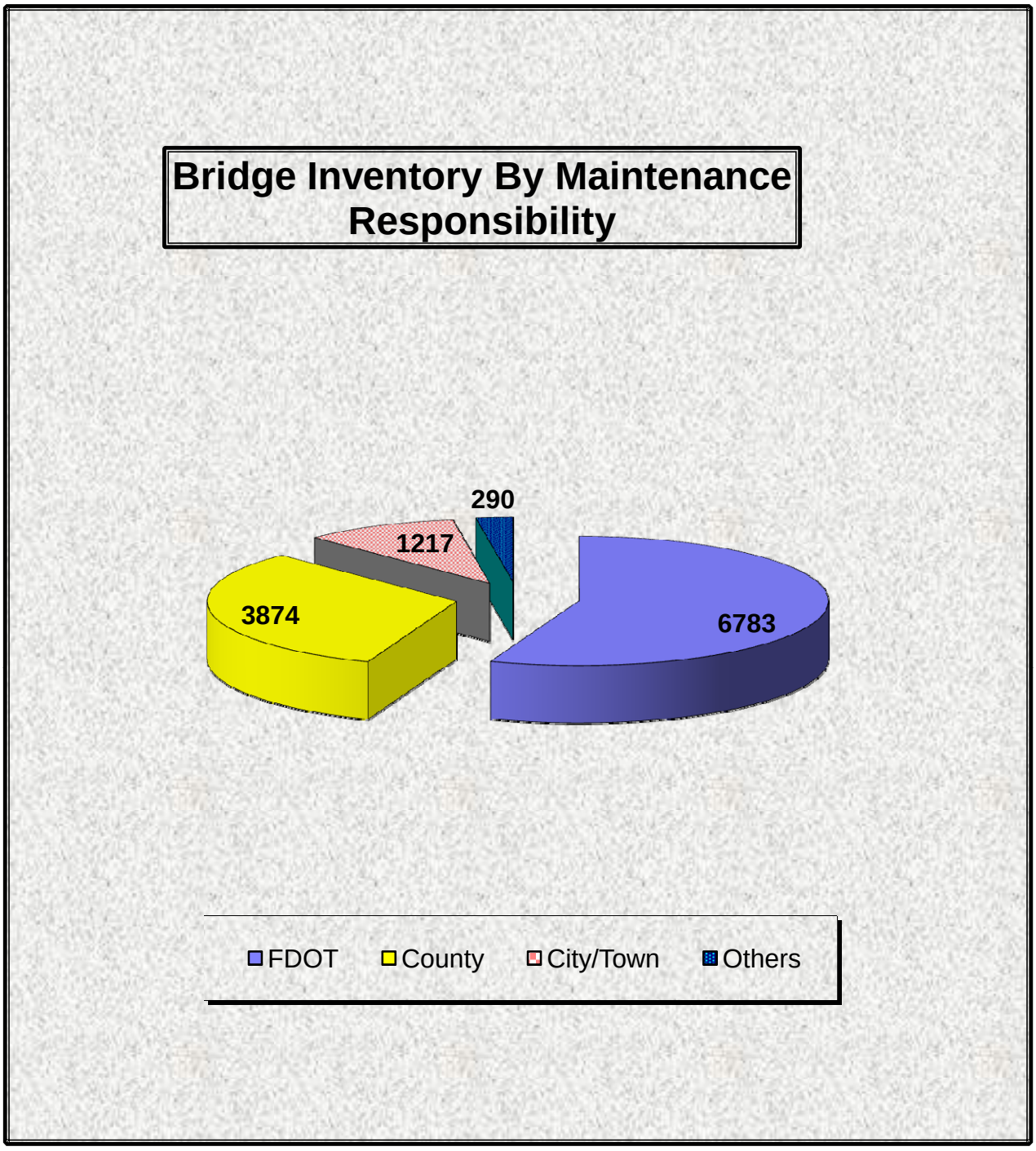

Figure 1

NOTE: The number of FDOT bridges includes 125 MDX bridges and 288 OOCEA bridges.

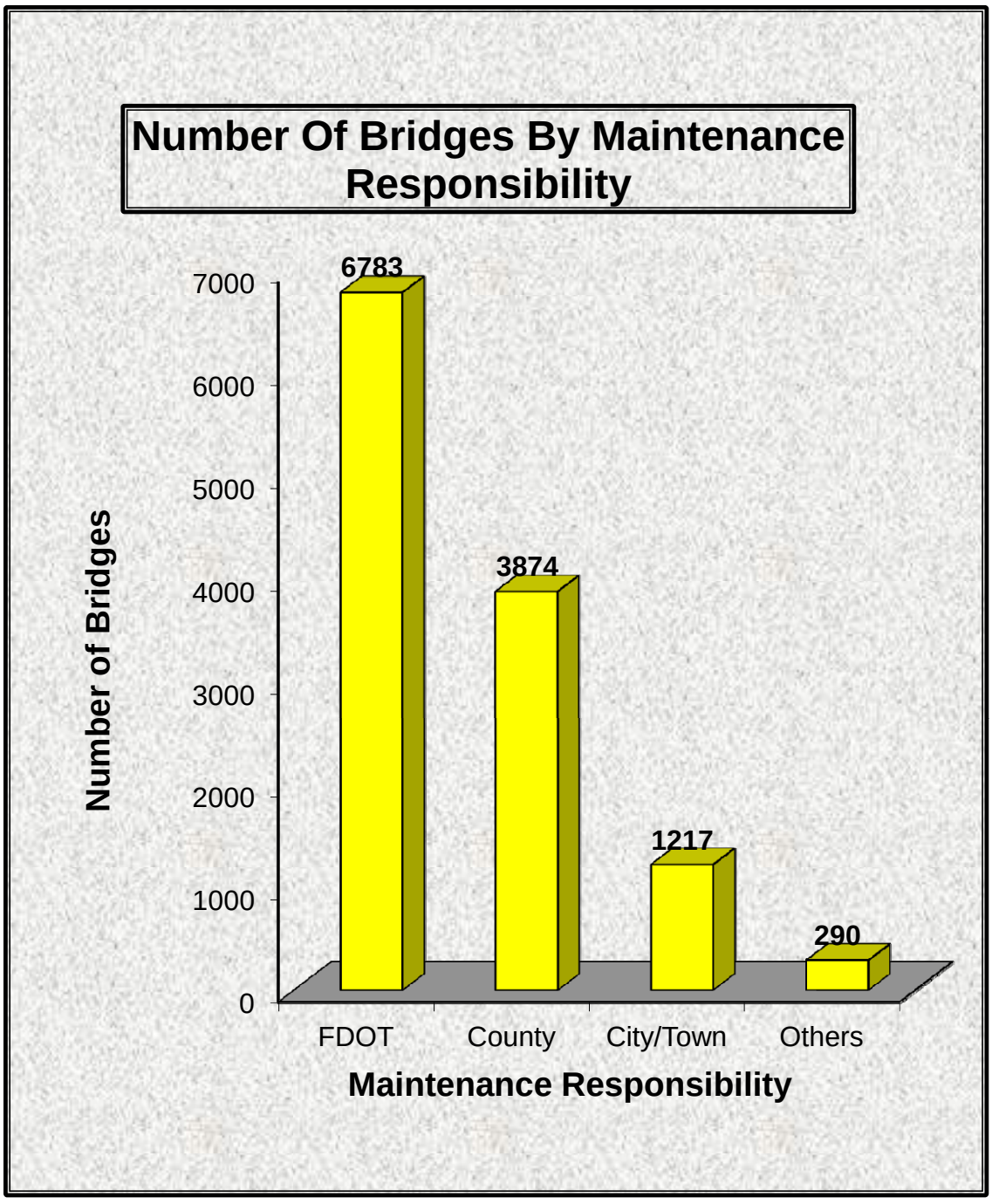

Figure 2

NOTE: The number of FDOT bridges includes 125 MDX bridges and 288 OOCEA bridges.

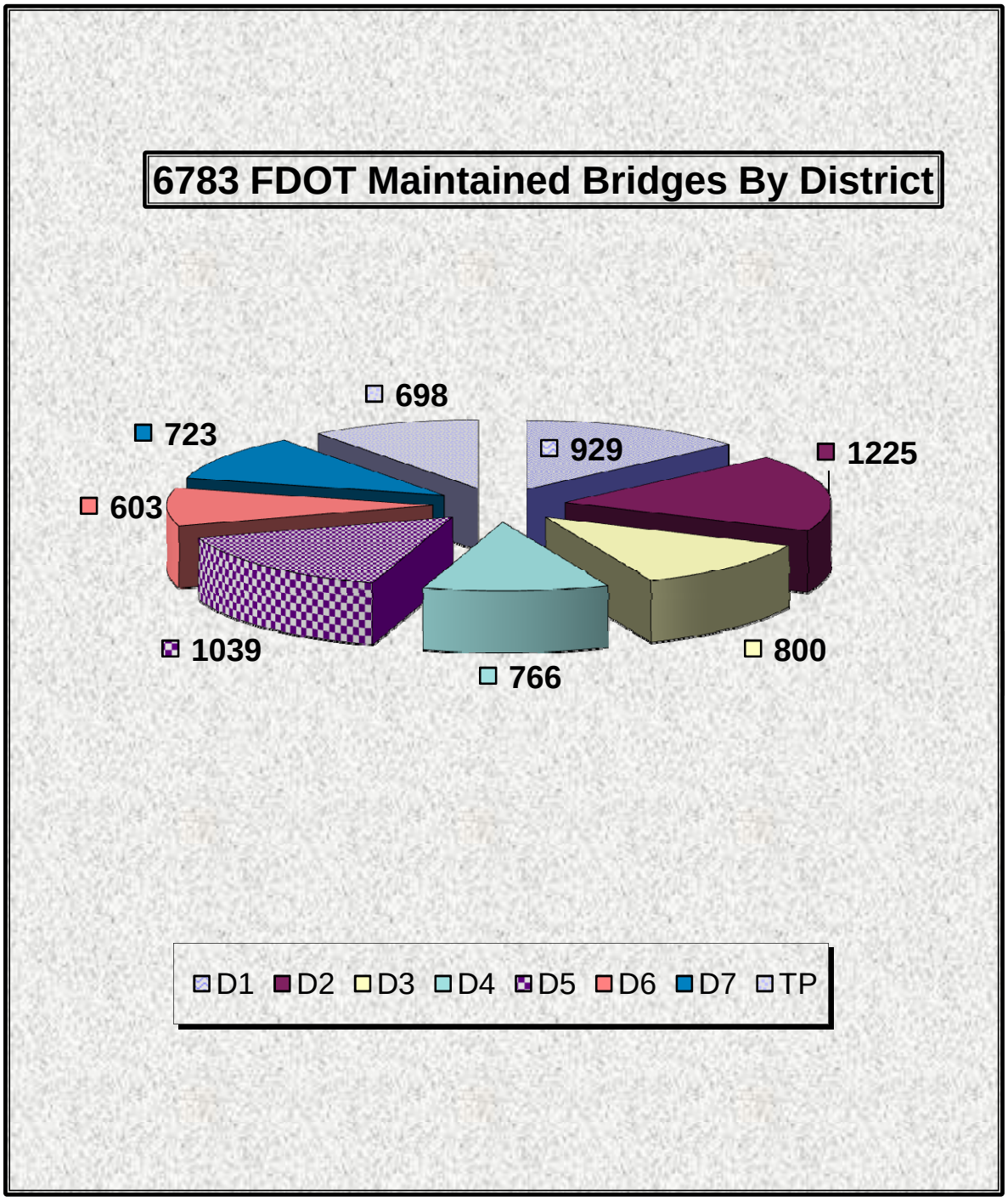

Figure 3

NOTE: The number of bridges includes 125 MDX bridges and 288 OOCEA bridges.

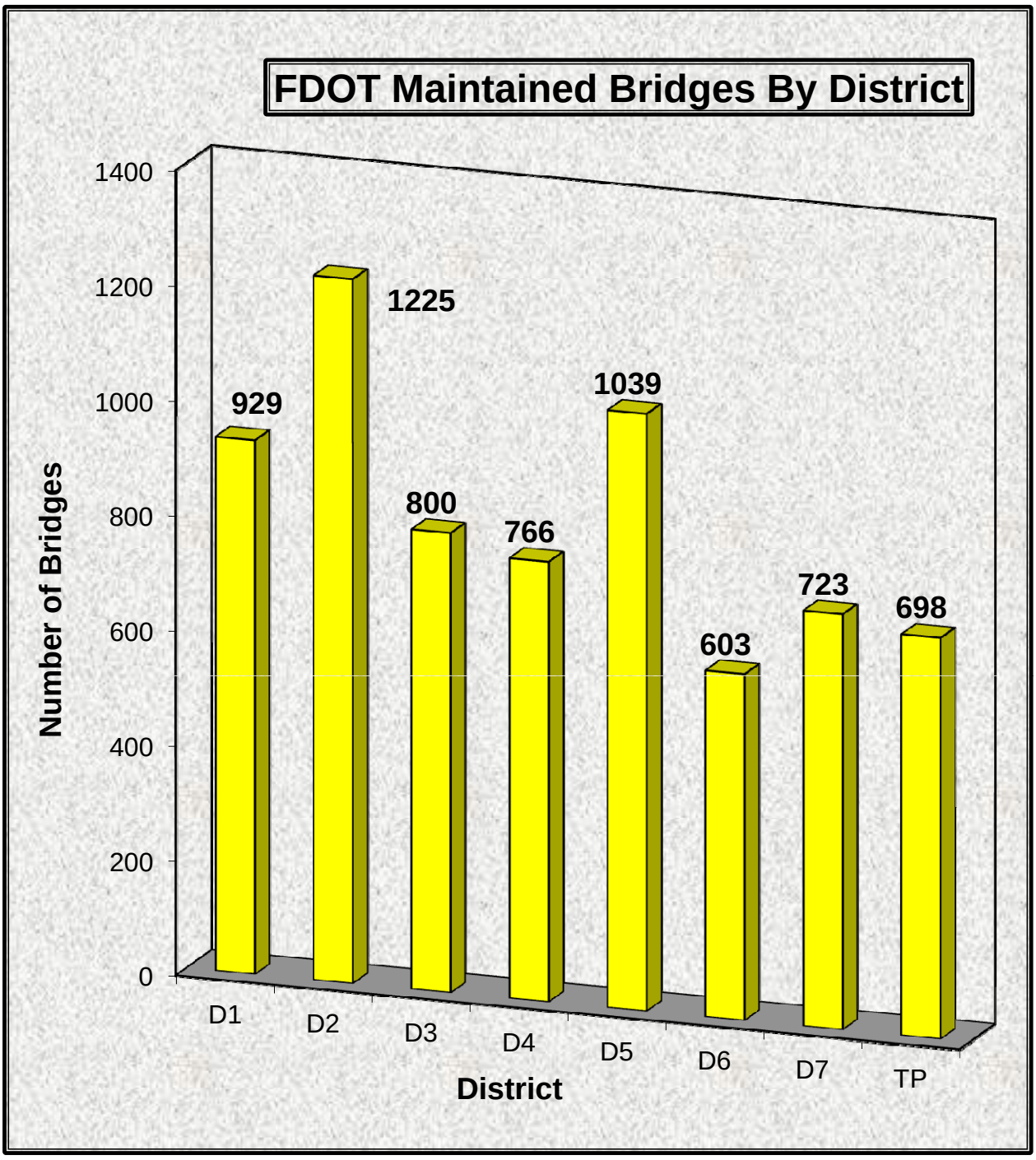

Figure 4

NOTE: The number of bridges includes 125 MDX bridges and 288 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 6,783 bridges maintained by FDOT, approximately 14.09% were constructed prior to 1960, about 40.79% were constructed in the 1960's and 1970's, with the remaining 45.11% having been built since 1980 (see Figure 5).

Similar results can be seen with the statewide bridge inventory of county government maintained bridges with 18.30% constructed prior to 1960, 34.46% constructed in the 1960's and 1970's, and 47.24% since 1980 (see Figure 6).

The city and town maintained bridges are very similar as well, with 17.91% constructed prior to 1960, 39.85% constructed in the 1960's and 1970's, and 42.24% since 1980 (see Figure 7).

An examination of the distribution of the decade of construction by FDOT District, for the 6,783 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 – 22.05%, District 1 – 23.25%, District 3 – 18.13%, District 5 – 9.34%, District 7 – 10.10%, District 4 – 6.40%, District 6 – 10.28%, and the Turnpike District – 6.45%. 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	158	96	44	0	0	4	0	302
1940s	220	138	23	2	0	0	0	383
1950s	578	475	151	14	0	0	0	1218
1960s	1499	827	204	22	7	0	1	2560
1970s	1268	508	281	4	10	0	8	2079
1980s	883	509	212	18	10	0	20	1652
1990s	906	656	148	41	9	0	24	1784
2000s	988	485	122	64	4	0	12	1675
2010s	278	180	32	7	9	0	0	506
Total	6778	3874	1217	172	49	4	65	12159

Table 1

NOTE: The number of bridges includes 125 MDX bridges and 288 OOCEA bridges.

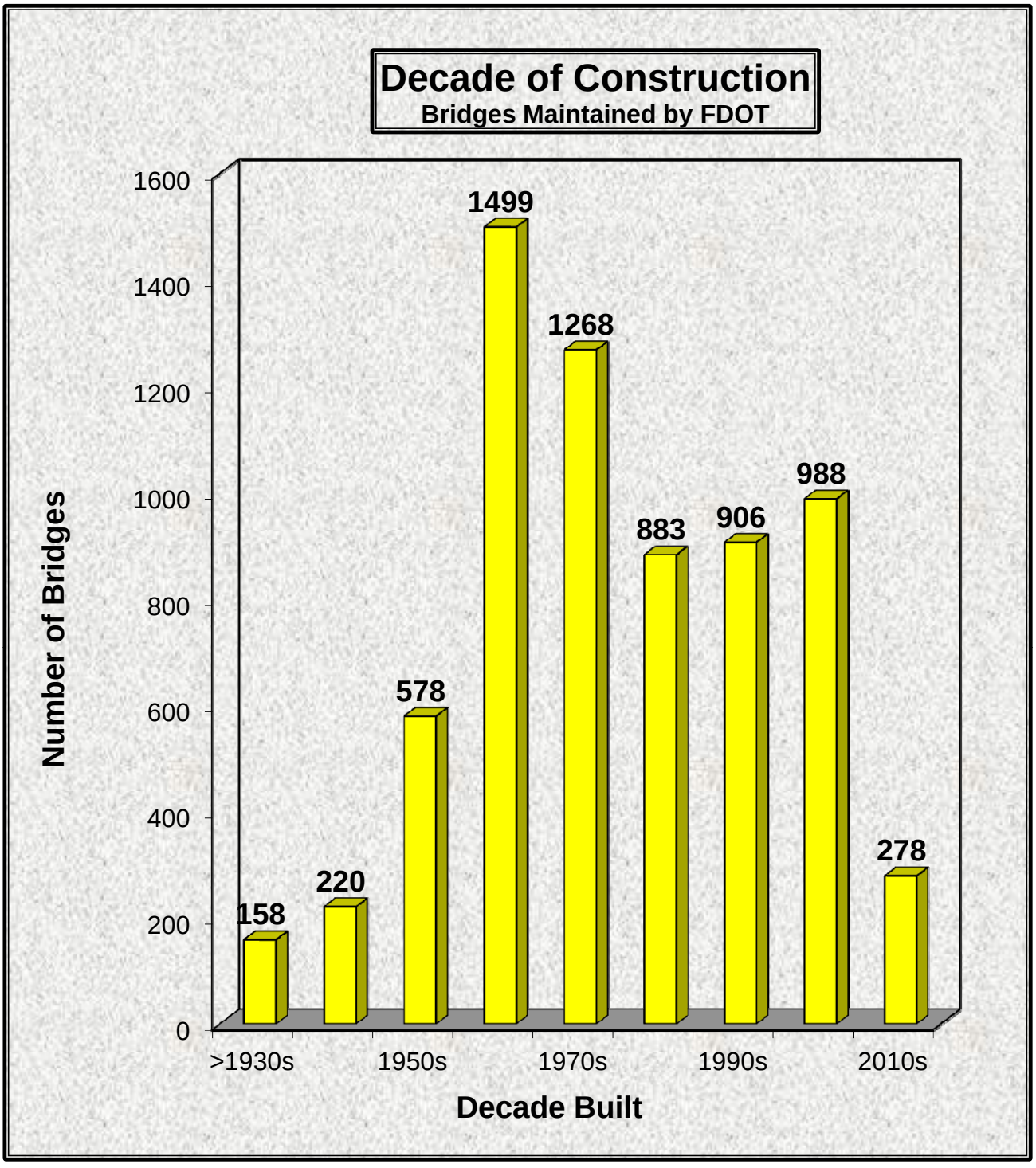

Figure 5

NOTE: The number of bridges includes 125 MDX bridges and 288 OOCEA bridges.

