Florida Department of Transportation

Bridge Inventory
2013 Annual Report

August 2013
State Maintenance Office
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Bridge Inventory - 2013 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 12,059 bridge-structures accounted for in the Florida DOT Bridge Management System. The FDOT has maintenance responsibility for 6,703 of the bridges, or 55.59%. County governments maintain 3,862 bridges (32.03%), city and towns maintain 1,213 bridges (10.06%), with the remaining 281 bridges (2.33%) maintained by others (see Figures 1 & 2).

The 6,703 bridges maintained by FDOT are divided by district and shown in Figures 3 & 4. District 2 has the most bridges, with 1,204 (17.96%), followed by District 5 (1038 bridges – 15.49%), District 1 (923 bridges – 13.77%), District 3 (801 bridges – 11.95%), District 4 (754 bridges - 11.25%), Turnpike District (700 bridges – 10.44%), District 7 (699 bridges – 10.43%), and District 6 (584 bridges – 8.71%). The number of bridges shown includes the 127 bridges maintained by the Dade County Expressway Authority (MDX) and 288 bridges maintained by the Orlando Orange County Expressway Authority (OOCEA).

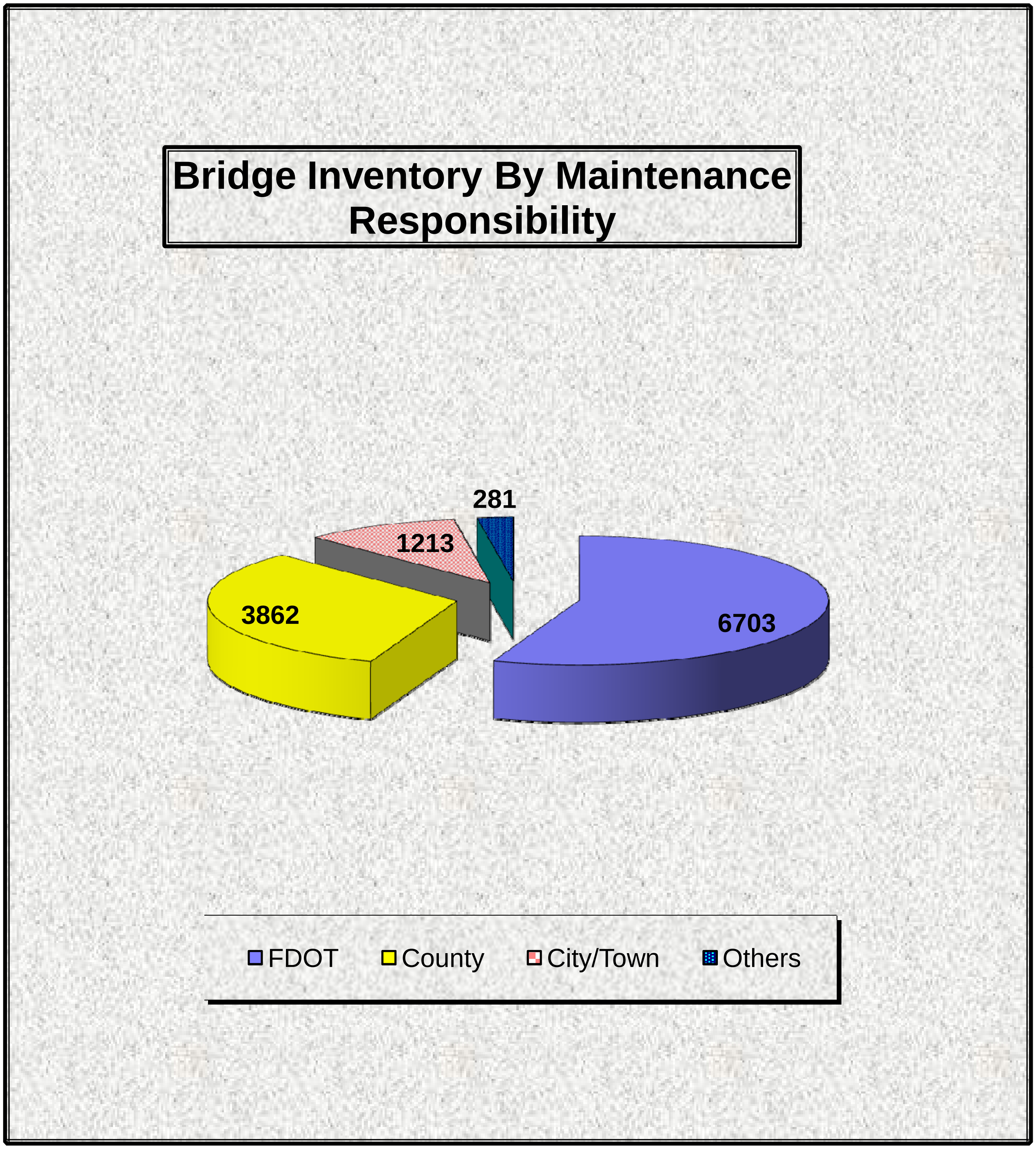


Figure 1

NOTE: The number of FDOT bridges includes 127MDX bridges and 288 OOCEA bridges.