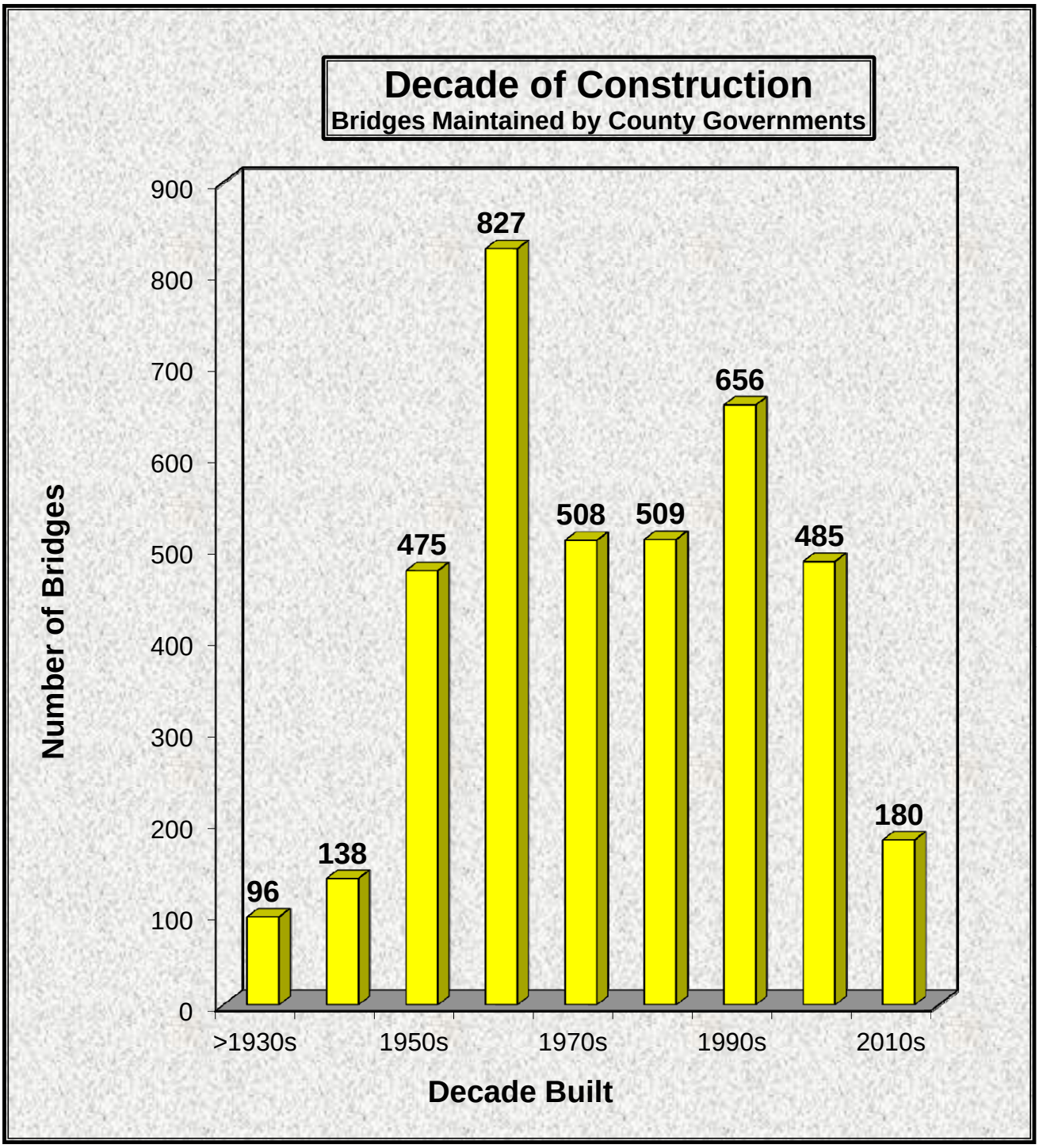
Decade of Construction
Bridges Maintained by County Governments
Number of Bridges
900
800
700
600
500
400
300
200
100
0
96
138
475
827
508
509
656
485
180
>1930s
1950s
1970s
1990s
2010s
Decade Built

Figure 6

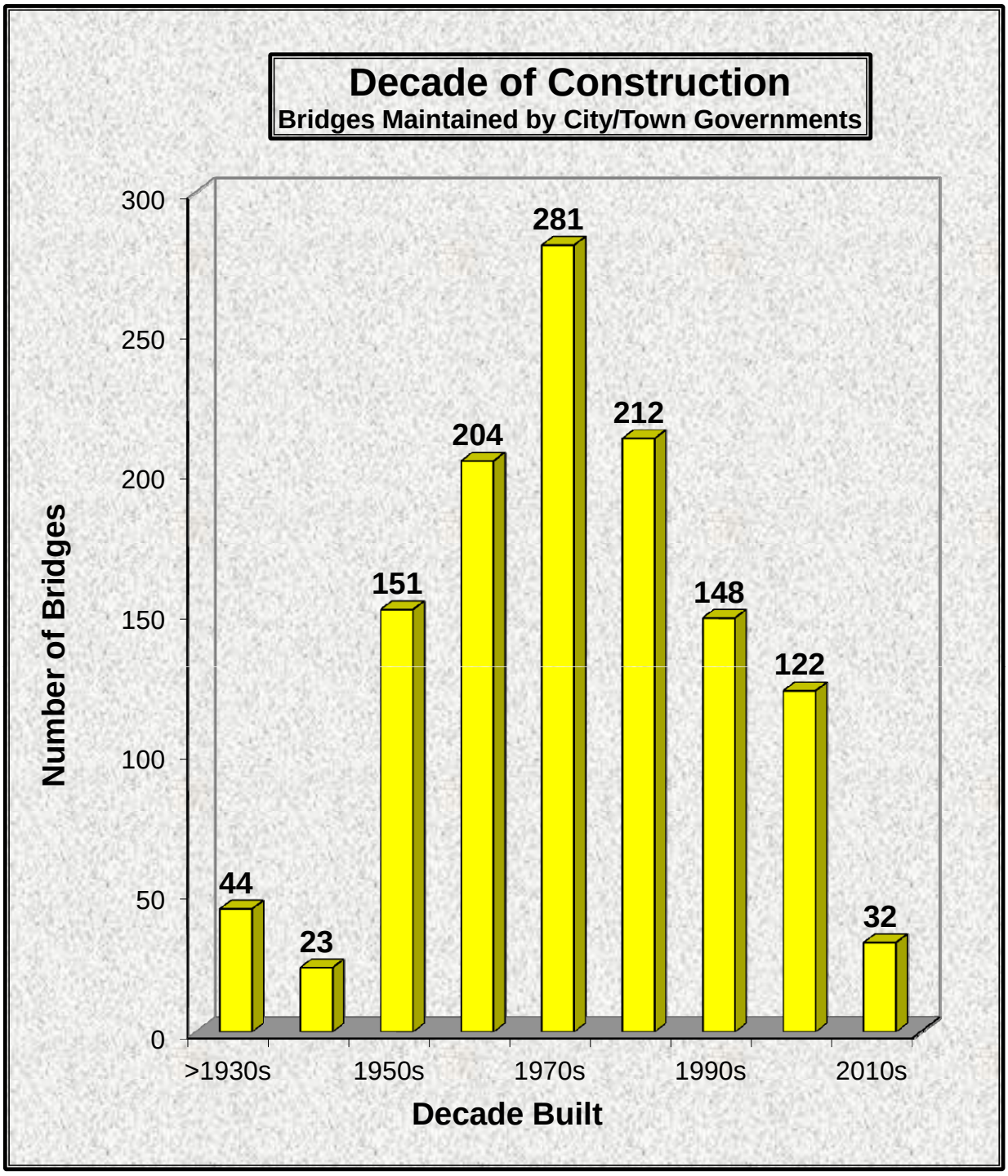
Decade of Construction
Bridges Maintained by City/Town Governments
Number of Bridges
300
250
200
150
100
50
0
44
23
151
204
281
212
148
122
32
>1930s
1950s
1970s
1990s
2010s
Decade Built

Figure 7

Bridge Inventory by Decade Built (Districts 1 thru 4)								
	Maintenance Responsibility							
	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
District 1								
>1930s	24	10	6	0	0	0	0	40
1940s	61	25	3	1	0	0	0	90
1950s	131	101	13	2	0	0	0	247
1960s	117	217	37	7	6	0	0	384
1970s	158	135	87	0	3	0	0	383
1980s	177	139	48	2	5	0	0	371
1990s	138	135	26	6	8	0	0	313
2000s	98	99	19	4	0	0	0	220
2010s	25	49	6	2	1	0	0	83
Total	929	910	245	24	23	0	0	2131
District 2								
>1930s	60	16	6	0	0	0	0	82
1940s	62	52	3	0	0	0	0	117
1950s	147	122	36	6	0	0	0	311
1960s	420	97	37	1	0	0	0	555
1970s	193	41	32	0	0	0	1	267
1980s	44	47	27	0	0	0	0	118
1990s	100	48	21	2	0	0	0	171
2000s	148	51	36	3	0	0	1	239
2010s	46	14	3	0	0	0	0	63
Total	1220	488	201	12	0	0	2	1923
District 3								
>1930s	10	25	0	0	0	0	0	35
1940s	60	35	2	1	0	0	0	98
1950s	75	143	5	0	0	0	0	223
1960s	115	172	5	6	0	0	0	298
1970s	288	100	9	4	2	0	0	403
1980s	58	74	8	14	0	0	1	155
1990s	103	199	12	28	0	0	0	342
2000s	68	157	9	49	1	0	0	284
2010s	23	47	0	4	0	0	0	74
Total	800	952	50	106	3	0	1	1912
District 4								
>1930s	6	5	6	0	0	0	0	17
1940s	4	3	6	0	0	0	0	13
1950s	39	39	60	6	0	0	0	144
1960s	74	75	60	3	0	0	0	212
1970s	159	75	68	0	0	0	0	302
1980s	228	73	53	1	0	0	0	355
1990s	96	105	17	1	0	0	0	219
2000s	128	60	13	3	0	0	0	204
2010s	32	16	8	0	0	0	0	56
Total	766	451	291	14	0	0	0	1522

Table 2

Bridge Inventory by Decade Built (Districts 5 thru 8)								
	Maintenance Responsibility							
	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
District 5								
>1930s	25	10	3	0	0	0	0	38
1940s	13	12	2	0	0	0	0	27
1950s	59	27	5	0	0	0	0	91
1960s	281	63	11	2	0	0	1	358
1970s	141	38	46	0	0	0	7	232
1980s	79	79	39	1	2	0	19	219
1990s	154	66	27	3	0	0	24	274
2000s	235	57	23	5	1	0	10	331
2010s	52	30	11	0	8	0	0	101
Total	1039	382	167	11	11	0	61	1671
District 6								
>1930s	4	20	9	0	0	4	0	37
1940s	10	7	4	0	0	0	0	21
1950s	48	24	12	0	0	0	0	84
1960s	236	97	16	3	1	0	0	353
1970s	78	32	16	0	0	0	0	126
1980s	64	26	17	0	0	0	0	107
1990s	49	14	10	1	0	0	0	74
2000s	73	23	8	0	0	0	0	104
2010s	41	13	2	1	0	0	0	57
Total	603	256	94	5	1	4	0	963
District 7								
>1930s	29	10	14	0	0	0	0	53
1940s	10	4	3	0	0	0	0	17
1950s	34	19	20	0	0	0	0	73
1960s	135	106	38	0	0	0	0	279
1970s	114	87	23	0	5	0	0	229
1980s	168	71	20	0	3	0	0	262
1990s	64	89	35	0	1	0	0	189
2000s	122	38	14	0	2	0	1	177
2010s	47	11	2	0	0	0	0	60
Total	723	435	169	0	11	0	1	1339
District 8								
>1930s	0	0	0	0	0	0	0	0
1940s	0	0	0	0	0	0	0	0
1950s	45	0	0	0	0	0	0	45
1960s	121	0	0	0	0	0	0	121
1970s	137	0	0	0	0	0	0	137
1980s	65	0	0	0	0	0	0	65
1990s	202	0	0	0	0	0	0	202
2000s	116	0	0	0	0	0	0	116
2010s	12	0	0	0	0	0	0	12
Total	698	0	0	0	0	0	0	698

Table 3

NOTE: The number of FDOT bridges includes 125 MDX bridges and 288 OOCEA bridges.

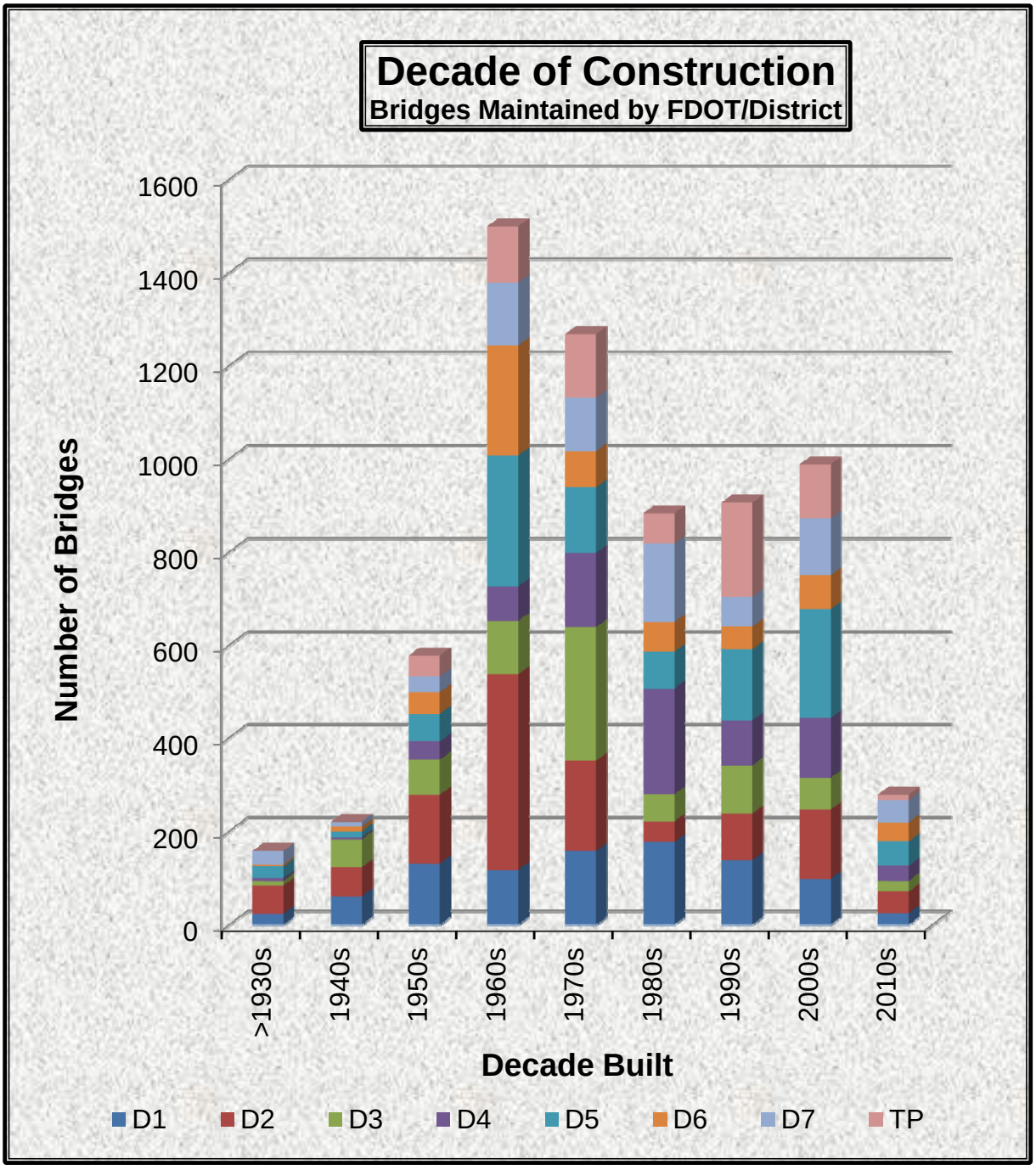
Decade of Construction
Bridges Maintained by FDOT/District
Number of Bridges
1600
1400
1200
1000
800
600
400
200
0
>1930s
1940s
1950s
1960s
1970s
1980s
1990s
2000s
2010s
Decade Built
D1
D2
D3
D4
D5
D6
D7
TP

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 16.29% of the total inventory. Similarly, slab bridges maintained by counties are 35.31%, and by cities and towns are 54.64%.

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 62.10% of the state maintained inventory, 34.72% of the county bridges, and 24.90% 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 0.04% of the state maintained bridges use truss superstructures. Likewise, 0.34% 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 16.33% of the state maintained bridges. County inventories include 26.92% culverts, and city/towns include 17.42% 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 1.36% of the total state bridge inventory. County inventories include 1.01% movables, and city/towns include 0.58% 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	783	644	218	15	8	0	1	1669
PSC Slab	322	724	447	19	14	4	10	1540
RC Beam	114	138	73	1	0	0	1	327
PSC Beam	3434	679	181	16	8	0	49	4367
Steel Beam	663	145	29	30	6	0	1	874
Timber Beam	1	383	20	36	0	0	0	440
RC Box	5	1	0	0	0	0	0	6
PSC Box	119	3	2	0	0	0	0	124
Steel Box	121	9	4	0	0	0	0	134
Truss	3	13	1	40	0	0	0	57
Movable	92	39	7	1	1	0	0	140
Culvert	1108	1043	212	6	11	0	3	2383
Other	13	53	23	8	1	0	0	98
Total	6778	3874	1217	172	49	4	65	12159

Table 4

NOTE: The number of FDOT bridges includes 125 MDX bridges and 288 OOCEA bridges.

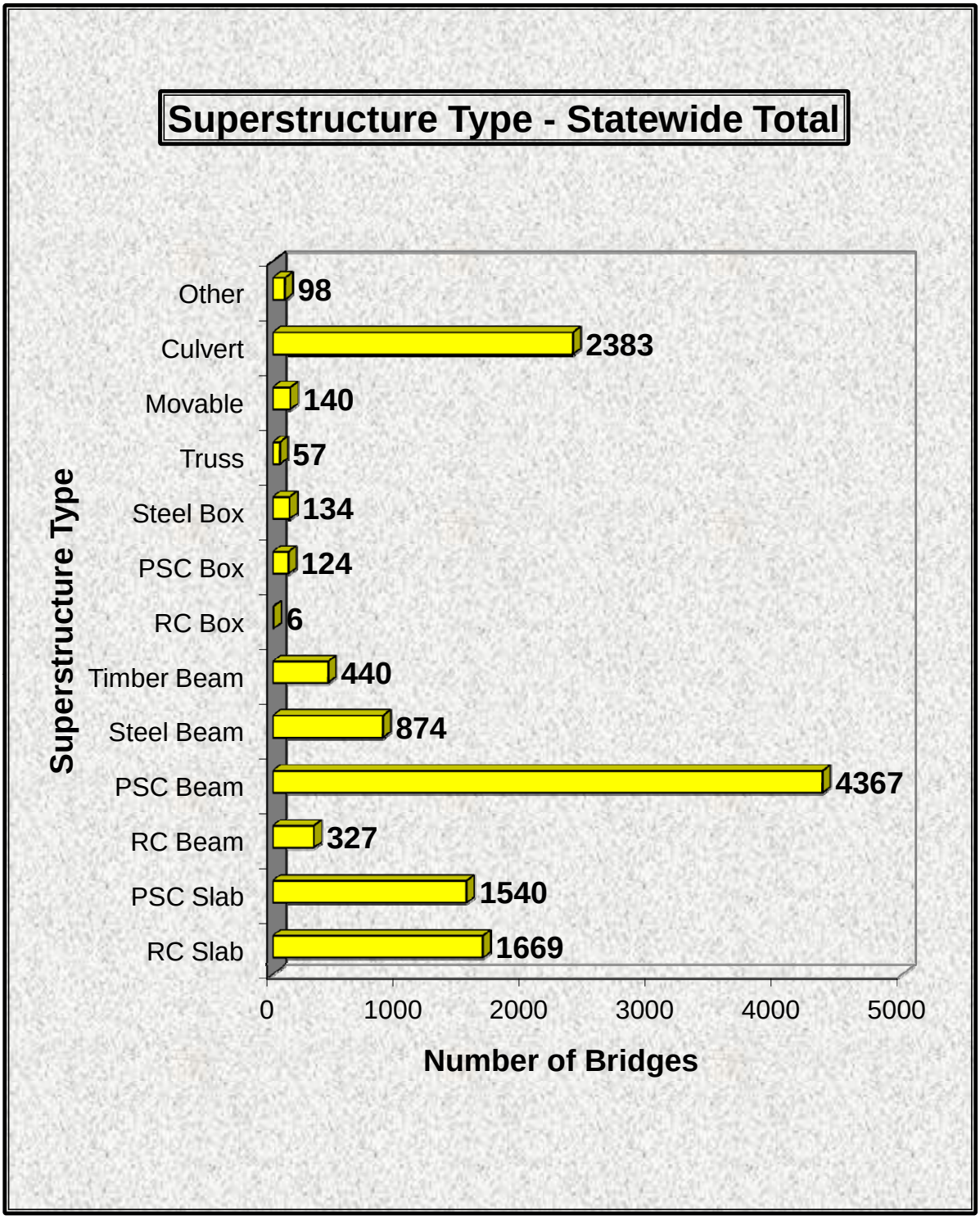
Superstructure Type - Statewide Total
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
98
2383
140
57
134
124
6
440
874
4367
327
1540
1669
0
1000
2000
3000
4000
5000
Number of Bridges

Figure 9

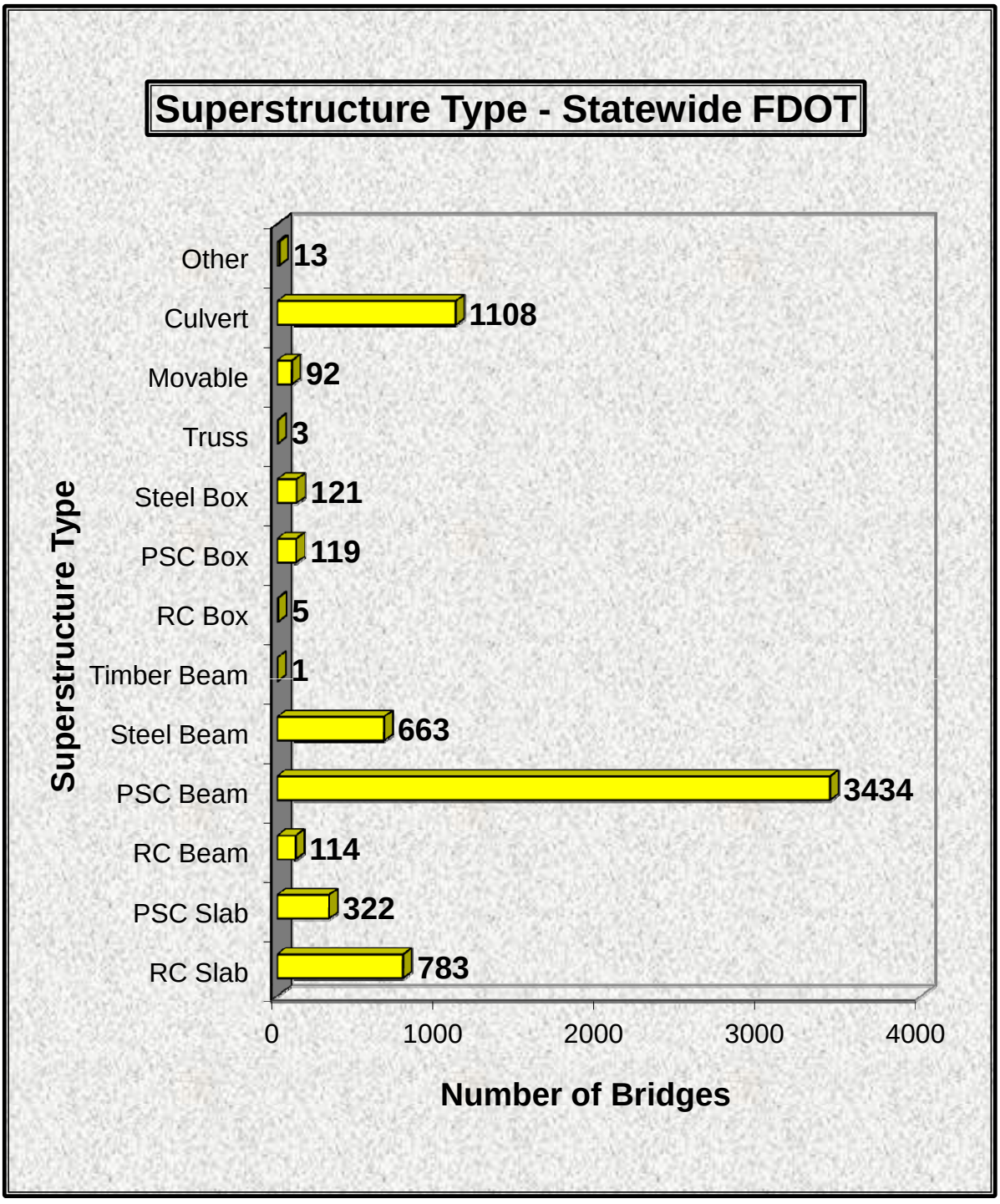
Superstructure Type - Statewide FDOT
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
13
1108
92
3
121
119
5
1
663
3434
114
322
783
0
1000
2000
3000
4000
Number of Bridges

Figure 10

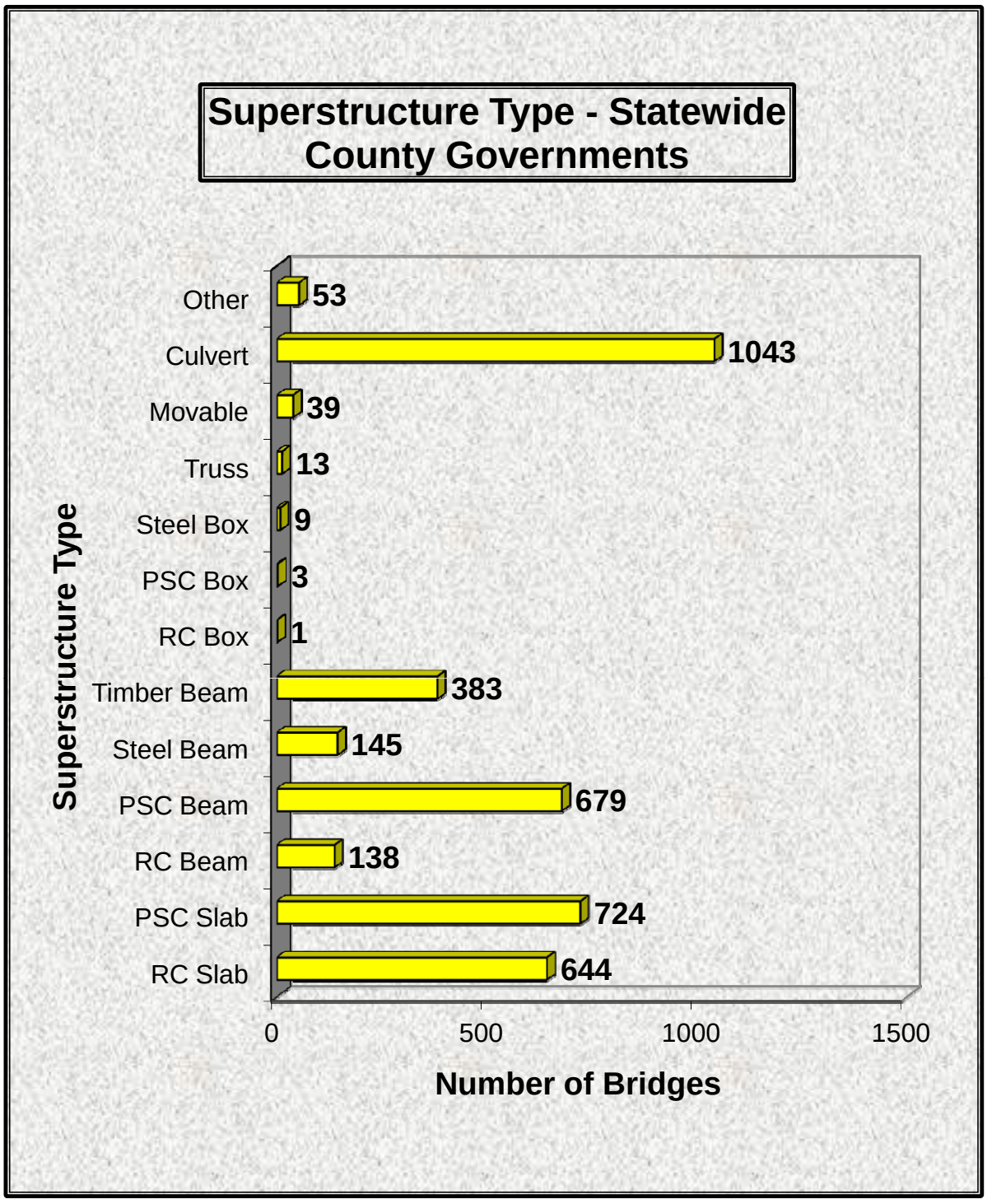
Superstructure Type - Statewide
County Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
53
1043
39
13
9
3
1
383
145
679
138
724
644
0
500
1000
1500
Number of Bridges

Figure 11

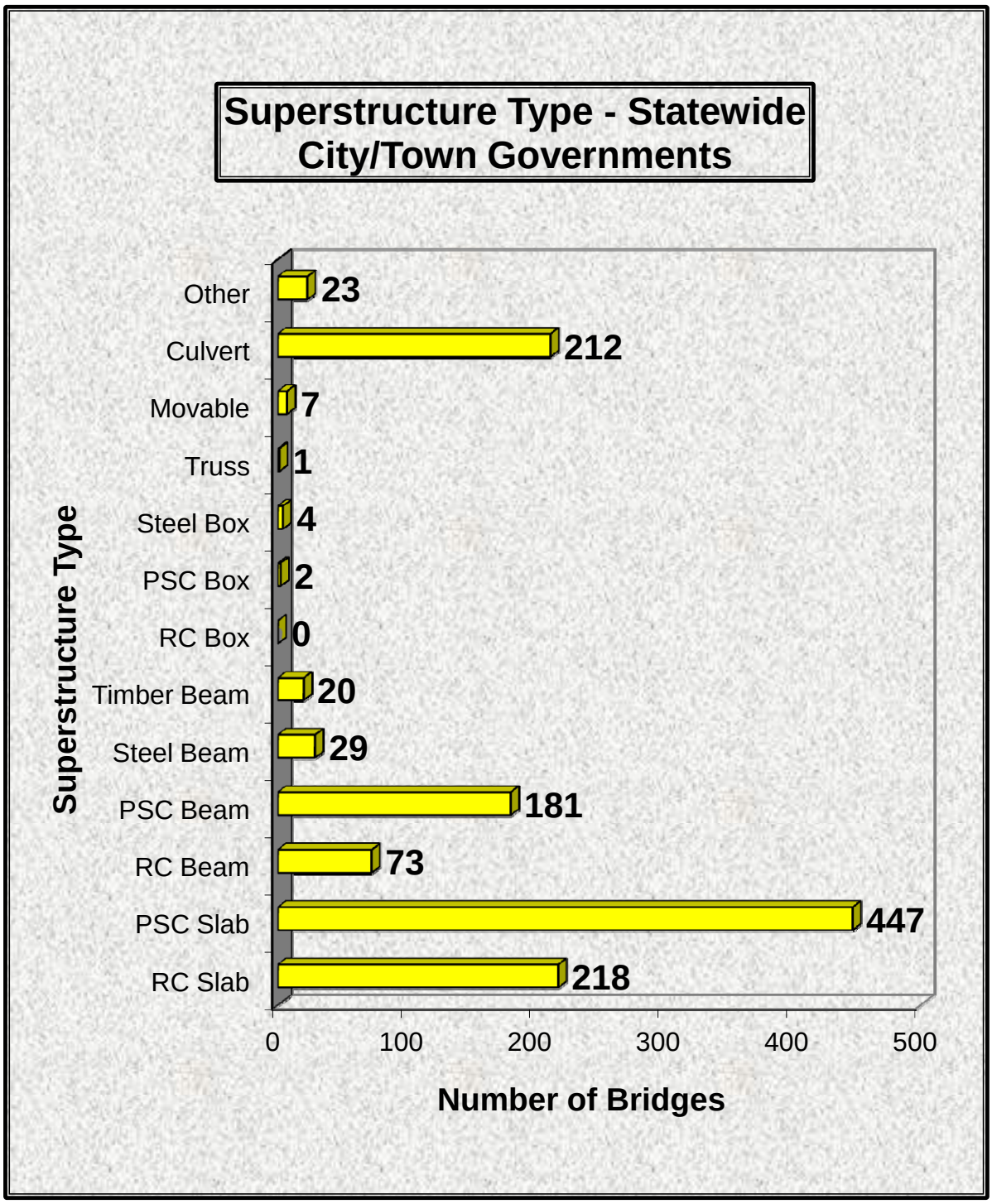
Superstructure Type - Statewide
City/Town Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
23
212
7
1
4
2
0
20
29
181
73
447
218
0
100
200
300
400
500
Number of Bridges

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 5,657 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 1,663 bridges, 29.40% of the total. 15.13% of the FDOT bridges fall into the 0 to 5,000 square foot range; 31.73% are in the 5,000 to 10,000 square foot range; and 23.74% 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 69.75% of their bridges under 5,000 square feet; with 16.85% between 5,000 and 10,000 square feet; 7.79% between 10,000 to 20,000 square feet; and only 5.62% over 20,000 square feet (see Figure 14). The results for the City/Town and Others groups are similar; with 76.43% 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 district. Figure 17 allows graphic comparison between the districts for the FDOT maintained bridges. For example, 31.29% of the District 1 bridges are less than 5,000 square feet and only 14.86% of their bridges are over 20,000 square feet. In contrast, only 13.83% of District 4 bridges are less than 5,000 square feet, while 33.47% 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	24	524	131	93	1	0	1	774
1,000-2,500	179	776	354	44	12	4	8	1377
2,500-5,000	653	662	277	18	9	0	11	0
5,000-7,500	921	305	93	4	9	0	12	1344
7,500-10,000	874	169	40	2	3	0	9	1097
10,000-20,000	1663	219	59	4	0	0	14	1959
20,000-40,000	731	92	24	1	0	0	2	850
40,000-80,000	334	42	14	0	1	0	5	396
80,000-160,000	161	14	5	0	3	0	0	183
>160,000	117	10	0	0	0	0	0	127
Total	5657	2813	997	166	38	4	62	9737

Table 5

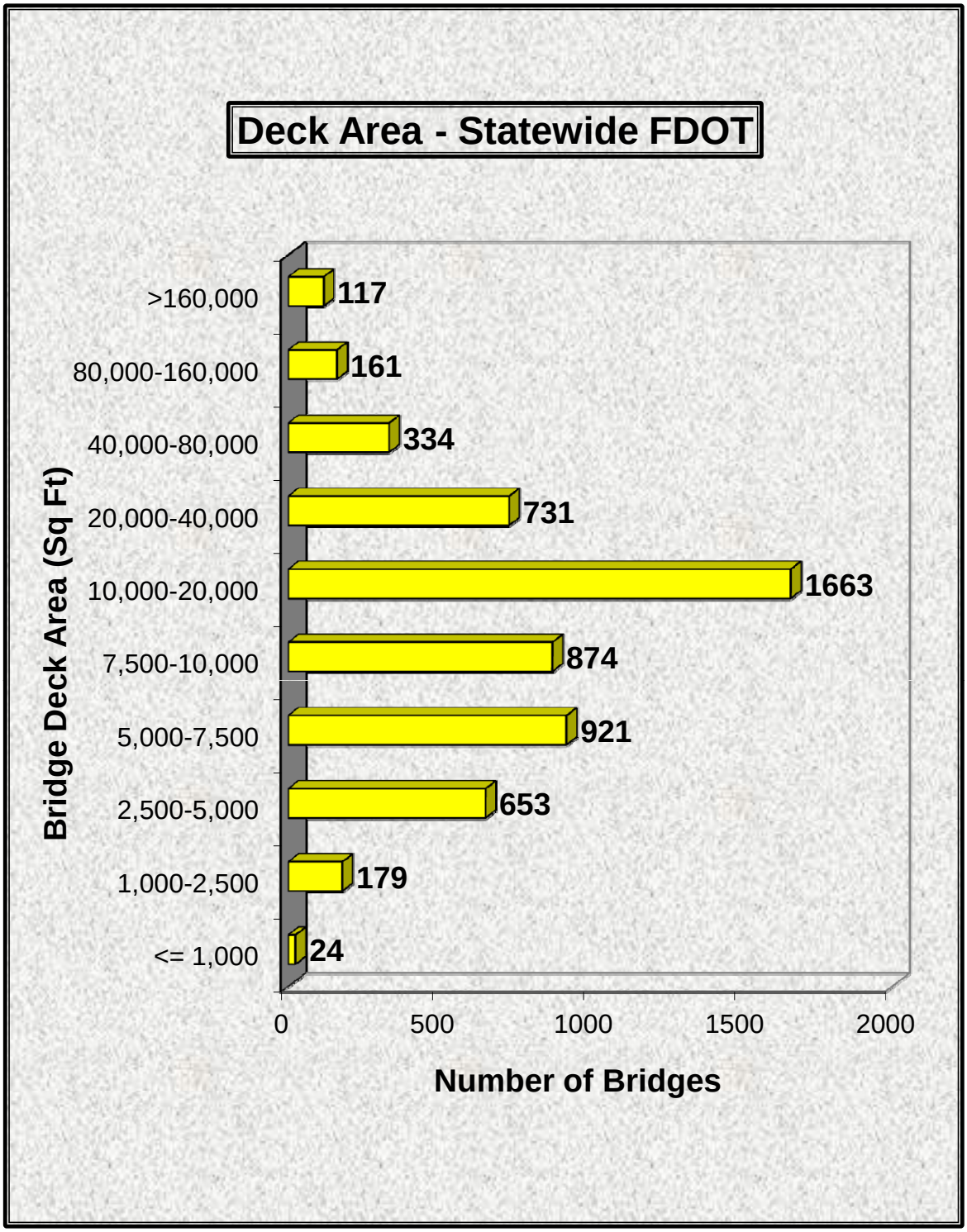
Deck Area - Statewide FDOT
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
117
161
334
731
1663
874
921
653
179
24
0
500
1000
1500
2000
Number of Bridges

Figure 13

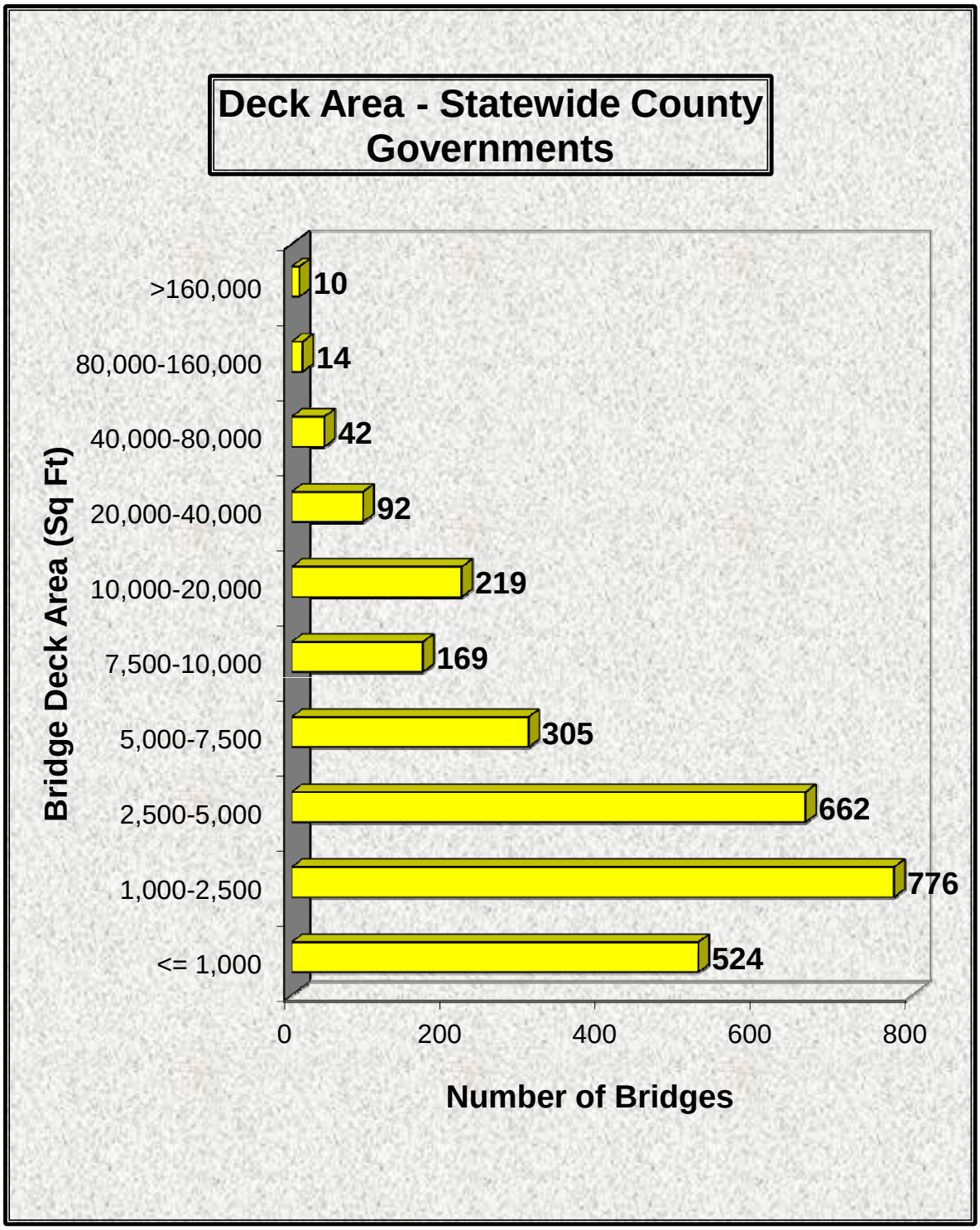
Deck Area - Statewide County Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
10
14
42
92
219
169
305
662
776
524
0
200
400
600
800
Number of Bridges

Figure 14

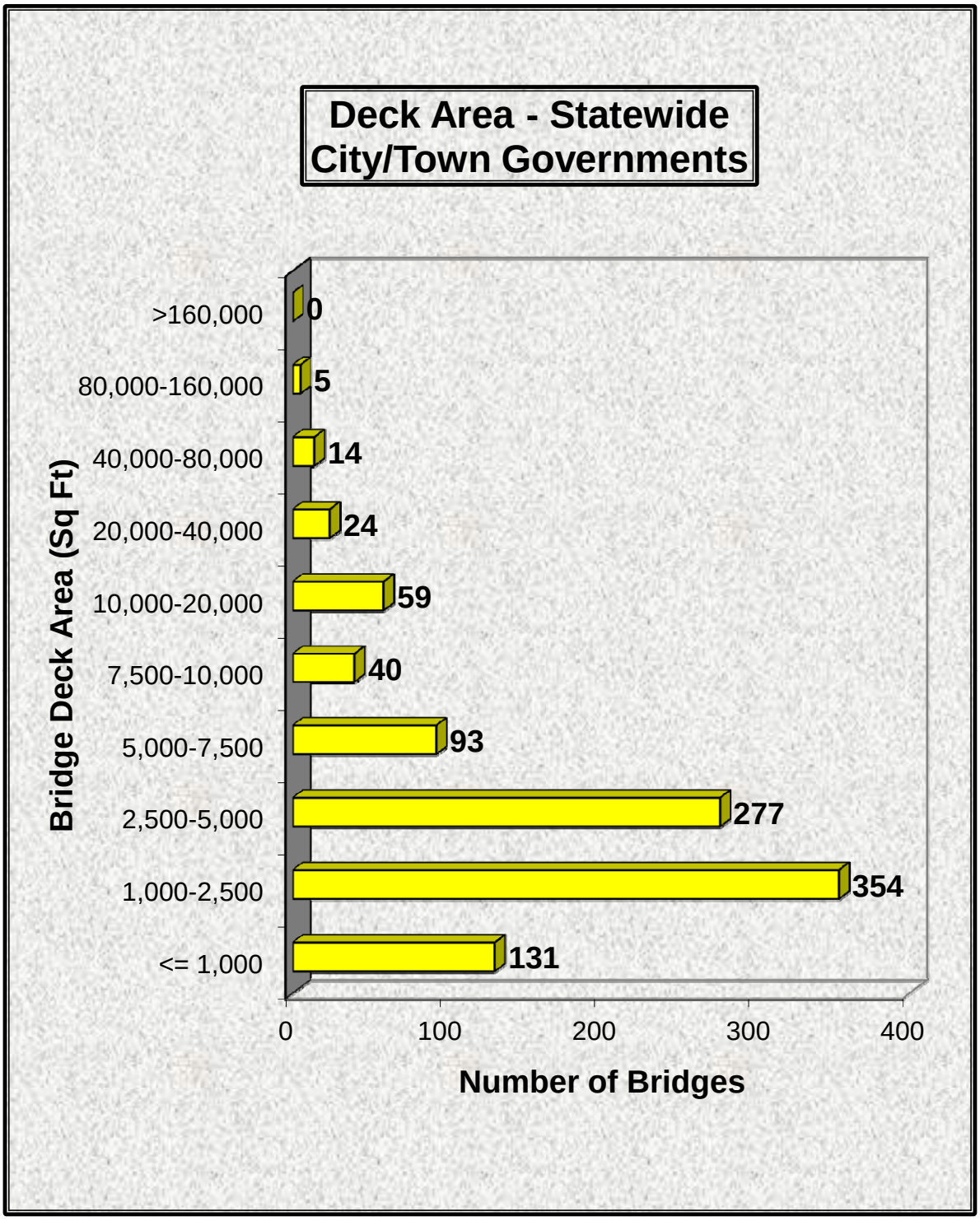
Deck Area - Statewide
City/Town Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
5
14
24
59
40
93
277
354
131
0
100
200
300
400
Number of Bridges