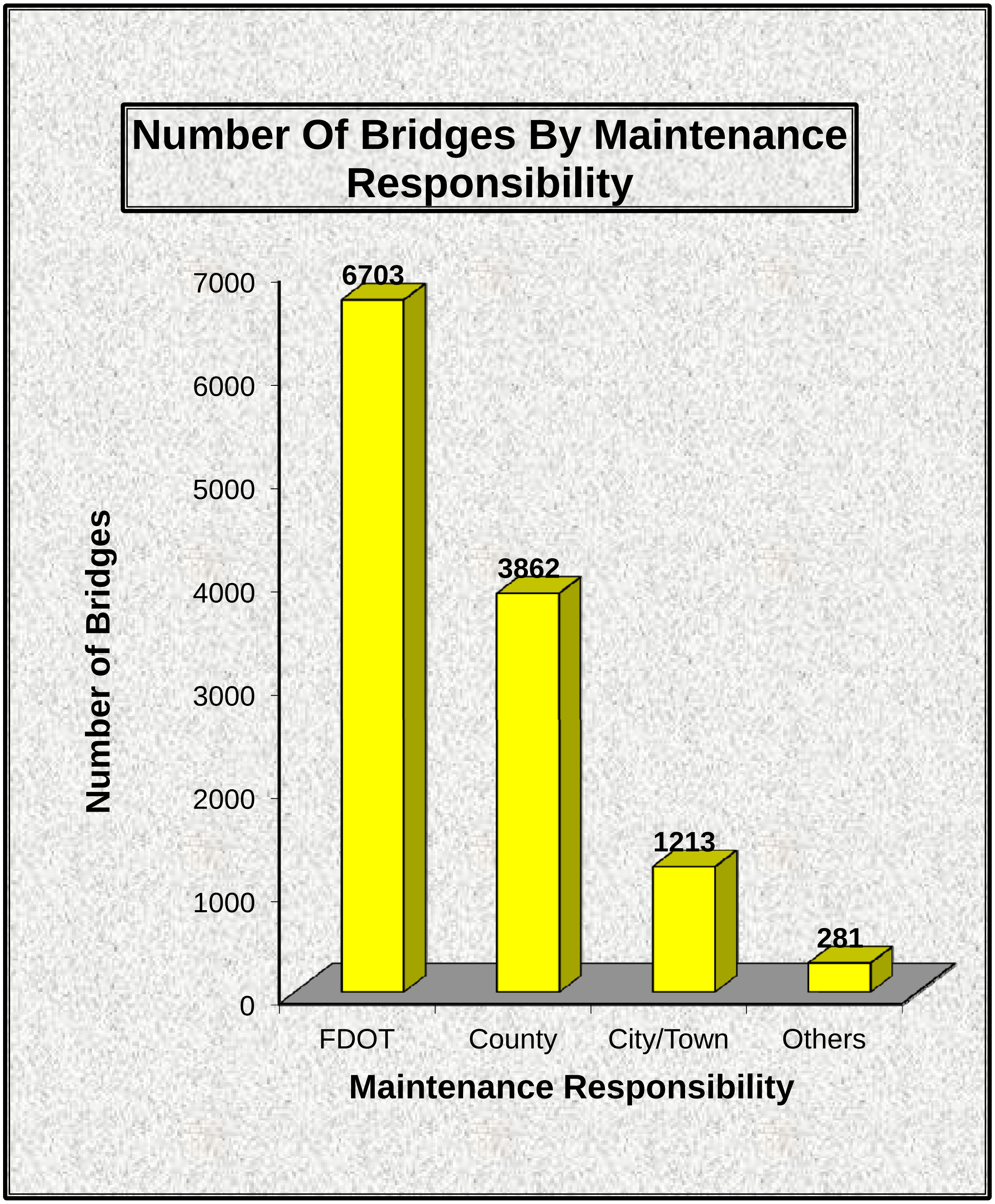


Figure 2

NOTE: The number of FDOT bridges includes 127MDX bridges and 288 OOCEA bridges.

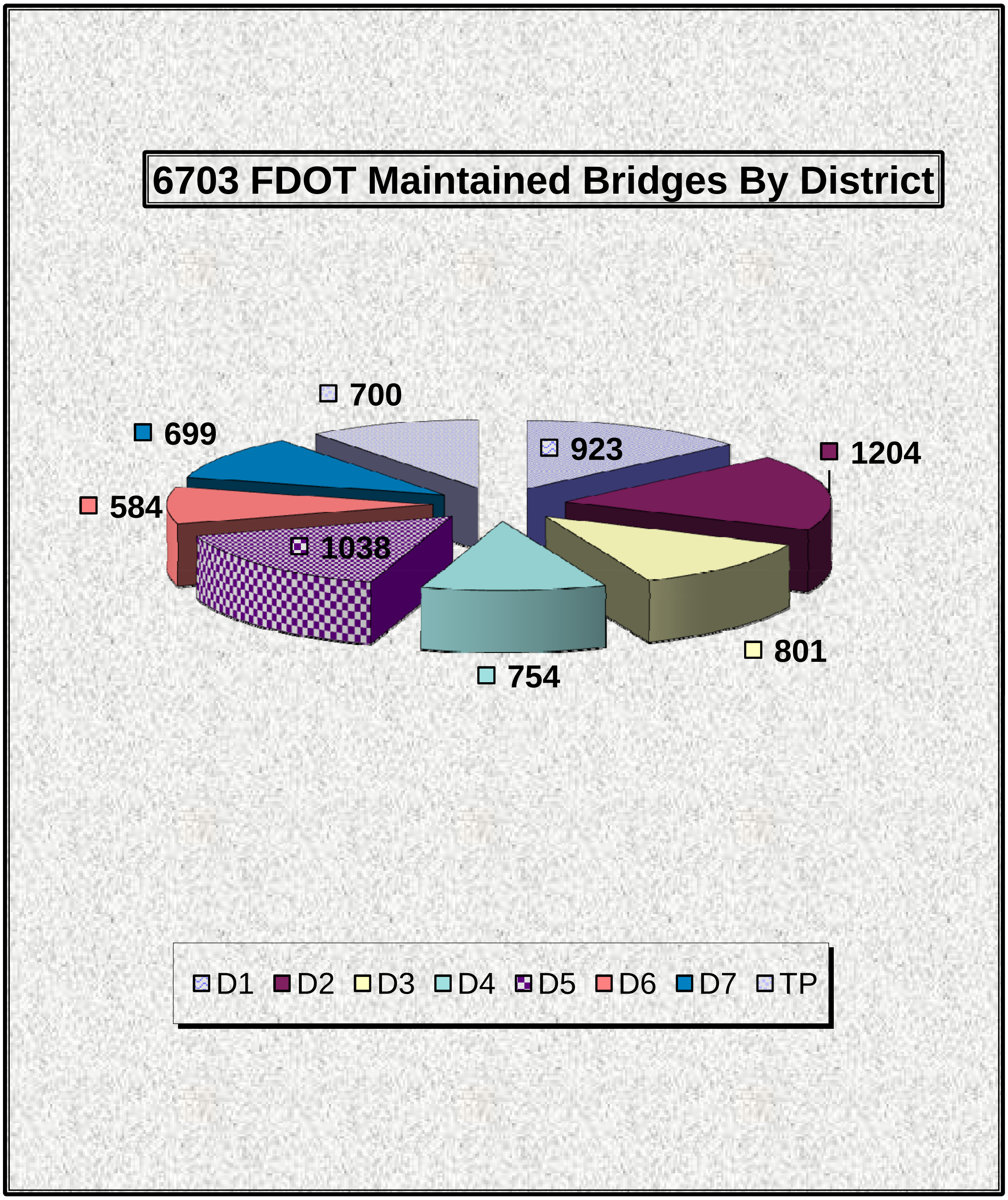


Figure 3

NOTE: The number of bridges includes 127 MDX bridges and 288 OOCEA bridges.

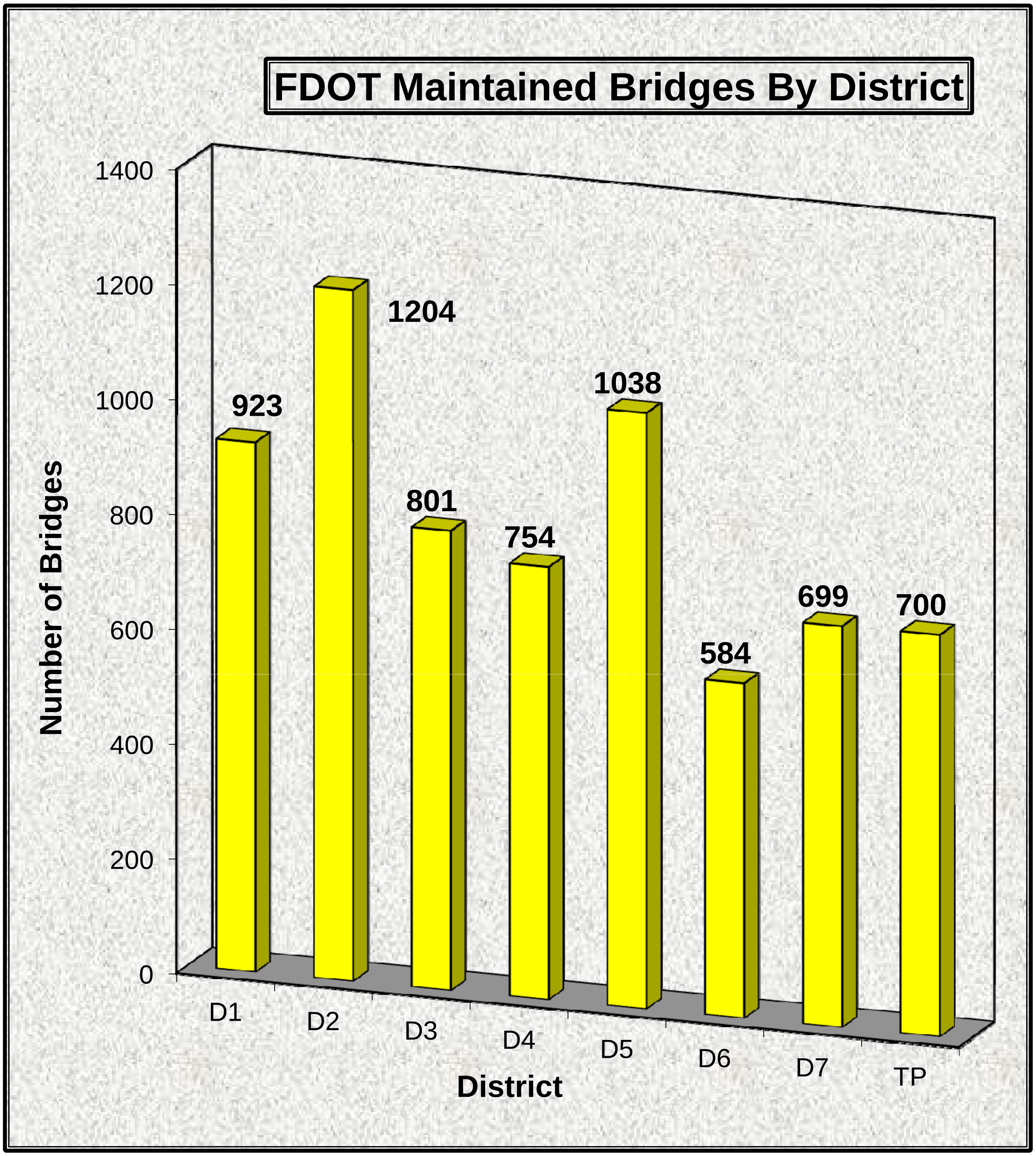


Figure 4

NOTE: The number of bridges includes 127 MDX bridges and 288 OOCEA bridges.