Figure 15

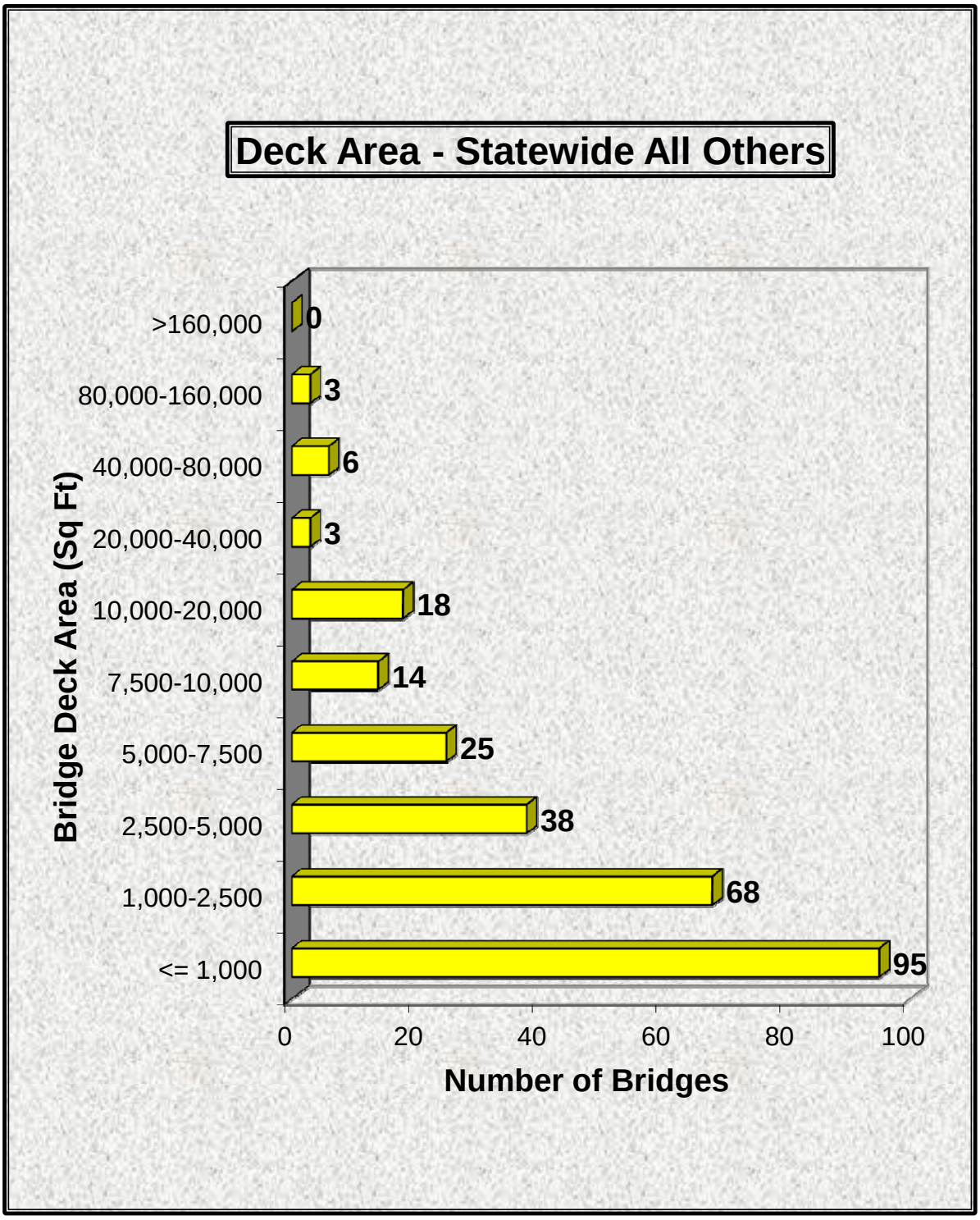
Deck Area - Statewide All Others
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
3
6
3
18
14
25
38
68
95
0
20
40
60
80
100
Number of Bridges

Figure 16

Bridge Inventory By Deck Area (Districts 1 Thru 4)

	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
District 1								
<= 1,000	8	110	28	5	0	0	0	151
1,000-2,500	77	203	61	7	10	0	0	358
2,500-5,000	134	168	75	6	8	0	0	391
5,000-7,500	116	55	26	1	4	0	0	202
7,500-10,000	95	33	4	1	0	0	0	133
10,000-20,000	166	36	7	2	0	0	0	211
20,000-40,000	58	17	0	1	0	0	0	76
40,000-80,000	23	6	0	0	0	0	0	29
80,000-160,000	11	5	0	0	0	0	0	16
>160,000	12	1	0	0	0	0	0	13
Total	700	634	201	23	22	0	0	1580
District 2								
<= 1,000	6	59	14	10	0	0	0	89
1,000-2,500	23	62	60	2	0	0	0	147
2,500-5,000	96	63	28	0	0	0	0	187
5,000-7,500	165	25	13	0	0	0	0	203
7,500-10,000	170	11	14	0	0	0	0	195
10,000-20,000	272	12	9	0	0	0	2	295
20,000-40,000	91	6	6	0	0	0	0	103
40,000-80,000	49	3	4	0	0	0	0	56
80,000-160,000	35	0	1	0	0	0	0	36
>160,000	20	1	0	0	0	0	0	21
Total	927	242	149	12	0	0	2	1332
District 3								
<= 1,000	4	254	7	74	1	0	0	340
1,000-2,500	12	209	10	24	0	0	0	255
2,500-5,000	61	124	10	5	0	0	0	200
5,000-7,500	106	52	2	0	0	0	0	160
7,500-10,000	102	25	0	1	0	0	0	128
10,000-20,000	150	25	2	0	0	0	0	177
20,000-40,000	62	11	1	0	0	0	0	74
40,000-80,000	30	3	2	0	0	0	0	35
80,000-160,000	19	3	1	0	2	0	0	25
>160,000	23	0	0	0	0	0	0	23
Total	569	706	35	104	3	0	0	1417
District 4								
<= 1,000	0	18	48	0	0	0	0	66
1,000-2,500	22	106	114	5	0	0	0	247
2,500-5,000	78	132	87	7	0	0	0	304
5,000-7,500	65	66	13	2	0	0	0	146
7,500-10,000	60	25	7	0	0	0	0	92
10,000-20,000	256	52	12	0	0	0	0	320
20,000-40,000	146	21	2	0	0	0	0	169
40,000-80,000	61	6	0	0	0	0	0	67
80,000-160,000	20	2	0	0	0	0	0	22
>160,000	15	1	0	0	0	0	0	16
Total	723	429	283	14	0	0	0	1449

Table 6

Bridge Inventory By Deck Area (Districts 5 Thru 8)

	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
District 5								
<= 1,000	1	22	12	3	0	0	1	39
1,000-2,500	17	52	39	4	0	0	8	120
2,500-5,000	90	63	28	0	1	0	11	193
5,000-7,500	178	28	17	1	1	0	12	237
7,500-10,000	159	33	8	0	0	0	9	209
10,000-20,000	247	35	19	1	0	0	12	314
20,000-40,000	106	16	3	0	0	0	2	127
40,000-80,000	40	8	4	0	0	0	5	57
80,000-160,000	23	1	2	0	1	0	0	27
>160,000	13	0	0	0	0	0	0	13
Total	874	258	132	9	3	0	60	1336
District 6								
<= 1,000	2	18	4	1	0	0	0	25
1,000-2,500	11	69	30	2	0	4	0	116
2,500-5,000	65	64	30	0	0	0	0	159
5,000-7,500	70	37	13	0	0	0	0	120
7,500-10,000	67	17	4	0	0	0	0	88
10,000-20,000	174	19	5	1	0	0	0	199
20,000-40,000	119	9	4	0	0	0	0	132
40,000-80,000	48	6	2	0	1	0	0	57
80,000-160,000	28	2	0	0	0	0	0	30
>160,000	15	4	0	0	0	0	0	19
Total	599	245	92	4	1	4	0	945
District 7								
<= 1,000	3	43	18	0	0	0	0	64
1,000-2,500	13	75	40	0	2	0	0	130
2,500-5,000	30	48	19	0	0	0	0	97
5,000-7,500	75	42	9	0	4	0	0	130
7,500-10,000	108	25	3	0	3	0	0	139
10,000-20,000	200	40	5	0	0	0	0	245
20,000-40,000	96	12	8	0	0	0	0	116
40,000-80,000	61	10	2	0	0	0	0	73
80,000-160,000	24	1	1	0	0	0	0	26
>160,000	15	3	0	0	0	0	0	18
Total	625	299	105	0	9	0	0	1038
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	99	0	0	0	0	0	0	99
5,000-7,500	146	0	0	0	0	0	0	146
7,500-10,000	113	0	0	0	0	0	0	113
10,000-20,000	198	0	0	0	0	0	0	198
20,000-40,000	53	0	0	0	0	0	0	53
40,000-80,000	22	0	0	0	0	0	0	22
80,000-160,000	1	0	0	0	0	0	0	1
>160,000	4	0	0	0	0	0	0	4
Total	640	0	0	0	0	0	0	640

Table 7

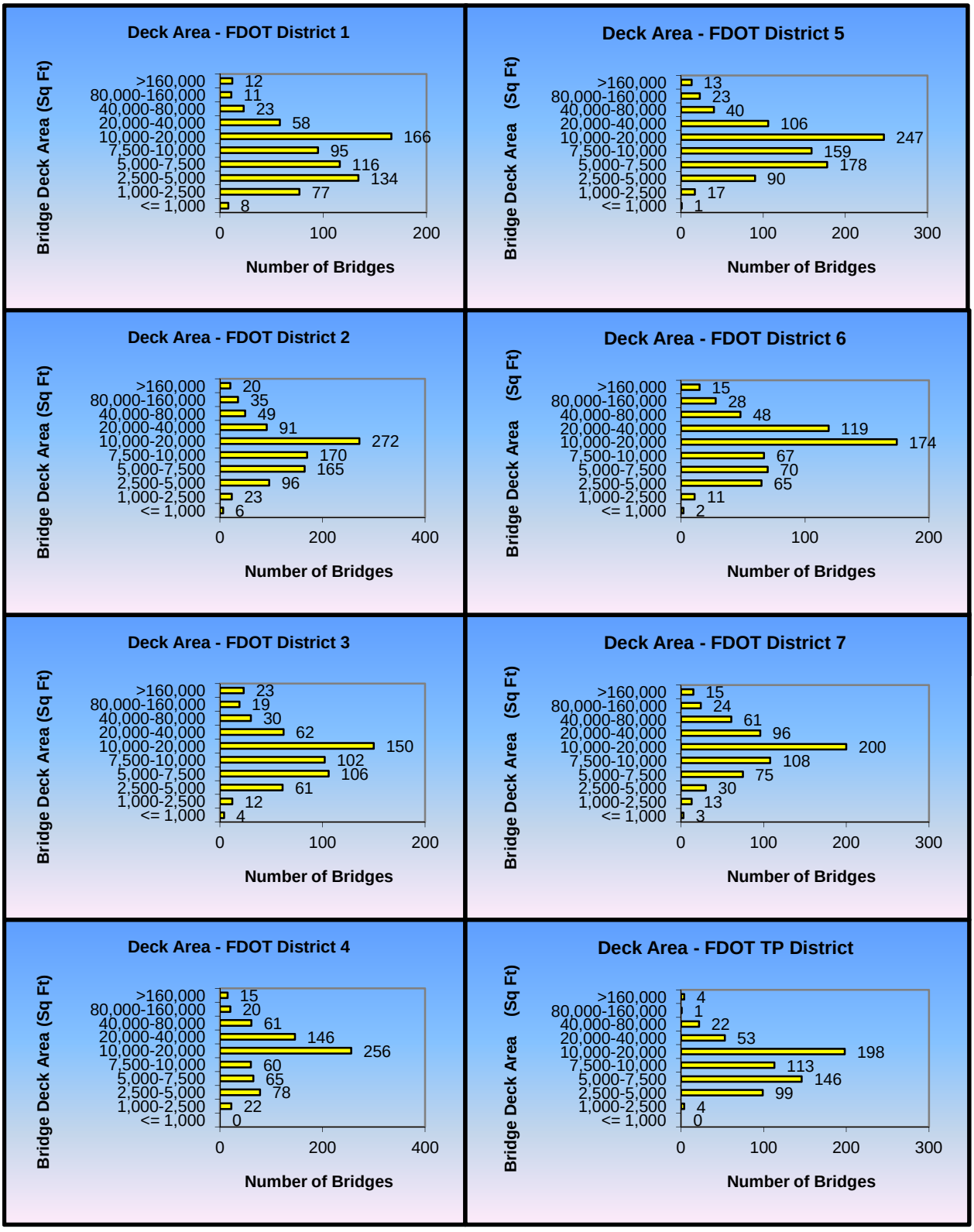
Deck Area - FDOT District 1
Bridge Deck Area (Sq Ft)
>160,000 12
80,000-160,000 11
40,000-80,000 23
20,000-40,000 58
10,000-20,000 166
7,500-10,000 95
5,000-7,500 116
2,500-5,000 134
1,000-2,500 77
<= 1,000 8
0 100 200
Number of Bridges
Deck Area - FDOT District 5
Bridge Deck Area (Sq Ft)
>160,000 13
80,000-160,000 23
40,000-80,000 40
20,000-40,000 106
10,000-20,000 247
7,500-10,000 159
5,000-7,500 178
2,500-5,000 90
1,000-2,500 17
<= 1,000 1
0 100 200 300
Number of Bridges
Deck Area - FDOT District 2
Bridge Deck Area (Sq Ft)
>160,000 20
80,000-160,000 35
40,000-80,000 49
20,000-40,000 91
10,000-20,000 272
7,500-10,000 170
5,000-7,500 165
2,500-5,000 96
1,000-2,500 23
<= 1,000 6
0 200 400
Number of Bridges
Deck Area - FDOT District 6
Bridge Deck Area (Sq Ft)
>160,000 15
80,000-160,000 28
40,000-80,000 48
20,000-40,000 119
10,000-20,000 174
7,500-10,000 67
5,000-7,500 70
2,500-5,000 65
1,000-2,500 11
<= 1,000 2
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 30
20,000-40,000 62
10,000-20,000 150
7,500-10,000 102
5,000-7,500 106
2,500-5,000 61
1,000-2,500 12
<= 1,000 4
0 100 200
Number of Bridges
Deck Area - FDOT District 7
Bridge Deck Area (Sq Ft)
>160,000 15
80,000-160,000 24
40,000-80,000 61
20,000-40,000 96
10,000-20,000 200
7,500-10,000 108
5,000-7,500 75
2,500-5,000 30
1,000-2,500 13
<= 1,000 3
0 100 200 300
Number of Bridges
Deck Area - FDOT District 4
Bridge Deck Area (Sq Ft)
>160,000 15
80,000-160,000 20
40,000-80,000 61
20,000-40,000 146
10,000-20,000 256
7,500-10,000 60
5,000-7,500 65
2,500-5,000 78
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 22
20,000-40,000 53
10,000-20,000 198
7,500-10,000 113
5,000-7,500 146
2,500-5,000 99
1,000-2,500 4
<= 1,000 0
0 100 200 300
Number of Bridges

Figure 17

Bridge Inventory - 2014 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 95.21% of the FDOT maintained bridges are in excellent or good condition. However, the number drops to 87.64% for County bridges, 87.59% for City/Town bridges, and 91.38% for Other Agency bridges. Figures 19 and 20 provide similar views of the FDOT maintained bridges, by district. An alternative view of the data is presented in Figures 21, 22, and 23, for each of the three maintenance groups.

Figure 24 is 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	806	328	81	9	10	0	8	1242
	Good	5647	3067	985	142	37	4	55	9937
	Fair	247	346	109	14	1	0	1	718
	Poor	78	133	42	7	1	0	1	262
	Total	6778	3874	1217	172	49	4	65	12159
District 1	Excellent	59	83	19	2	0	0	0	163
	Good	838	777	221	20	23	0	0	1879
	Fair	29	44	3	2	0	0	0	78
	Poor	3	6	2	0	0	0	0	11
	Total	929	910	245	24	23	0	0	2131
District 2	Excellent	67	30	10	0	0	0	0	107
	Good	1080	316	153	5	0	0	1	1555
	Fair	51	92	24	4	0	0	0	171
	Poor	22	50	14	3	0	0	1	90
	Total	1220	488	201	12	0	0	2	1923
District 3	Excellent	55	43	1	4	0	0	0	103
	Good	687	742	42	94	3	0	1	1569
	Fair	35	129	5	5	0	0	0	174
	Poor	23	38	2	3	0	0	0	66
	Total	800	952	50	106	3	0	1	1912
District 4	Excellent	160	53	13	3	0	0	0	229
	Good	570	369	220	9	0	0	0	1168
	Fair	20	24	53	2	0	0	0	99
	Poor	16	5	5	0	0	0	0	26
	Total	766	451	291	14	0	0	0	1522
District 5	Excellent	135	54	18	0	8	0	7	222
	Good	857	299	141	10	3	0	53	1363
	Fair	41	18	7	1	0	0	1	68
	Poor	6	11	1	0	0	0	0	18
	Total	1039	382	167	11	11	0	61	1671
District 6	Excellent	147	39	11	0	0	0	0	197
	Good	435	187	71	4	0	4	0	701
	Fair	18	22	3	0	1	0	0	44
	Poor	3	8	9	1	0	0	0	21
	Total	603	256	94	5	1	4	0	963
District 7	Excellent	110	26	9	0	2	0	1	148
	Good	565	377	137	0	8	0	0	1087
	Fair	43	17	14	0	0	0	0	74
	Poor	5	15	9	0	1	0	0	30
	Total	723	435	169	0	11	0	1	1339
District 8	Excellent	73	0	0	0	0	0	0	73
	Good	615	0	0	0	0	0	0	615
	Fair	10	0	0	0	0	0	0	10
	Poor	0	0	0	0	0	0	0	0
	Total	698	0	0	0	0	0	0	698

Table 8

NOTE: The number of FDOT bridges includes 125 MDX bridges and 288 OOCEA bridges.

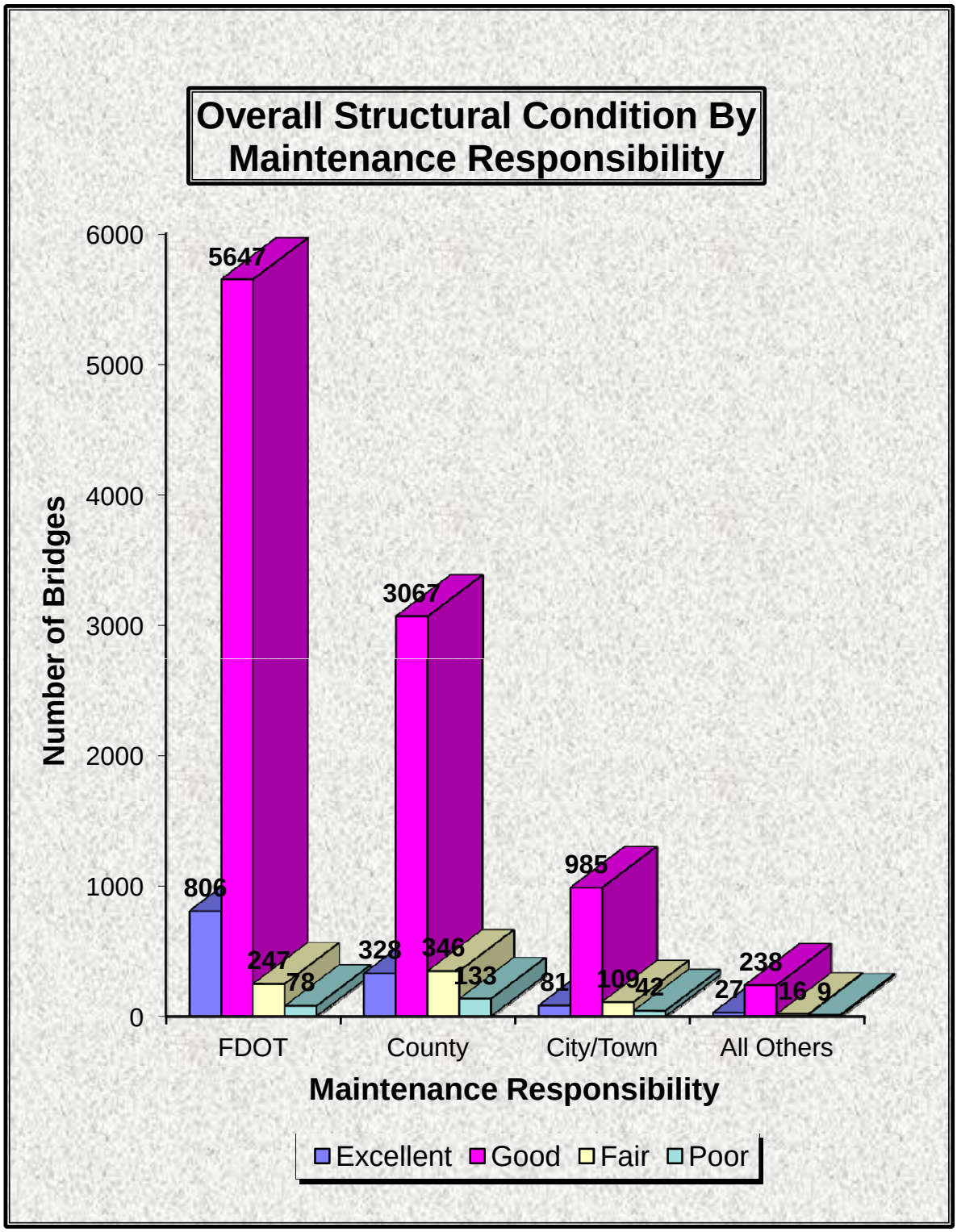
Overall Structural Condition By Maintenance Responsibility
Number of Bridges
6000
5000
4000
3000
2000
1000
0
5647
3067
985
806
247
78
328
346
133
81
109
42
27
238
16
9
FDOT
County
City/Town
All Others
Maintenance Responsibility
Excellent
Good
Fair
Poor

Figure 18

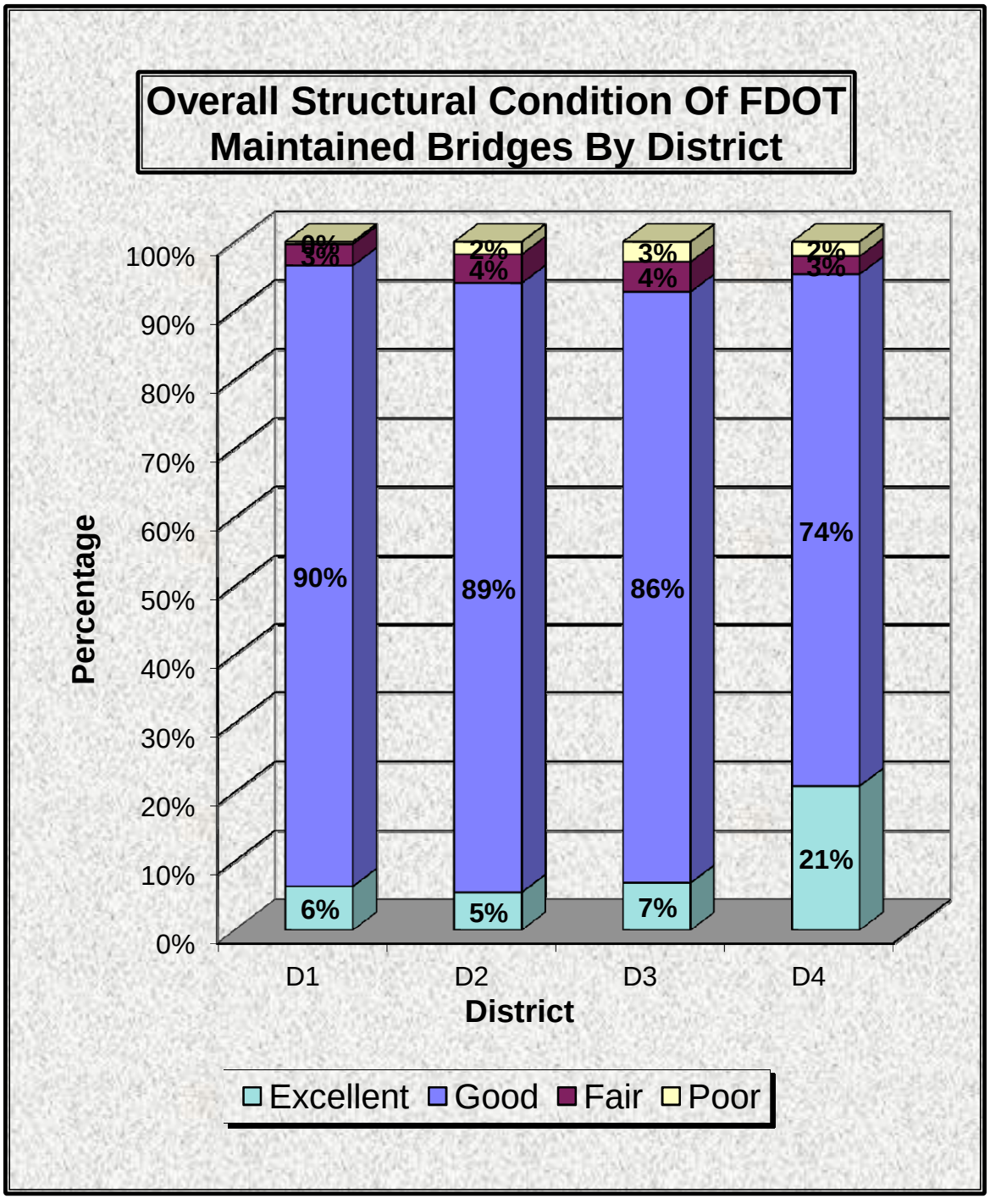
Overall Structural Condition Of FDOT Maintained Bridges By District
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
90%
89%
86%
74%
6%
5%
7%
21%
4%
4%
3%
3%
2%
2%
D1
D2
D3
D4
District
Excellent
Good
Fair
Poor

Figure 19

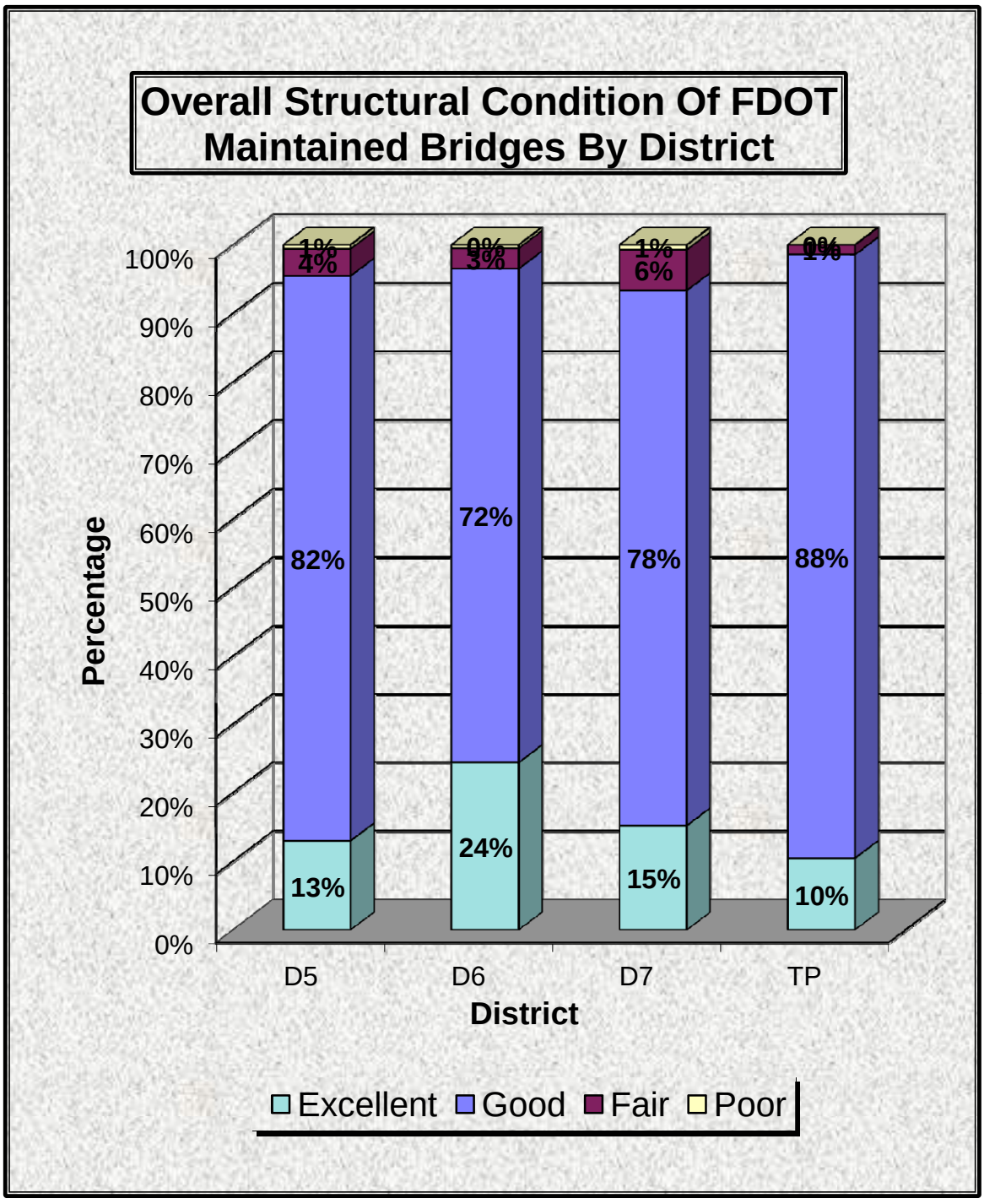
Overall Structural Condition Of FDOT Maintained Bridges By District
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
82%
13%
4%
1%
72%
24%
3%
0%
78%
15%
6%
1%
88%
10%
1%
0%
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor

Figure 20

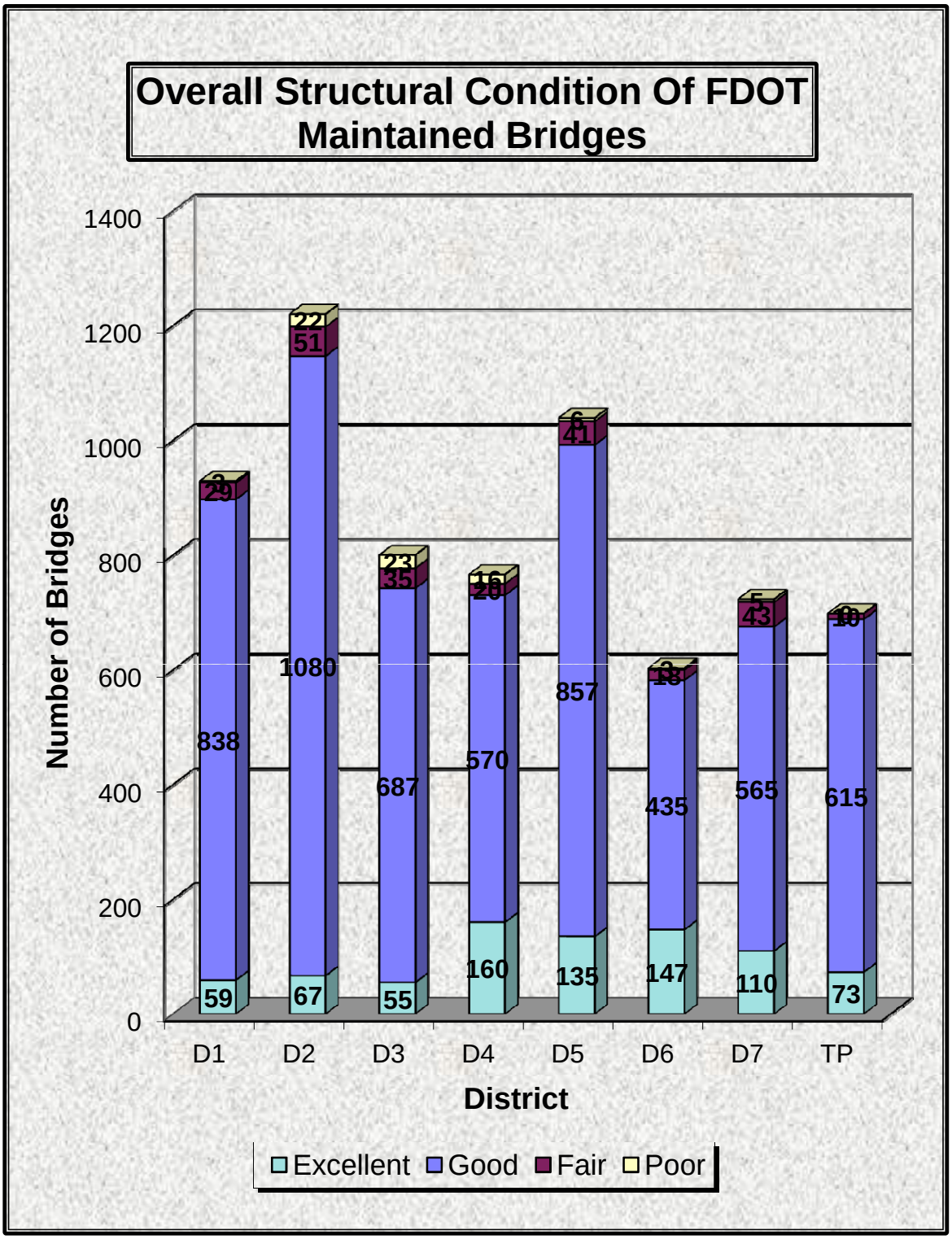
Overall Structural Condition Of FDOT Maintained Bridges
Number of Bridges
1400
1200
1000
800
600
400
200
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
59
838
29
67
1080
51
55
687
35
160
570
20
135
857
41
147
435
18
110
565
43
73
615

Figure 21

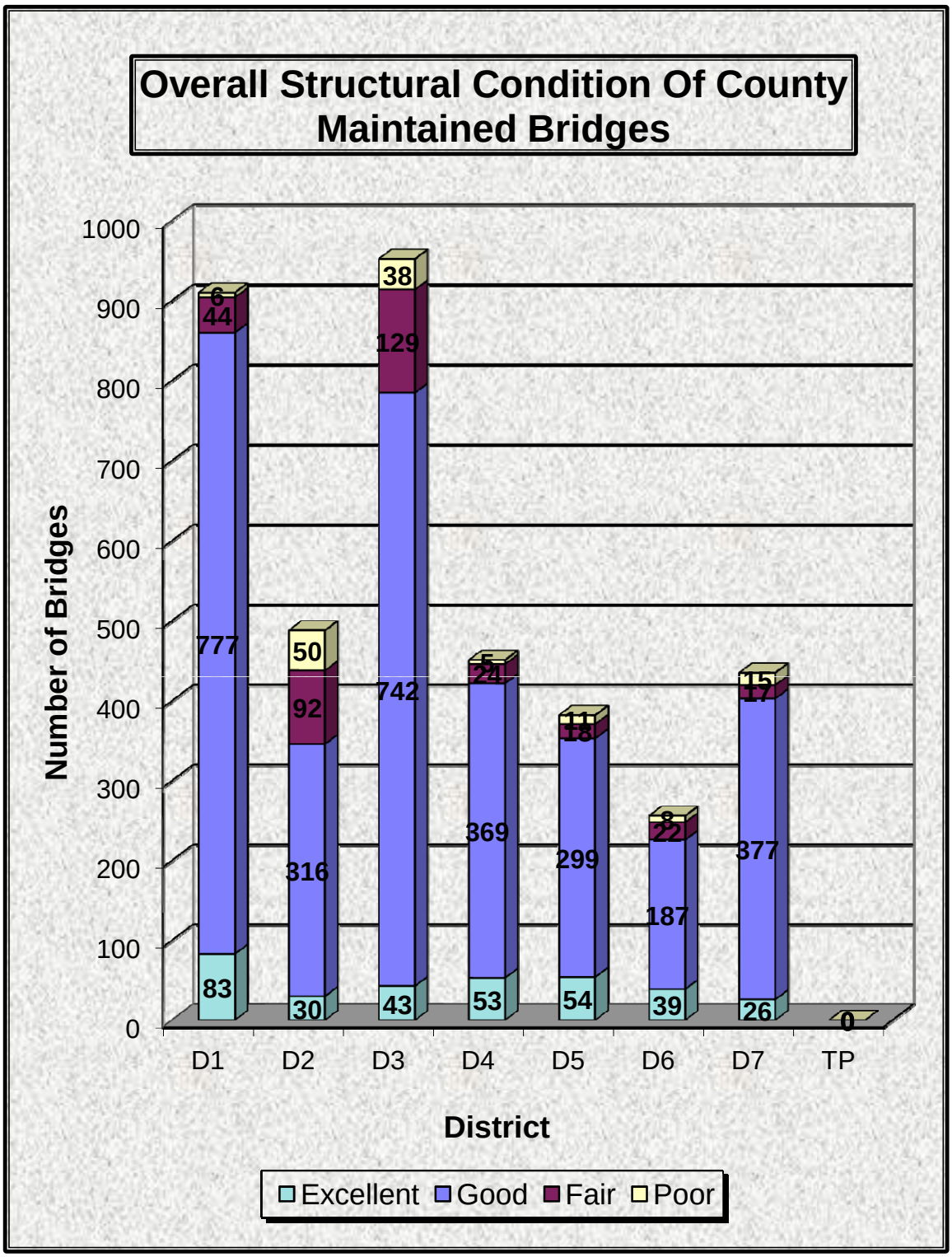
Overall Structural Condition Of County Maintained Bridges
Number of Bridges
1000
900
800
700
600
500
400
300
200
100
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
83
777
44
6
30
316
92
50
43
742
129
38
53
369
24
5
54
299
18
11
39
187
22
8
26
377
17
15
0

Figure 22

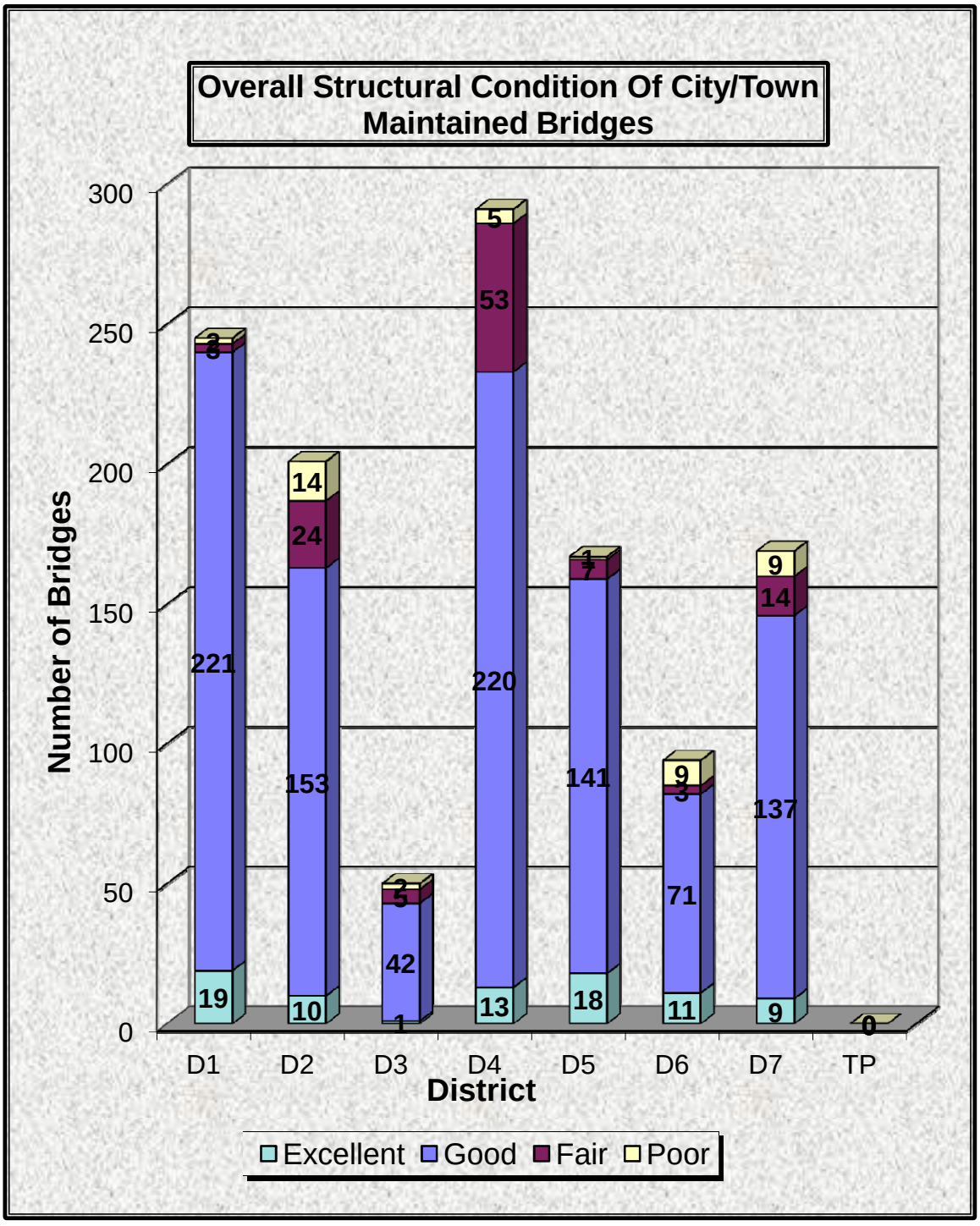
Overall Structural Condition Of City/Town Maintained Bridges
Number of Bridges
300
250
200
150
100
50
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
19
221
3
2
10
153
24
14
1
42
5
2
13
220
53
5
18
141
7
1
11
71
3
9
9
137
14
9
0

Figure 23

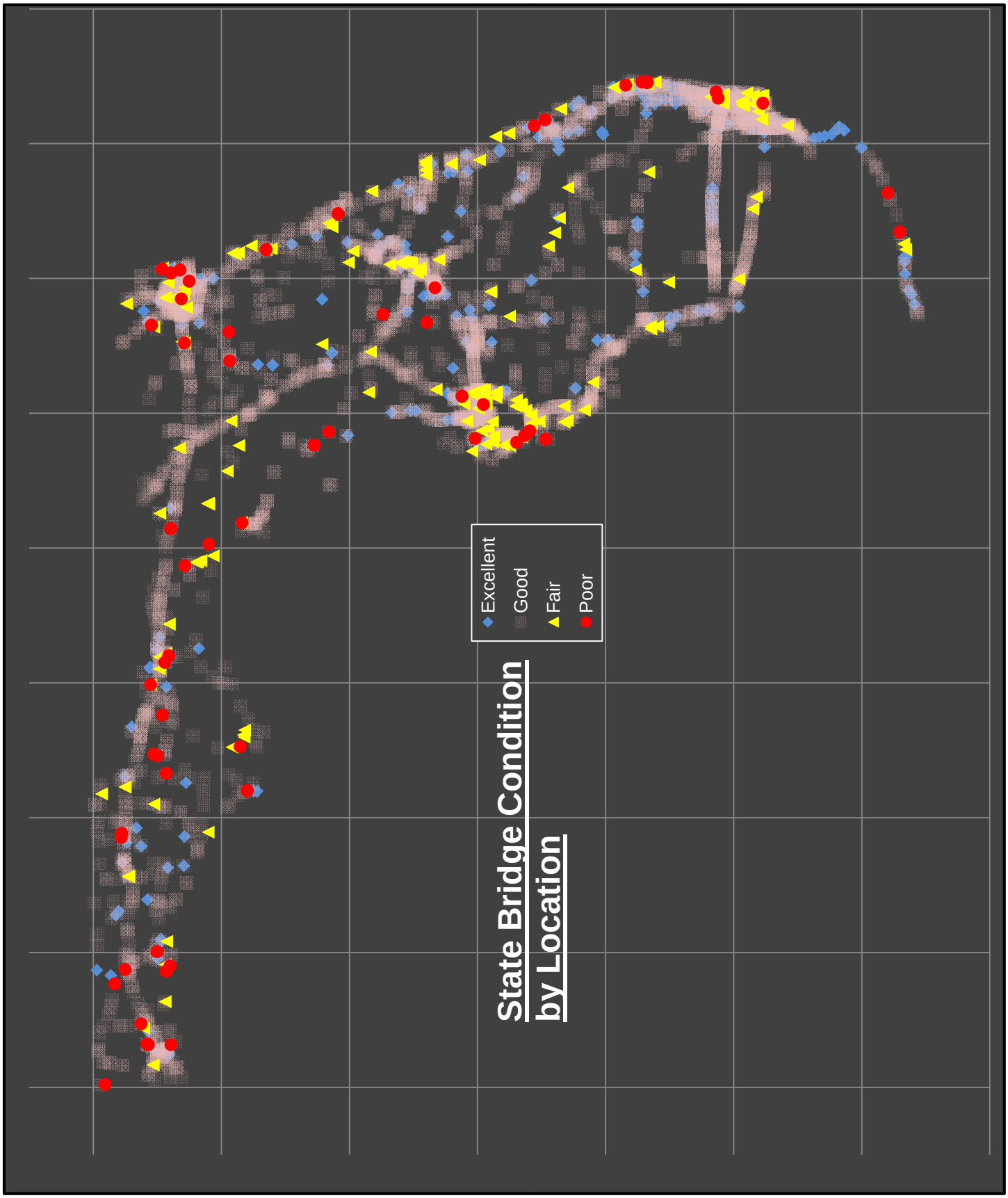
State Bridge Condition
by Location
Excellent
Good
Fair
Poor

Figure 24

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.