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 6,703 bridges maintained by FDOT, approximately 14.37% were constructed prior to 1960, about 41.64% were constructed in the 1960's and 1970's, with the remaining 44.00% having been built since 1980 (see Figure 5).

Similar results can be seen with the statewide bridge inventory of county government maintained bridges with 18.75% constructed prior to 1960, 34.88% constructed in the 1960's and 1970's, and 46.37% since 1980 (see Figure 6).

The city and town maintained bridges are very similar as well, with 18.63% constructed prior to 1960, 40.48% constructed in the 1960's and 1970's, and 40.89% since 1980 (see Figure 7).

An examination of the distribution of the decade of construction by FDOT District, for the 6,703 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 – 22.51%, District 1 – 23.62%, District 3 – 18.48%, District 5 – 9.25%, District 7 – 10.44%, District 4 – 6.50%, District 6 – 10.62%, and the Turnpike District – 6.57%. 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	160	97	47	0	0	4	0	308
1940s	221	139	24	2	0	0	0	386
1950s	582	488	155	11	0	0	0	1236
1960s	1516	831	210	21	7	0	1	2586
1970s	1275	516	281	7	10	0	8	2097
1980s	890	512	211	18	10	0	20	1661
1990s	905	661	146	41	9	0	24	1786
2000s	989	484	118	59	4	0	12	1666
2010s	165	134	21	5	8	0	0	333
Total	6703	3862	1213	164	48	4	65	12059

Table 1

NOTE: The number of bridges includes 127 MDX bridges and 288 OOCEA bridges.

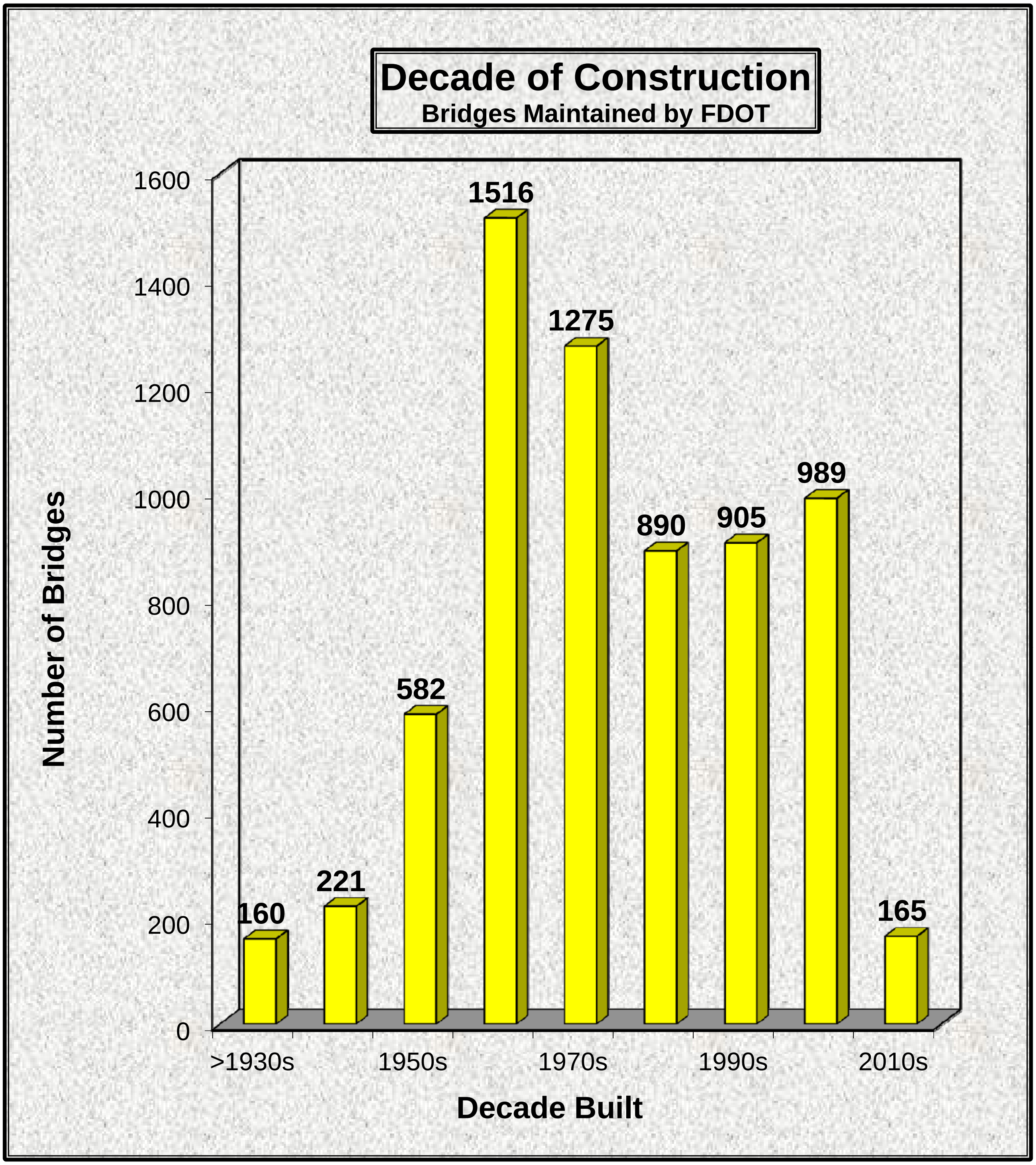


Figure 5

NOTE: The number of bridges includes 127 MDX bridges and 288 OOCEA bridges.