There are currently 219 structurally deficient bridges in Florida, with over 53.42% having county maintenance responsibility. Sixty-four (29.22%) of the structurally deficient bridges are maintained by FDOT (see Figure 25). Refer to Figure 26 for a presentation of structurally deficient bridges, by district, for each of the maintenance responsibility groups. Over 77.78% of the County Government maintained structurally deficient bridges are concentrated within District 2 and 3. Over 68.75% of the City/Town maintained structurally deficient bridges are concentrated within Districts 2 and 4.

Structurally Deficient Bridges (SD) Bridges								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Local	Federal	Others	Total
Statewide	64	117	32	6	0	0	0	219
District 1	3	5	0	0	0	0	0	8
District 2	18	51	14	3	0	0	0	86
District 3	23	40	2	3	0	0	0	68
District 4	8	5	8	0	0	0	0	21
District 5	6	5	0	0	0	0	0	11
District 6	3	6	5	0	0	0	0	14
District 7	3	5	3	0	0	0	0	11
District 8	0	0	0	0	0	0	0	0

Table 9

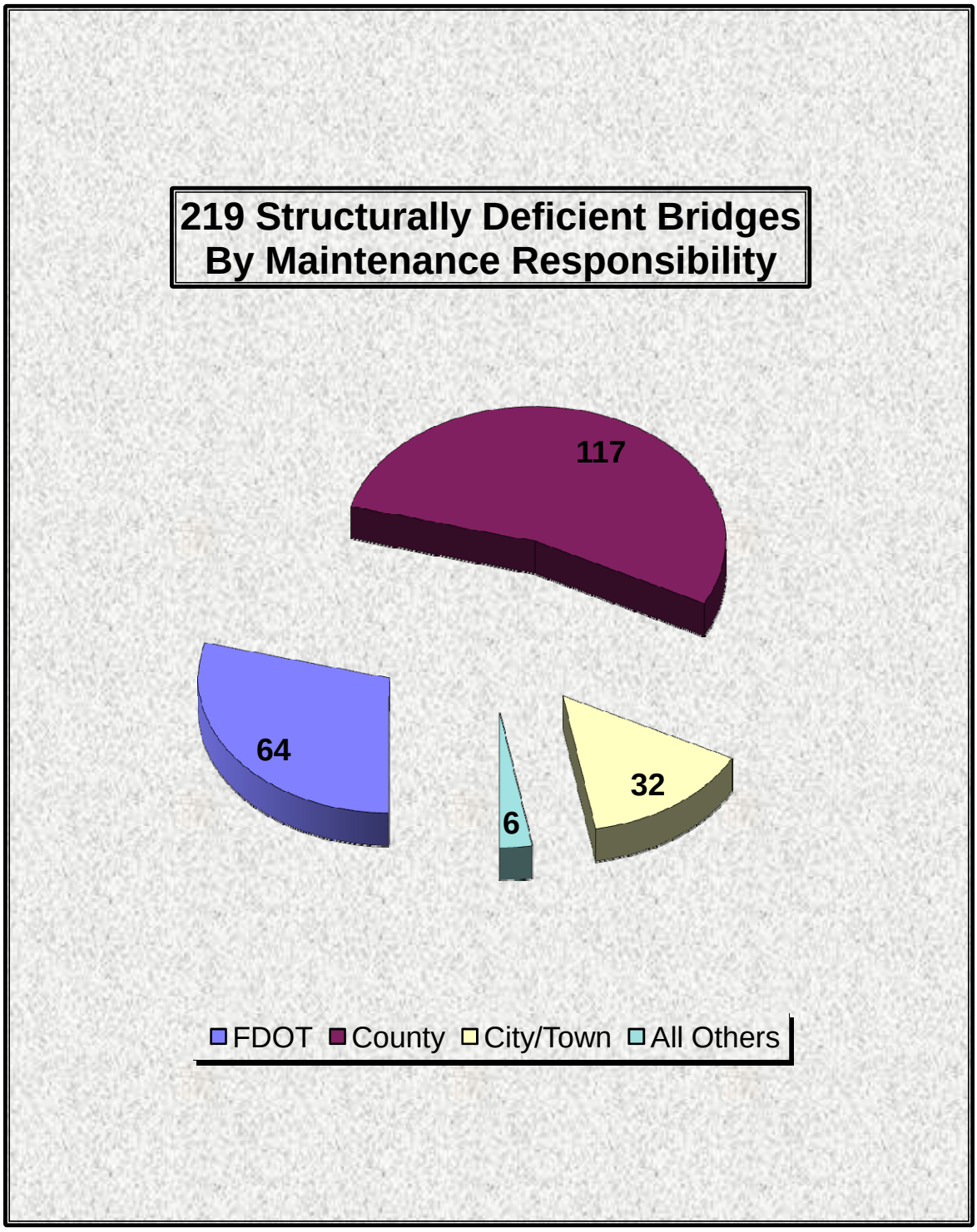
219 Structurally Deficient Bridges
By Maintenance Responsibility
117
64
6
32
FDOT
County
City/Town
All Others

Figure 25

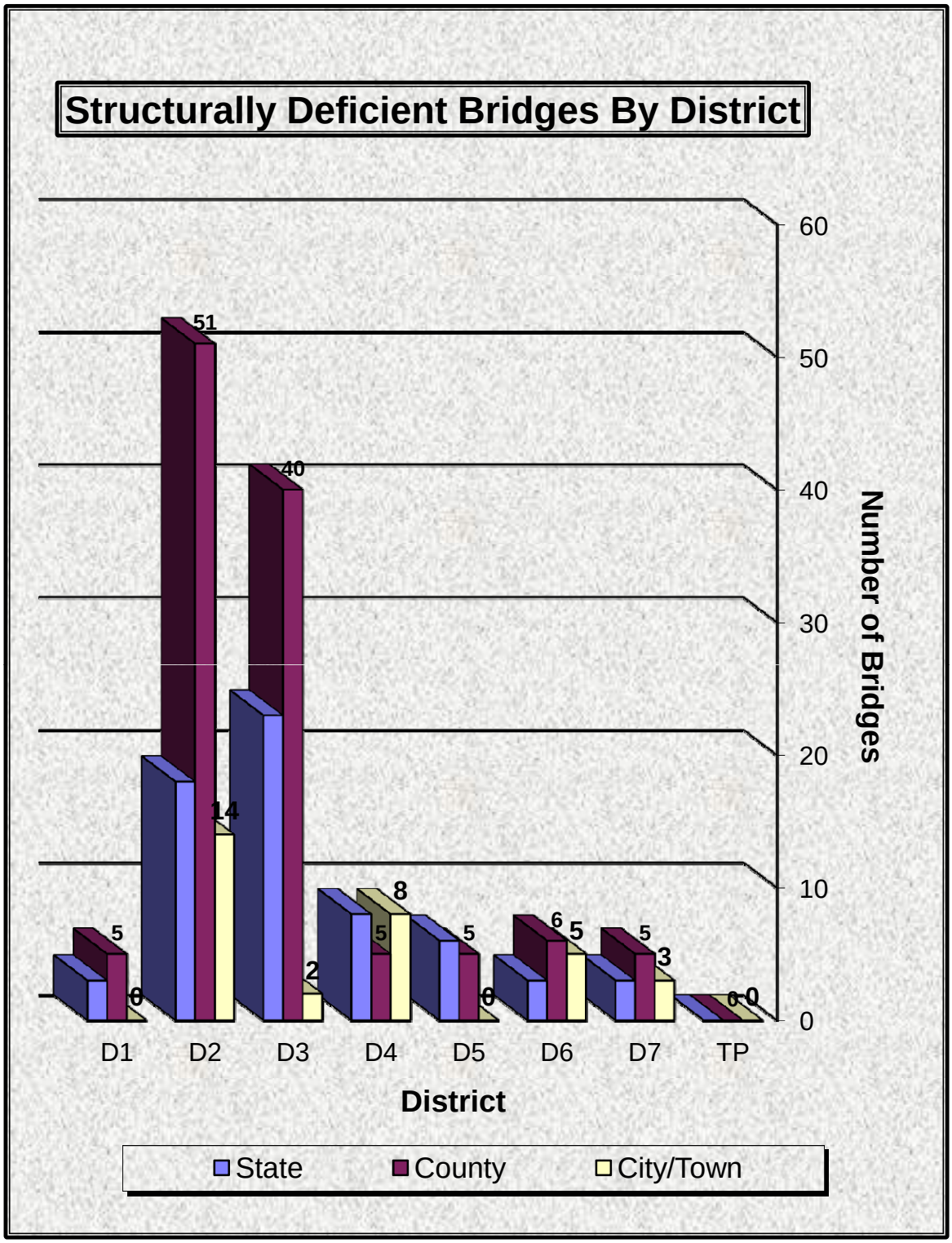
Structurally Deficient Bridges By District
60
50
40
30
20
10
0
Number of Bridges
5
0
51
14
40
2
5
8
5
0
6
5
5
3
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
State
County
City/Town

Figure 26

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 needs to post weight restrictions at on bridges are generally caused by the inability of individual bridge members to adequately carry the applied legal loads. The 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 districts. There are currently 766 posted or closed bridges in Florida, with County Governments having maintenance responsibility for over 76.24% of the total. City and Town Governments are responsible for the maintenance of over 17.75% of the total, while the FDOT is responsible for only 10 of the 766 bridges (1.31%) (see Figure 27). The number of posted County bridges (584 bridges) is much greater than the number of structurally deficient County bridges (117), which indicated that the majority of County bridge posting restrictions are caused by obsolete design, rather than advanced structural deterioration (see Figure 28).

Of the 10 posted or closed bridges maintained by the FDOT, Districts 1, 4, 7, and Turnpike had none, and District 6 constituted 60% of the posted or closed bridges (see Figure 29). Seventy-one percent (72.77%) of the posted or closed bridges maintained by County Governments are concentrated within Districts 2 and 3 (see Figure 30). Seventy-seven (56.62%) of the posted or closed bridges maintained by City/Town Governments are concentrated within Districts 2 and 4 (see Figure 31). Statewide, 66.06% 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	2	573	129	33	0	0	0	737
Closed	8	11	7	2	1	0	0	29
Total	10	584	136	35	1	0	0	766
District 1								
Posted	0	85	19	3	0	0	0	107
Closed	0	0	0	0	0	0	0	0
Total	0	85	19	3	0	0	0	107
District 2								
Posted	1	90	39	4	0	0	0	134
Closed	1	6	2	2	0	0	0	11
Total	2	96	41	6	0	0	0	145
District 3								
Posted	1	327	9	21	0	0	0	358
Closed	0	2	1	0	0	0	0	3
Total	1	329	10	21	0	0	0	361
District 4								
Posted	0	24	35	1	0	0	0	60
Closed	0	0	1	0	0	0	0	1
Total	0	24	36	1	0	0	0	61
District 5								
Posted	0	20	18	4	0	0	0	42
Closed	1	1	1	0	0	0	0	3
Total	1	21	19	4	0	0	0	45
District 6								
Posted	0	19	5	0	0	0	0	24
Closed	6	2	2	0	1	0	0	11
Total	6	21	7	0	1	0	0	35
District 7								
Posted	0	8	4	0	0	0	0	12
Closed	0	0	0	0	0	0	0	0
Total	0	8	4	0	0	0	0	12
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

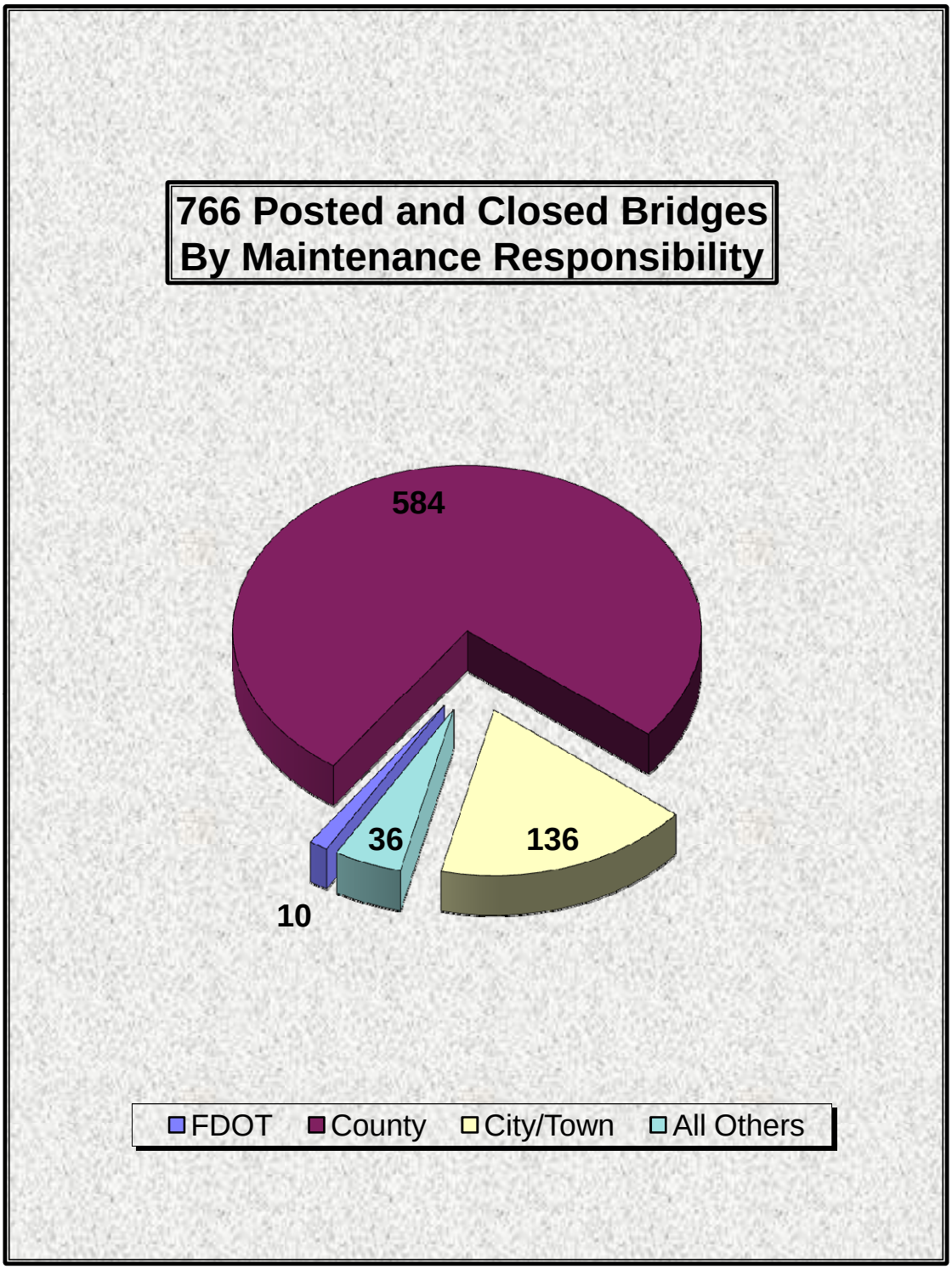
766 Posted and Closed Bridges
By Maintenance Responsibility
584
36
136
10
FDOT
County
City/Town
All Others

Figure 27

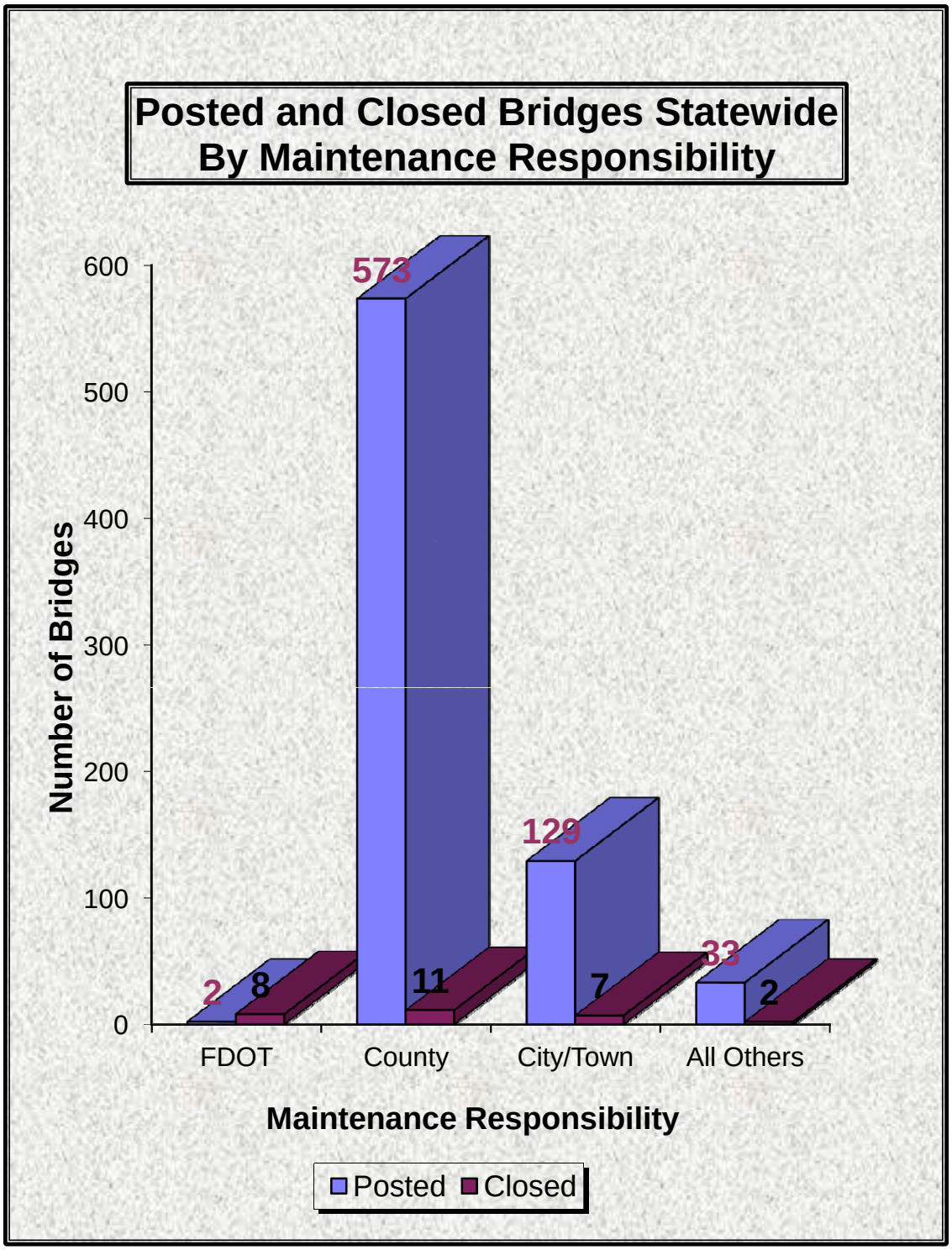
Posted and Closed Bridges Statewide
By Maintenance Responsibility
Number of Bridges
600
500
400
300
200
100
0
573
129
33
2
8
11
7
2
FDOT
County
City/Town
All Others
Maintenance Responsibility
Posted
Closed