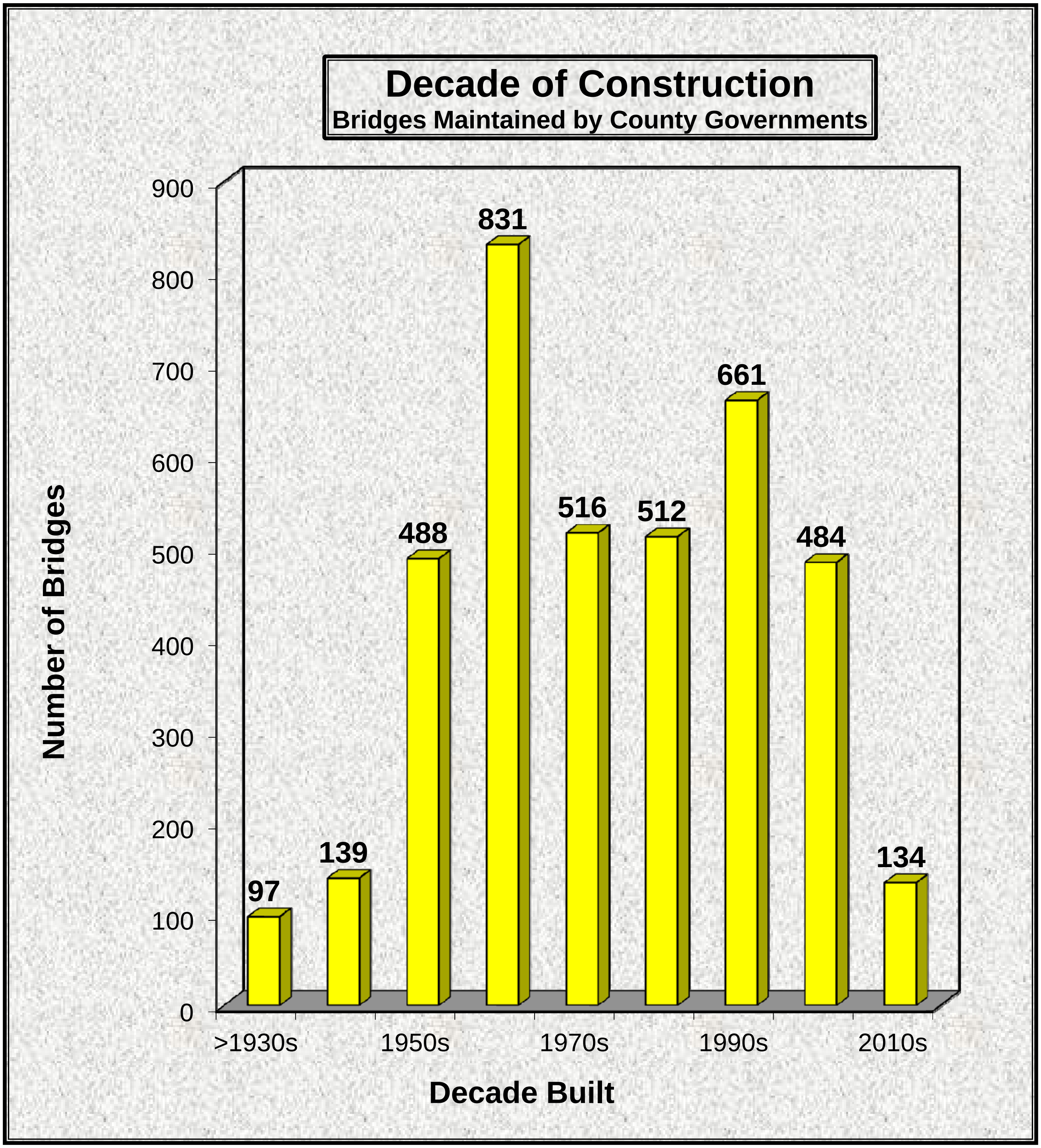

Decade of Construction
Bridges Maintained by County Governments
900
800
700
600
500
400
300
200
100
0
Number of Bridges
97
139
488
831
516
512
661
484
134
>1930s
1950s
1970s
1990s
2010s
Decade Built

Figure 6

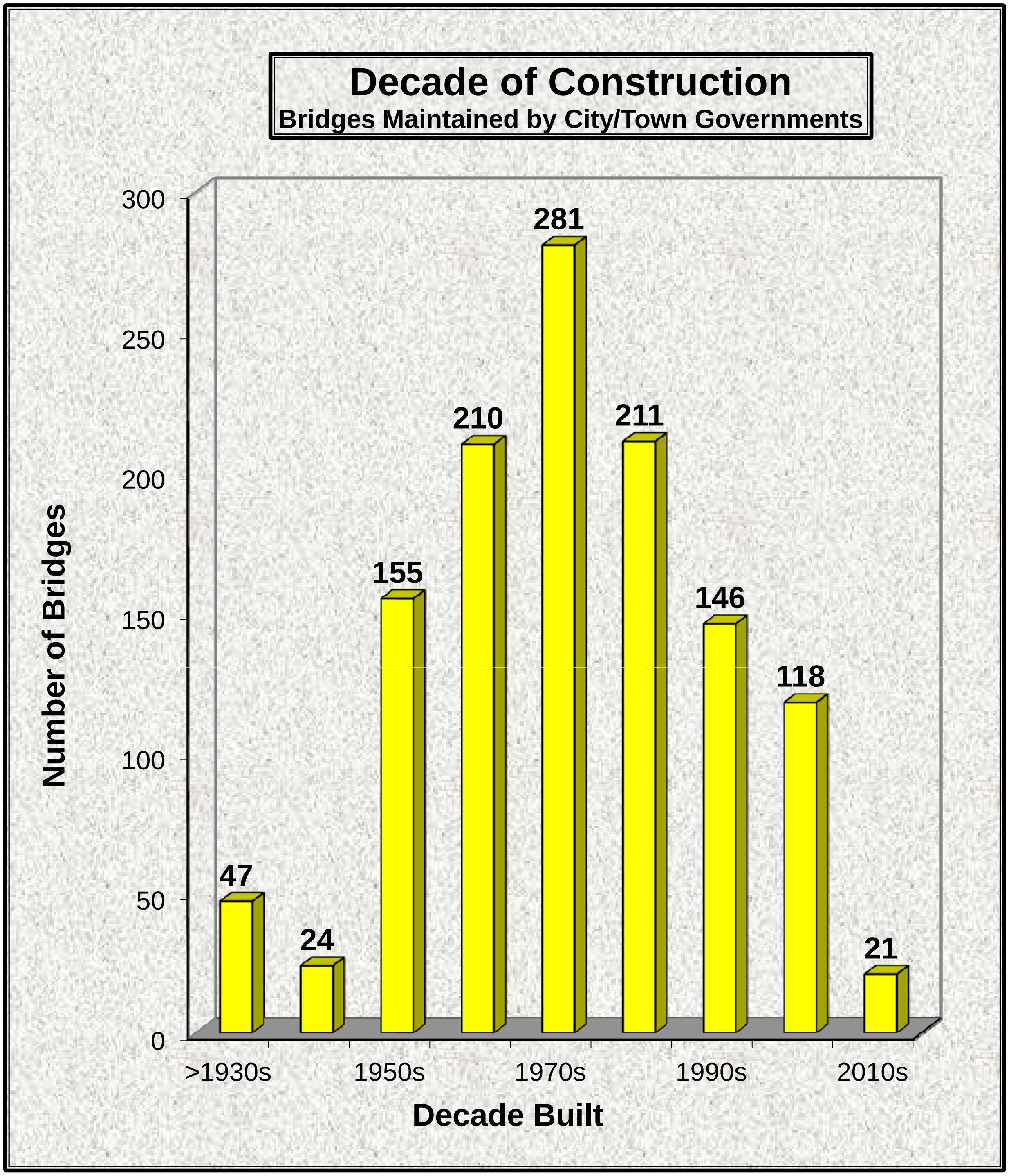

Decade of Construction
Bridges Maintained by City/Town Governments
Number of Bridges
300
250
200
150
100
50
0
47
24
155
210
281
211
146
118
21
>1930s
1950s
1970s
1990s
2010s
Decade Built

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	25	11	7	0	0	0	0	43
1940s	61	25	3	1	0	0	0	90
1950s	132	102	13	4	0	0	0	251
1960s	117	219	38	7	6	0	0	387
1970s	158	138	88	0	3	0	0	387
1980s	178	139	48	2	5	0	0	372
1990s	137	136	26	6	8	0	0	313
2000s	98	99	19	4	0	0	0	220
2010s	17	39	5	0	0	0	0	61
Total	923	908	247	24	22	0	0	2124
District 2								
>1930s	60	16	6	0	0	0	0	82
1940s	62	52	3	0	0	0	0	117
1950s	149	122	36	7	0	0	0	314
1960s	420	97	38	1	0	0	0	556
1970s	193	41	29	3	0	0	1	267
1980s	44	47	25	1	0	0	0	117
1990s	100	49	20	3	0	0	0	172
2000s	147	51	36	3	0	0	1	238
2010s	29	11	2	0	0	0	0	42
Total	1204	486	195	18	0	0	2	1905
District 3								
>1930s	12	25	0	0	0	0	0	37
1940s	61	35	2	1	0	0	0	99
1950s	75	145	5	0	0	0	0	225
1960s	116	173	6	6	0	0	0	301
1970s	289	103	9	4	2	0	0	407
1980s	58	76	8	14	0	0	1	157
1990s	103	200	12	28	0	0	0	343
2000s	70	158	7	47	1	0	0	283
2010s	17	29	0	4	0	0	0	50
Total	801	944	49	104	3	0	1	1902
District 4								
>1930s	6	5	6	0	0	0	0	17
1940s	4	3	6	0	0	0	0	13
1950s	39	48	62	0	0	0	0	149
1960s	76	77	63	2	0	0	0	218
1970s	164	76	68	0	0	0	0	308
1980s	227	74	54	0	0	0	0	355
1990s	96	107	16	0	0	0	0	219
2000s	128	58	12	0	0	0	0	198
2010s	14	12	5	0	0	0	0	31
Total	754	460	292	2	0	0	0	1508