Figure 28

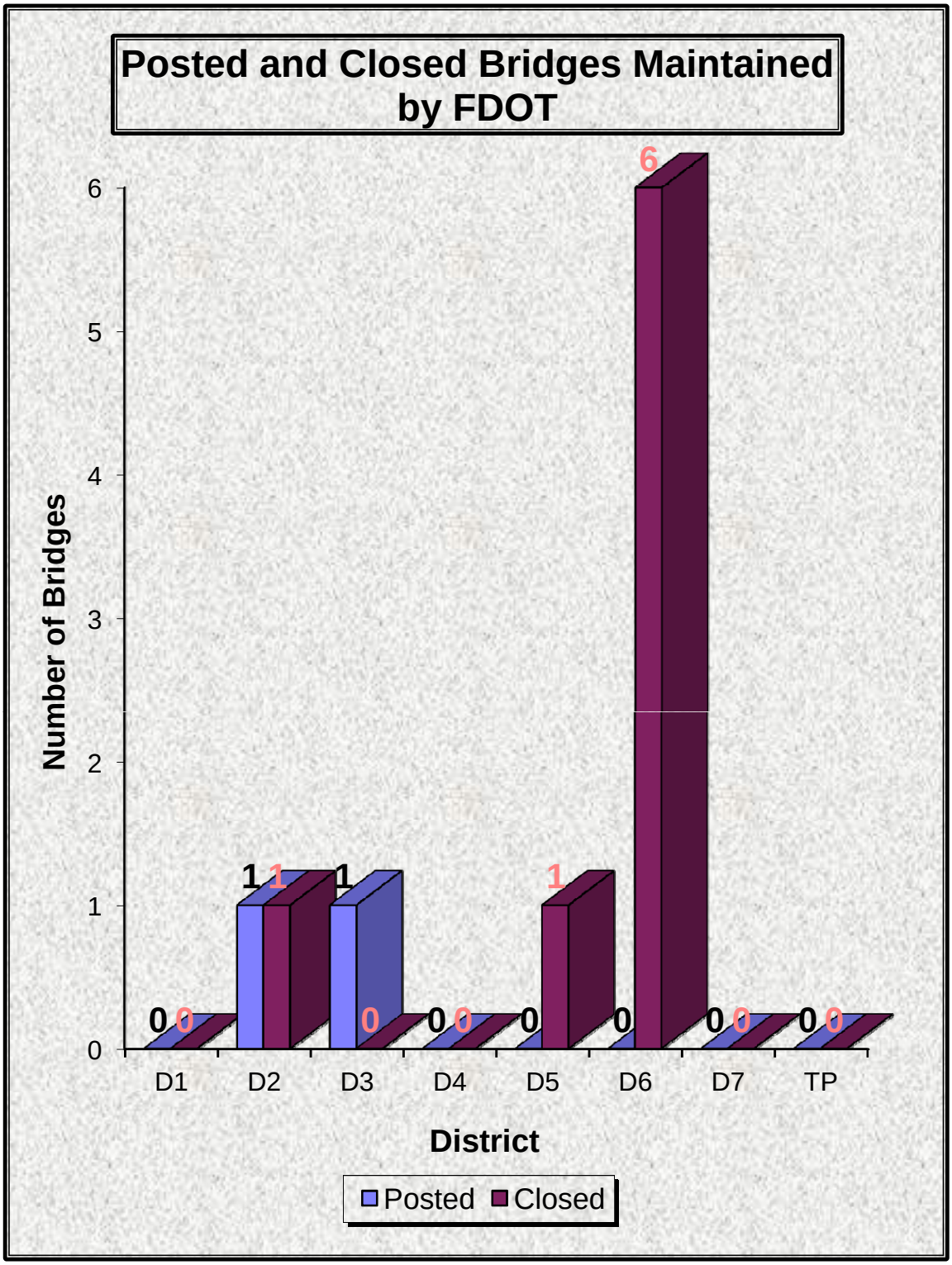
Posted and Closed Bridges Maintained by FDOT
Number of Bridges
0
1
2
3
4
5
6
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed
0 0
1 1
1 0
0 0
0 1
0 6
0 0
0 0

Figure 29

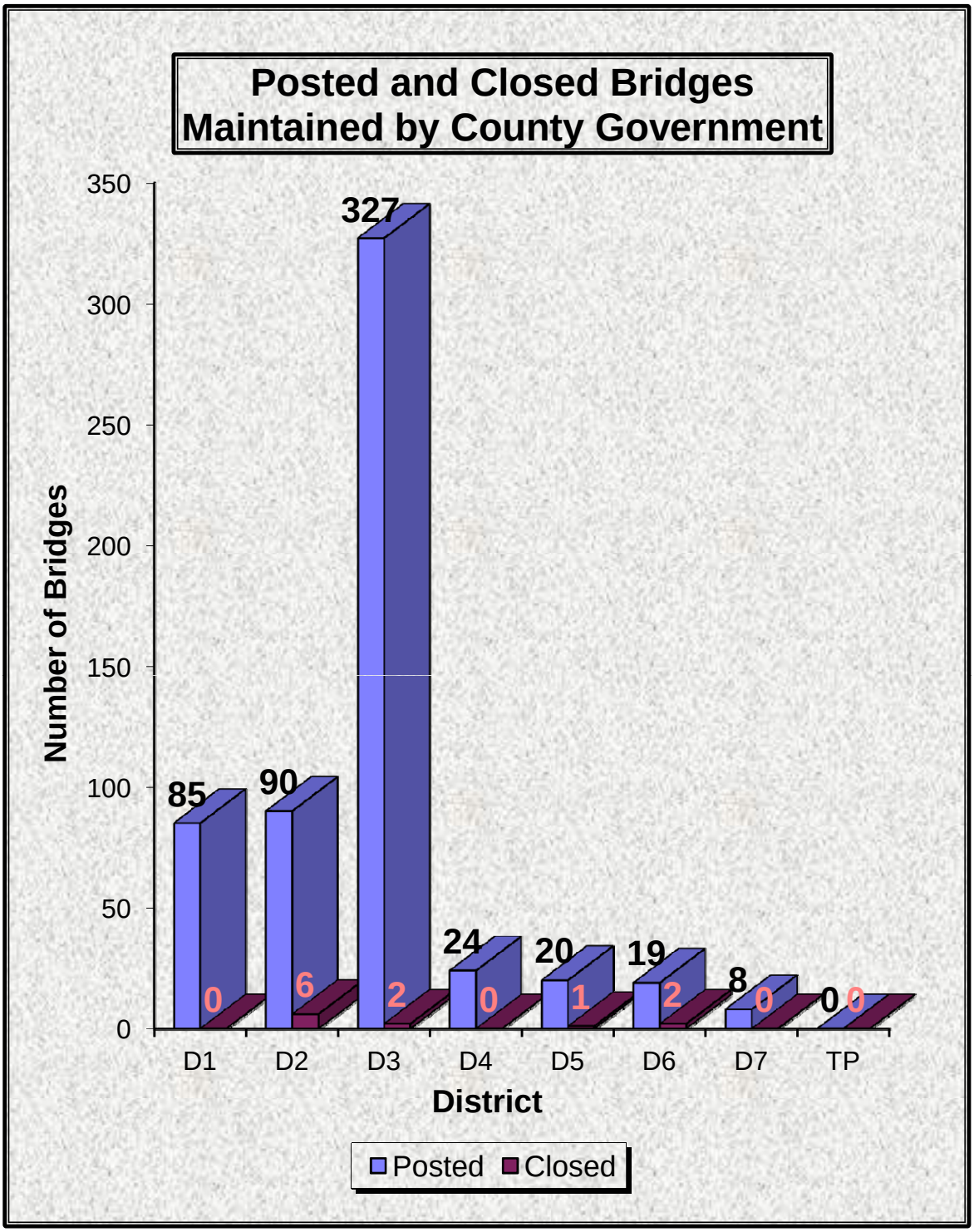
Posted and Closed Bridges
Maintained by County Government
Number of Bridges
350
300
250
200
150
100
50
0
85
0
90
6
327
2
24
0
20
1
19
2
8
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 30

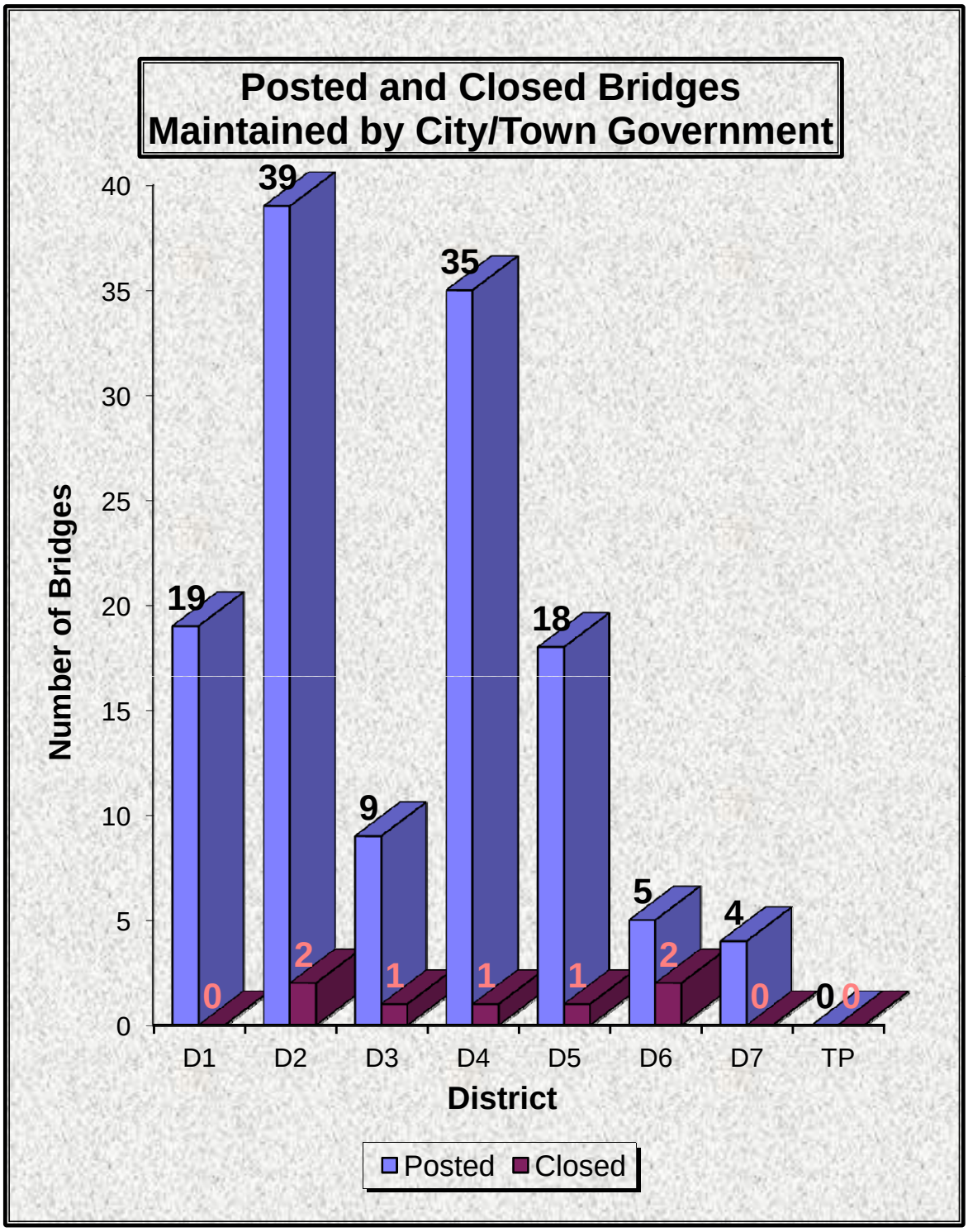
Posted and Closed Bridges
Maintained by City/Town Government
Number of Bridges
40
35
30
25
20
15
10
5
0
19
0
39
2
9
1
35
1
18
1
5
2
4
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 31

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).

There are currently 1,739 functionally obsolete bridges in Florida, about 14.30% of the total. The FDOT has maintenance responsibility for over 41.75% of all functionally obsolete bridges (see Figure 32). Refer to Figure 33 for a presentation of functionally obsolete bridges, by district, for each of the three maintenance responsibility groups.

Functionally Obsolete Bridges (FO) Bridges								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Local	Federal	Others	Total
Statewide	726	623	288	79	9	0	14	1739
District 1	73	159	82	5	2	0	0	321
District 2	167	41	24	3	0	0	0	235
District 3	33	138	3	61	0	0	1	236
District 4	45	92	73	5	0	0	0	215
District 5	112	40	46	3	1	0	12	214
District 6	158	76	21	2	0	0	0	257
District 7	83	77	39	0	6	0	1	206
District 8	55	0	0	0	0	0	0	55

Table 11

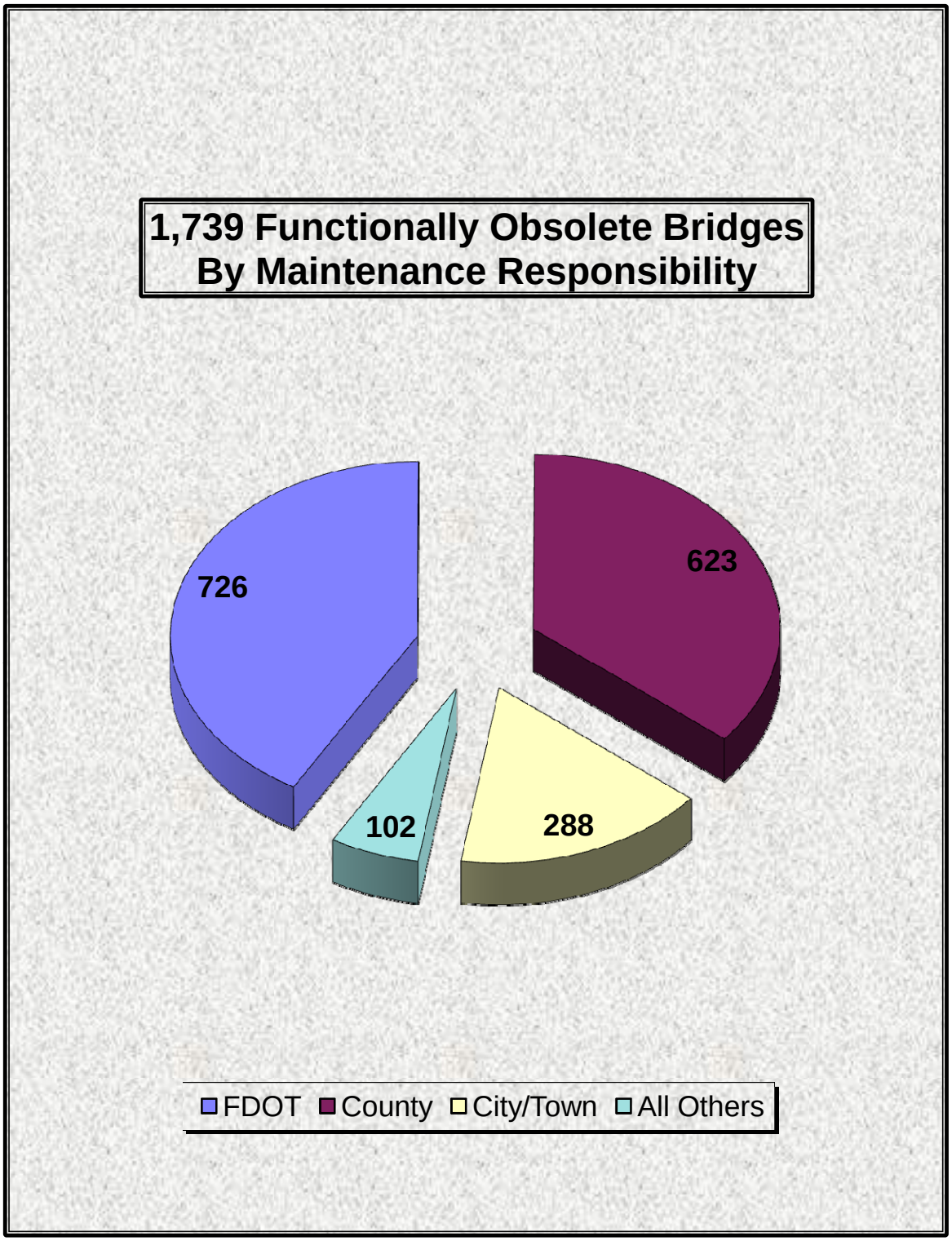
1,739 Functionally Obsolete Bridges
By Maintenance Responsibility
726
623
102
288
FDOT
County
City/Town
All Others

Figure 32

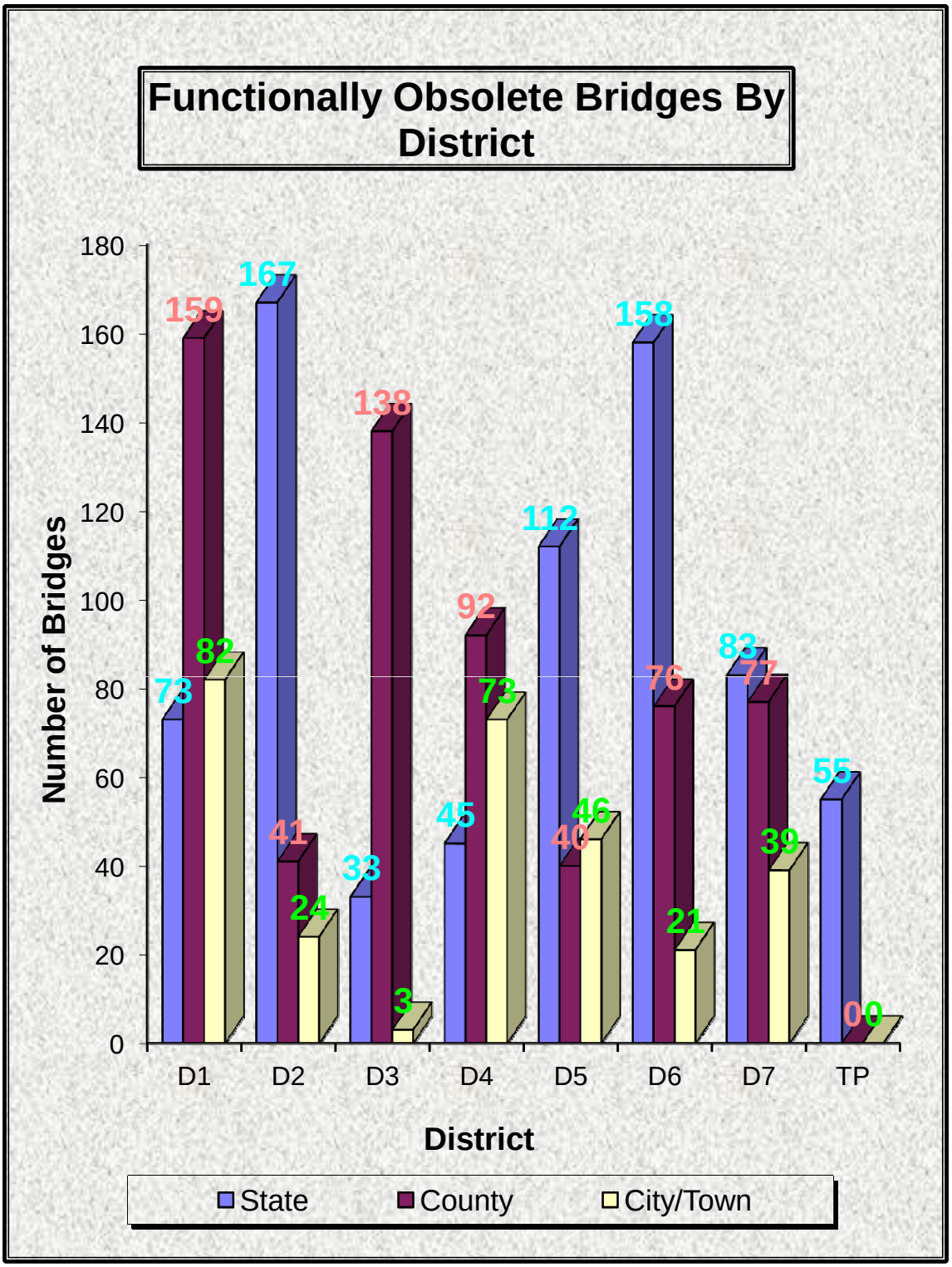
Functionally Obsolete Bridges By District
Number of Bridges
180
160
140
120
100
80
60
40
20
0
D1
D2
D3
D4
D5
D6
D7
TP
District
73
159
82
167
41
24
33
138
3
45
92
73
112
40
46
158
76
21
83
77
39
55
00
State
County
City/Town

Figure 33

Bridge Inventory - 2014 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 may be useful for identifying relative trends in the distribution of the bridge inventory based on structure cost.

The 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	53,488	251,804	564,192	718,140	639,538	683,206	1,680,797	1,119,809	169,127	5,880,101
P/C Slab	39,386	0	84,882	915,048	760,709	704,092	337,609	23,262	154,335	3,019,323
R/C Beam	241,839	218,868	590,970	0	0	0	0	31,392	216,997	1,300,066
P/C Beam	21,056	0	3,353,319	13,293,167	16,191,912	15,460,686	12,492,810	15,524,891	3,346,225	79,684,065
Steel Beam	464,802	203,996	2,281,030	4,782,170	7,342,776	2,847,810	3,172,395	3,655,719	876,008	25,626,706
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	294,771	24,101	318,873
Steel Box	0	0	0	0	110,928	1,336,088	1,529,314	1,438,828	257,333	4,672,492
Truss	223,246	0	428,297	250,885	0	0	0	0	0	902,428
Movable	328,865	87,844	718,302	543,772	659,492	1,246,975	474,164	564,115	67,337	4,690,866
Culvert	85,966	126,677	320,624	628,518	351,277	147,073	160,208	182,234	26,102	2,028,679
Other	35,805	20,050	130,729	0	0	6,696,791	2,917,085	4,718,103	1,206,254	15,724,818
Total	1,494,454	909,239	8,472,344	21,173,521	26,108,219	29,122,722	22,921,962	27,553,124	6,343,819	144,099,404

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	6,419	30,492	68,318	94,467	91,605	99,128	247,023	159,320	22,583	819,355
P/C Slab	5,908	0	12,732	137,257	114,106	105,614	50,641	3,489	23,150	452,898
R/C Beam	22,975	20,792	56,142	0	0	0	0	2,982	21,523	124,414
P/C Beam	2,211	0	352,098	1,395,783	1,706,464	1,634,546	1,366,782	1,679,680	353,936	8,491,500
Steel Beam	51,958	23,989	263,692	601,973	874,428	360,473	399,243	454,185	111,144	3,141,084
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	42,742	3,495	69,085
Steel Box	0	0	0	0	16,639	200,413	229,397	215,824	38,600	700,874
Truss	39,068	0	74,952	43,905	0	0	0	0	0	157,925
Movable	95,083	26,893	242,578	220,251	164,878	177,745	153,593	177,407	32,236	1,290,665
Culvert	8,167	12,034	30,459	59,709	33,371	13,972	15,220	17,312	2,480	192,724
Other	5,371	3,008	19,609	0	0	1,004,519	437,563	707,716	180,938	2,358,723
Total	237,159	117,209	1,120,581	2,559,564	3,009,230	3,596,409	2,922,311	3,460,658	790,085	17,813,205