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	24	10	3	0	0	0	0	37
1940s	13	13	3	0	0	0	0	29
1950s	59	27	5	0	0	0	0	91
1960s	290	63	11	2	0	0	1	367
1970s	142	39	47	0	0	0	7	235
1980s	79	79	39	1	2	0	19	219
1990s	154	66	27	3	0	0	24	274
2000s	235	58	22	5	1	0	10	331
2010s	42	25	8	0	8	0	0	83
Total	1038	380	165	11	11	0	61	1666
District 6								
>1930s	4	20	9	0	0	4	0	37
1940s	10	7	4	0	0	0	0	21
1950s	48	25	14	0	0	0	0	87
1960s	238	97	16	3	1	0	0	355
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	22	8	0	0	0	0	103
2010s	20	10	0	1	0	0	0	31
Total	584	253	94	5	1	4	0	941
District 7								
>1930s	29	10	16	0	0	0	0	55
1940s	10	4	3	0	0	0	0	17
1950s	34	19	20	0	0	0	0	73
1960s	137	105	38	0	0	0	0	280
1970s	114	87	24	0	5	0	0	230
1980s	171	71	20	0	3	0	0	265
1990s	64	89	35	0	1	0	0	189
2000s	122	38	14	0	2	0	1	177
2010s	18	8	1	0	0	0	0	27
Total	699	431	171	0	11	0	1	1313
District 8								
>1930s	0	0	0	0	0	0	0	0
1940s	0	0	0	0	0	0	0	0
1950s	46	0	0	0	0	0	0	46
1960s	122	0	0	0	0	0	0	122
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	116	0	0	0	0	0	0	116
2010s	8	0	0	0	0	0	0	8
Total	700	0	0	0	0	0	0	700

Table 3

NOTE: The number of FDOT bridges includes 127 MDX bridges and 288 OOCEA bridges.

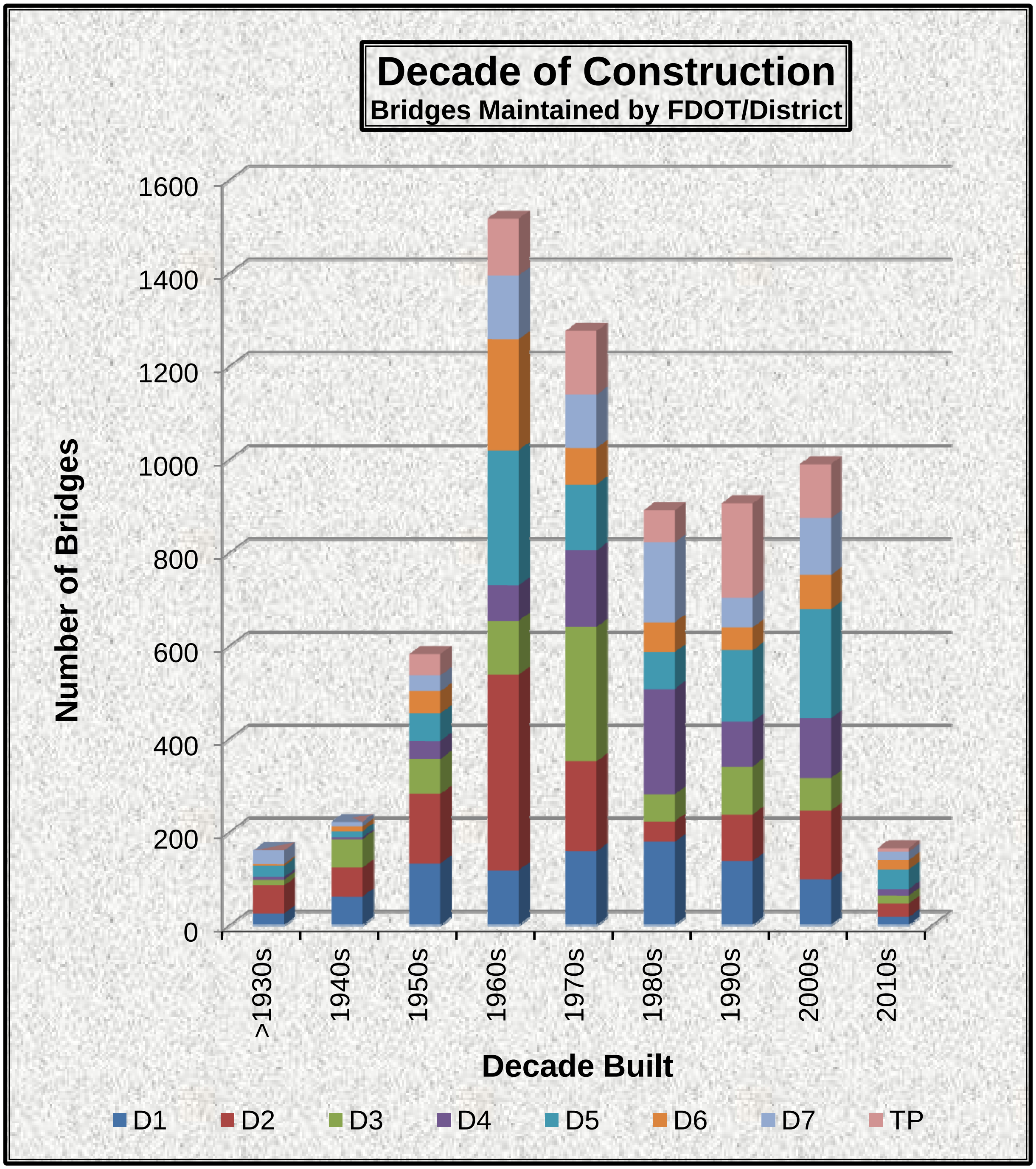

Decade of Construction
Bridges Maintained by FDOT/District
Number of Bridges
0
200
400
600
800
1000
1200
1400
1600
>1930s
1940s
1950s
1960s
1970s
1980s
1990s
2000s
2010s
Decade Built
D1
D2
D3
D4
D5
D6
D7
TP

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 16.46% of the total inventory. Similarly, slab bridges maintained by counties are 35.45%, and by cities and towns are 54.66%.