Table 13

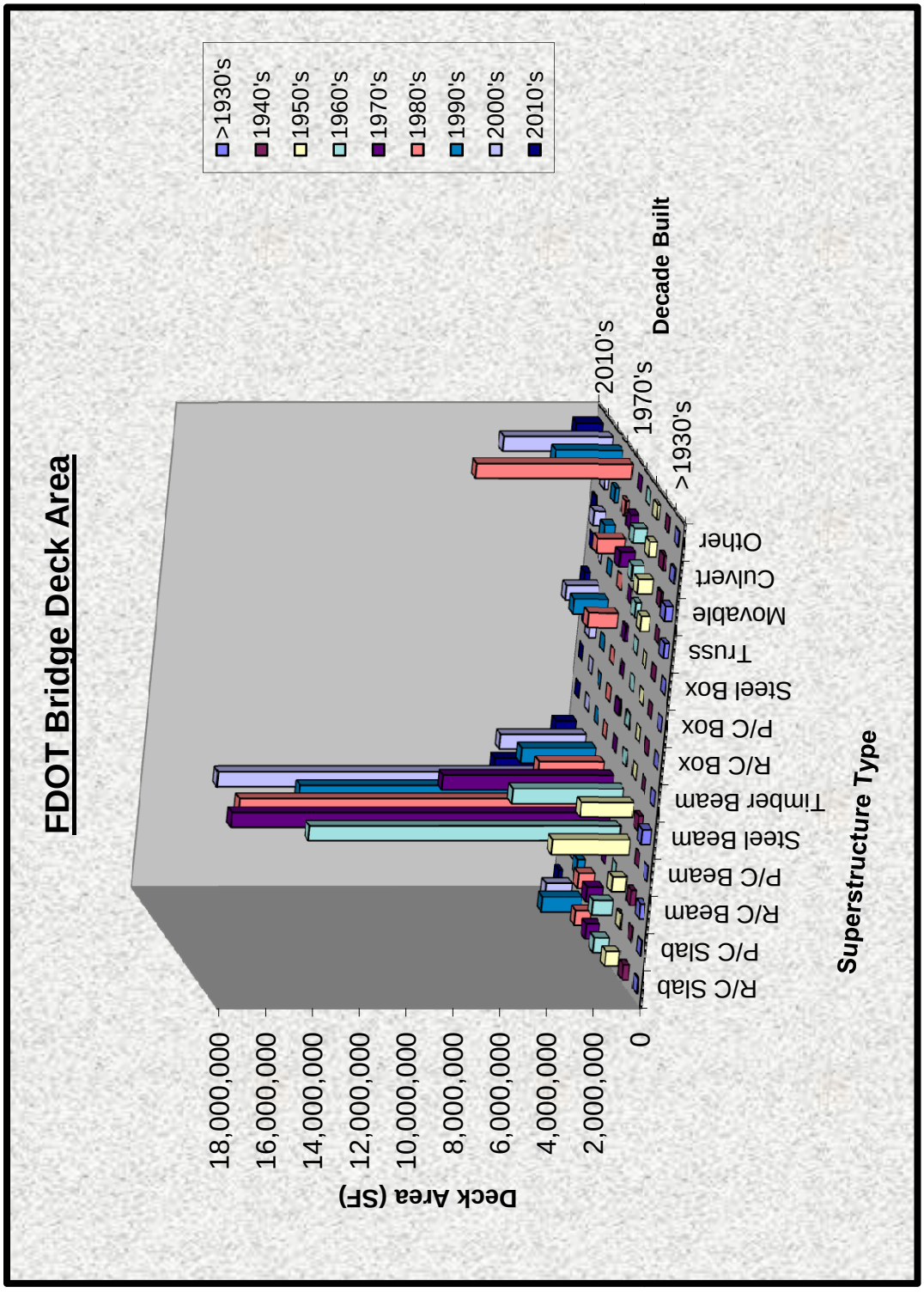
FDOT Bridge Deck Area
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Deck Area (SF)
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
Decade Built
2010's
1970's
>1930's
Superstructure Type
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber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

Figure 43

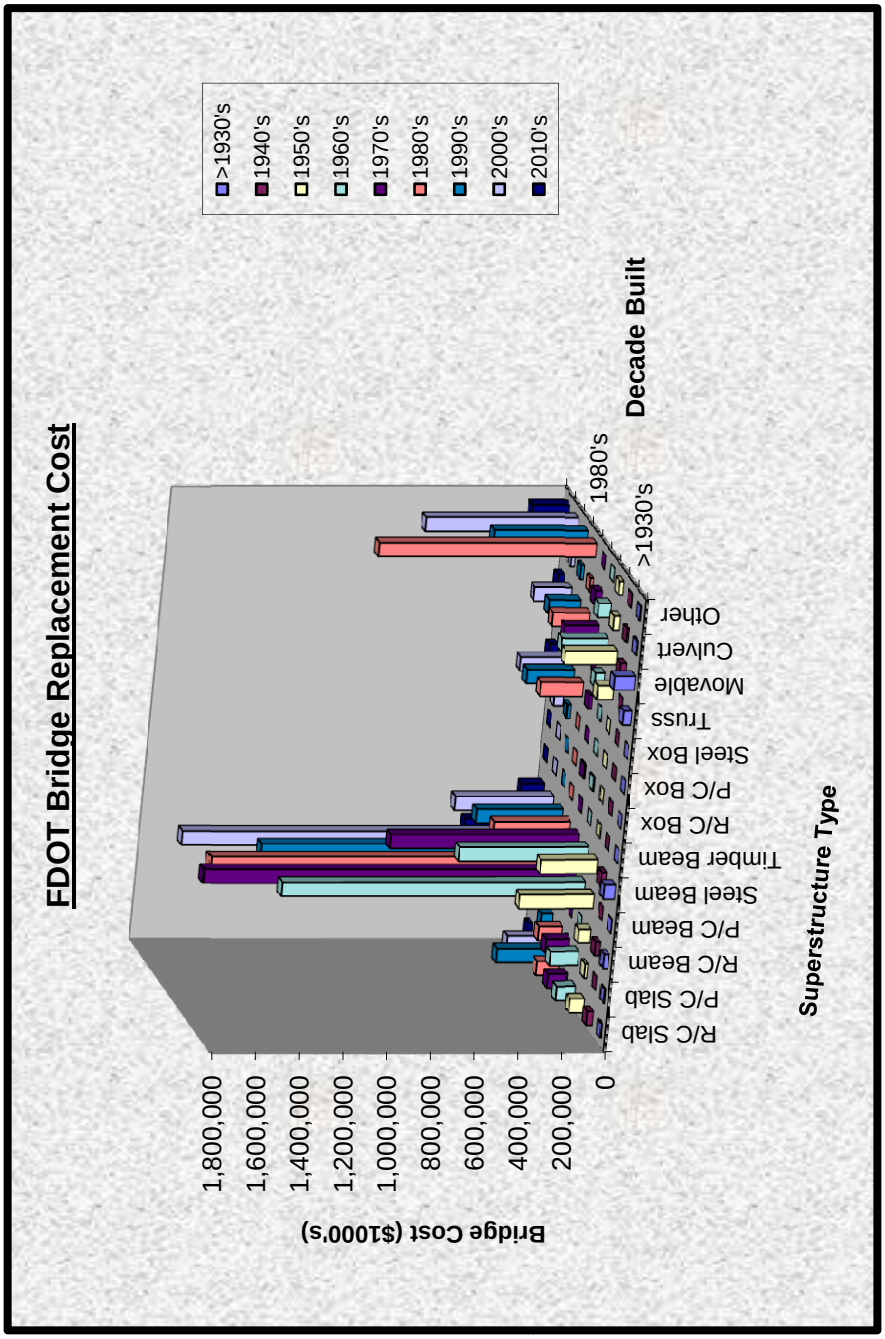
FDOT Bridge Replacement Cost
Bridge Cost ($1000's)
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Superstructure Type
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Decade Built
>1930's
1980's
>1930's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

Figure 44

FDOT Bridge Deck Area (Square Feet)									
	District								
	D1	D2	D3	D4	D5	D6	D7	D8	Total
>1930's	62,181	392,479	288,907	222,516	77,309	297,499	153,563	0	1,494,454
1940's	181,478	339,608	210,371	25,485	33,515	91,653	27,129	0	909,239
1950's	900,138	2,126,930	783,454	505,055	629,632	1,533,152	1,397,840	596,144	8,472,344
1960's	1,503,603	5,473,636	2,174,013	1,142,684	3,836,276	4,080,526	2,159,121	803,661	21,173,521
1970's	2,194,086	5,981,819	4,343,575	4,142,174	1,505,297	2,117,001	3,907,856	1,916,412	26,108,219
1980's	3,694,193	2,381,795	2,591,753	6,691,716	1,098,082	5,620,347	5,900,096	1,144,740	29,122,722
1990's	1,866,883	2,750,925	5,286,570	3,095,011	2,359,281	1,464,318	3,288,189	2,810,785	22,921,962
2000's	2,997,382	5,289,130	4,903,074	3,701,936	3,322,455	1,323,815	4,200,141	1,815,192	27,553,124
2010's	347,434	1,226,933	308,933	0	688,801	930,794	2,134,119	273,839	5,910,854
Total	13,747,377	25,963,255	20,890,649	19,526,578	13,550,648	17,459,105	23,168,054	9,360,773	143,666,440

Table 14

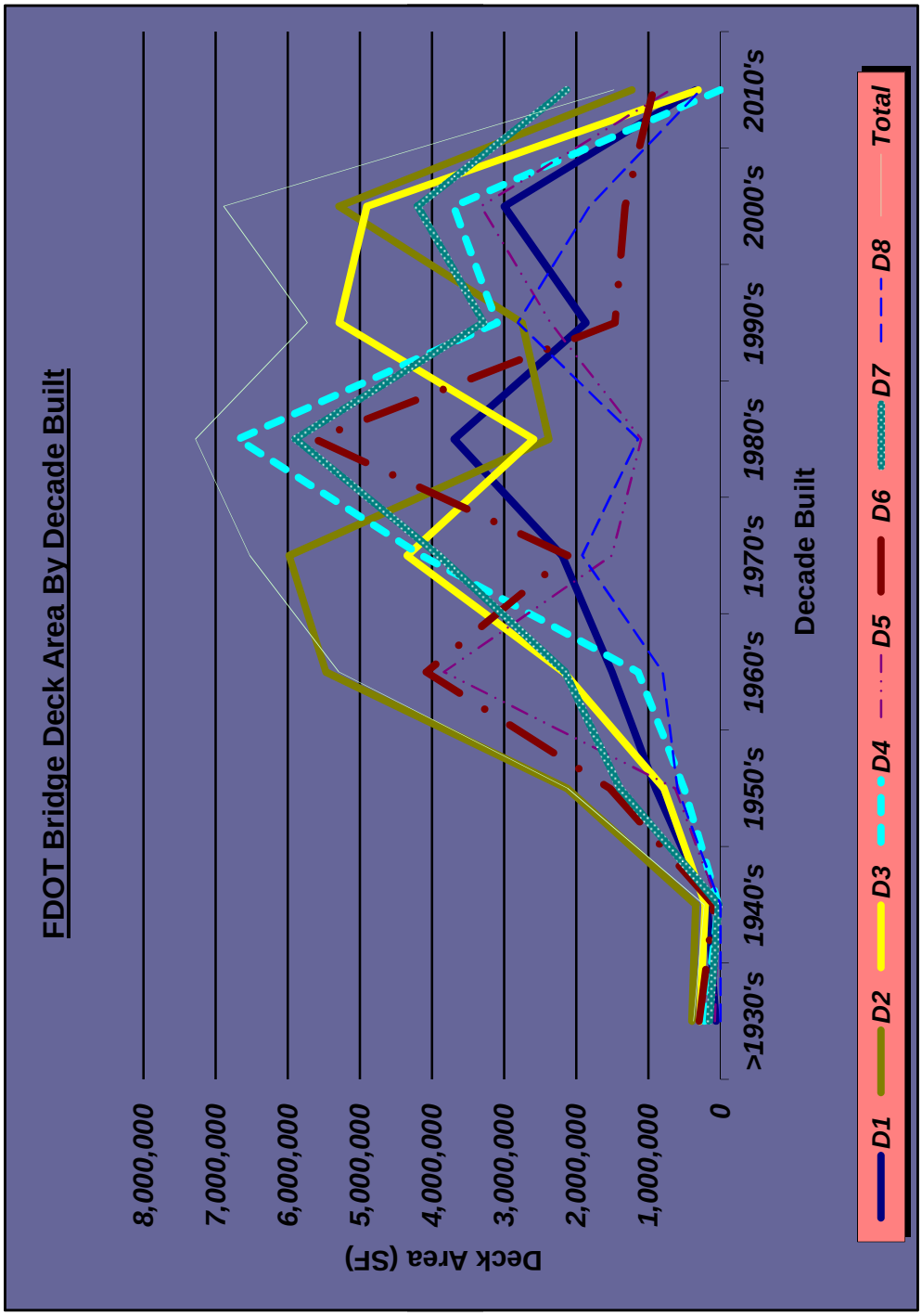
FDOT Bridge Deck Area By Decade Built
Deck Area (SF)
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
D8
Total

Figure 45

FDOT Bridge Replacement Cost ($1000's)									
	District								
	D1	D2	D3	D4	D5	D6	D7	D8	Total
>1930's	6,279	59,894	46,358	29,756	8,619	43,867	42,385	0	237,159
1940's	31,979	43,472	23,289	2,511	3,593	9,577	2,788	0	117,209
1950's	119,751	270,859	81,844	167,900	74,009	185,358	155,897	64,965	1,120,581
1960's	193,727	633,099	256,189	216,780	433,922	480,686	253,276	91,886	2,559,564
1970's	257,838	676,805	504,186	483,260	177,320	273,582	433,614	202,625	3,009,230
1980's	427,296	308,703	328,752	821,739	135,407	709,282	740,573	124,656	3,596,409
1990's	234,028	341,231	684,860	432,052	297,200	215,547	404,618	312,775	2,922,311
2000's	381,436	614,069	593,419	525,079	391,900	168,019	582,542	204,194	3,460,658
2010's	38,328	140,132	34,930	0	80,756	124,929	280,260	36,171	735,507
Total	1,690,662	3,088,263	2,553,827	2,679,077	1,602,727	2,210,847	2,895,952	1,037,272	4,439,657

Table 15

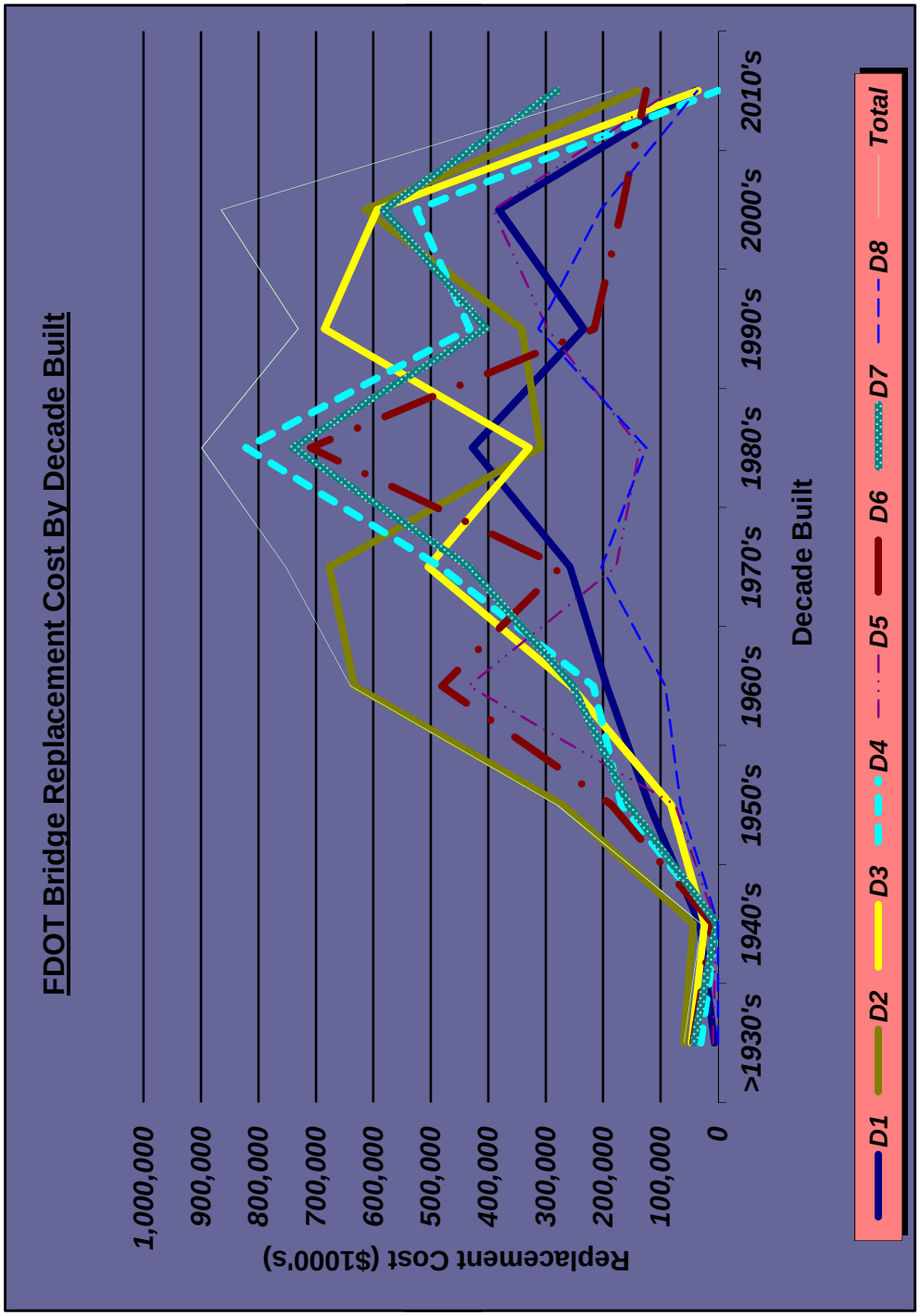
FDOT Bridge Replacement Cost By Decade Built
Replacement Cost ($1000's)
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
D8
Total

Figure 46

FDOT Inventory of Water Crossing (WC) vs. Non-Water Crossing (NWC) Bridges				
	Deck Area (SF)		Bridge Cost ($1000's)	
District	WC	NWC	WC	NWC
1	10,085,943	3,304,698	1,274,745	382,027
2	16,906,270	8,525,913	2,036,768	1,001,044
3	17,248,417	3,317,069	2,118,181	404,756
4	10,014,279	9,878,066	1,558,275	1,168,996
5	7,993,831	5,230,492	992,097	579,628
6	11,075,794	6,379,780	1,484,098	726,414
7	13,367,156	9,518,760	1,722,590	1,146,558
8	3,684,318	5,539,940	410,363	613,940
Total	90,376,007	51,694,719	11,597,117	6,023,364

Table 16

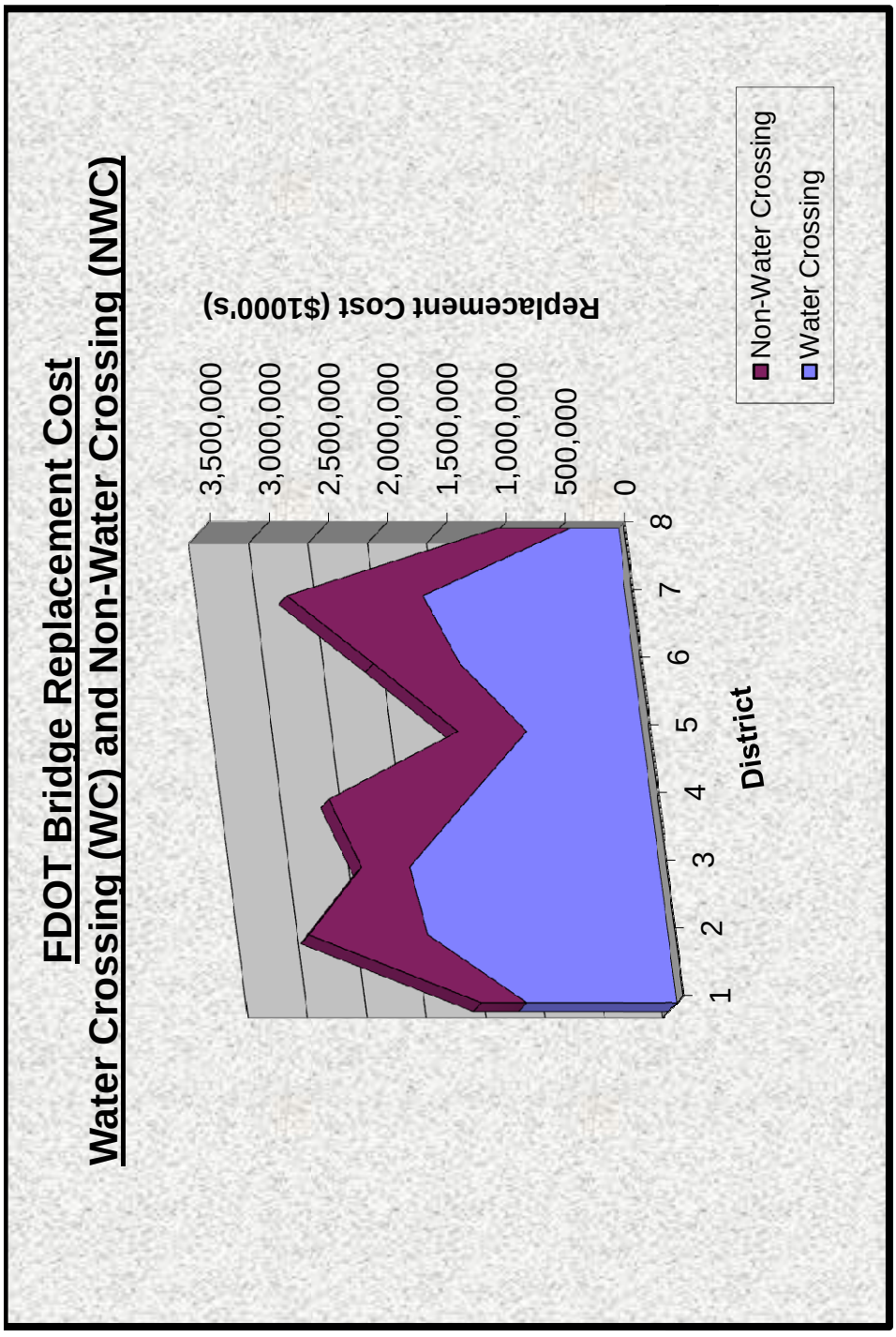
FDOT Bridge Replacement Cost
Water Crossing (WC) and Non-Water Crossing (NWC)
Replacement Cost ($1000's)
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1
2
3
4
5
6
7
8
District
Non-Water Crossing
Water Crossing

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 12,164 bridges accounted for in Florida. The FDOT has maintenance responsibility for 6,783 of the bridges, or 55.76%. County governments maintain 3,874 bridges (31.85%), city and towns maintain 1,217 bridges (10%), with the remaining 290 bridges (2.38%) maintained by others. 15.64% of all bridges currently in service in Florida were constructed prior to 1960; 38.14% were constructed in the 1960's and 1970's, while the remaining 46.18% 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 (38.14% 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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