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 61.93% of the state maintained inventory, 34.75% of the county bridges, and 25.39% 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, 0.36% 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 16.53% of the state maintained bridges. County inventories include 26.75% culverts, and city/towns include 16.98% 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 1.39% 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	777	644	219	15	8	0	1	1664
PSC Slab	326	725	444	13	13	4	10	1535
RC Beam	102	133	80	1	0	0	1	317
PSC Beam	3388	666	182	16	8	0	49	4309
Steel Beam	660	148	26	30	6	0	1	871
Timber Beam	1	395	20	37	0	0	0	453
RC Box	10	1	0	0	0	0	0	11
PSC Box	105	3	0	0	0	0	0	108
Steel Box	118	9	4	0	0	0	0	131
Truss	3	14	1	40	0	0	0	58
Movable	93	39	7	1	1	0	0	141
Culvert	1108	1033	206	3	11	0	3	2364
Other	12	52	24	8	1	0	0	97
Total	6703	3862	1213	164	48	4	65	12059

Table 4

NOTE: The number of FDOT bridges includes 127 MDX bridges and 288 OOCEA bridges.

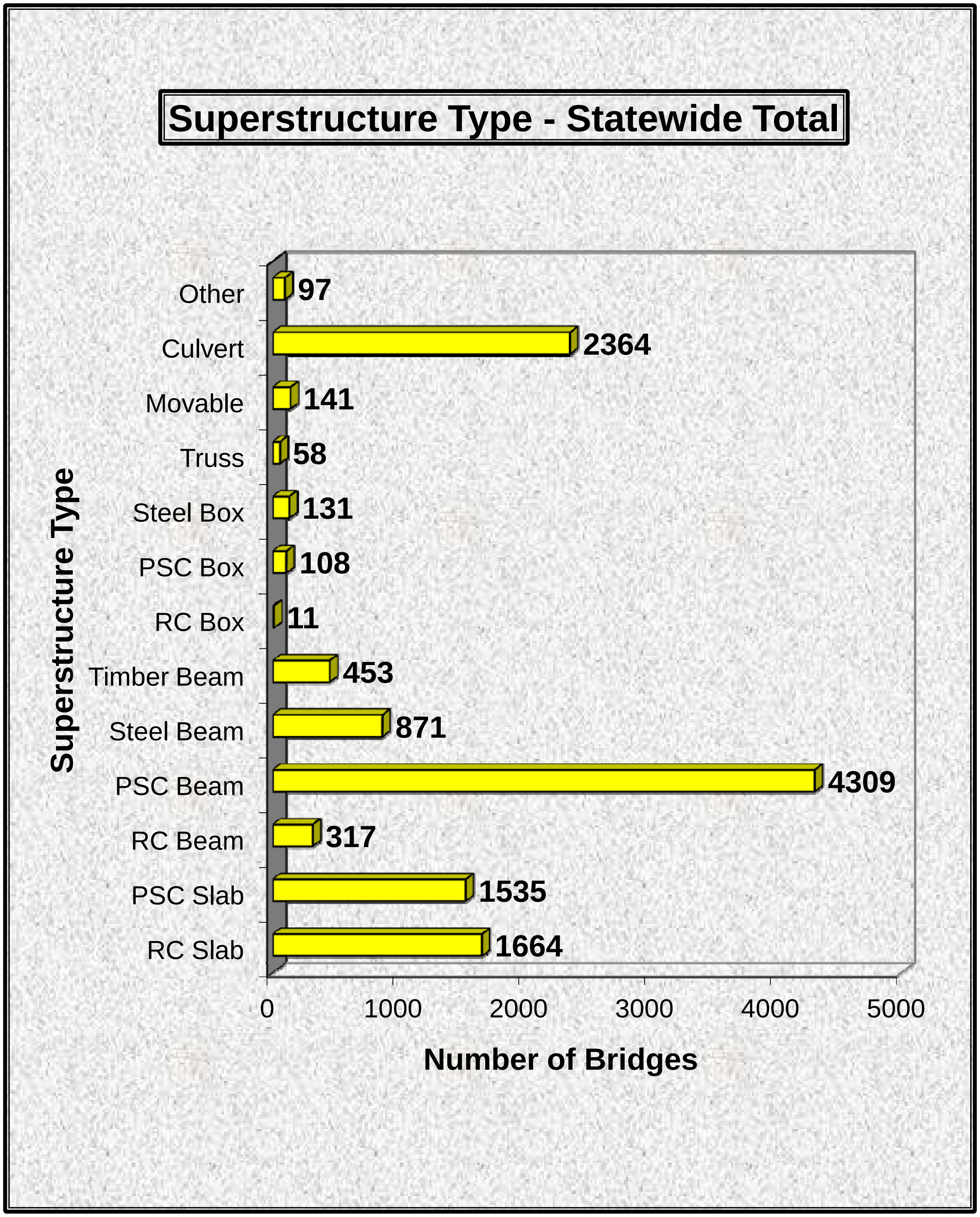

Superstructure Type - Statewide Total
Superstructure Type
Other
97
Culvert
2364
Movable
141
Truss
58
Steel Box
131
PSC Box
108
RC Box
11
Timber Beam
453
Steel Beam
871
PSC Beam
4309
RC Beam
317
PSC Slab
1535
RC Slab
1664
0
1000
2000
3000
4000
5000
Number of Bridges

Figure 9

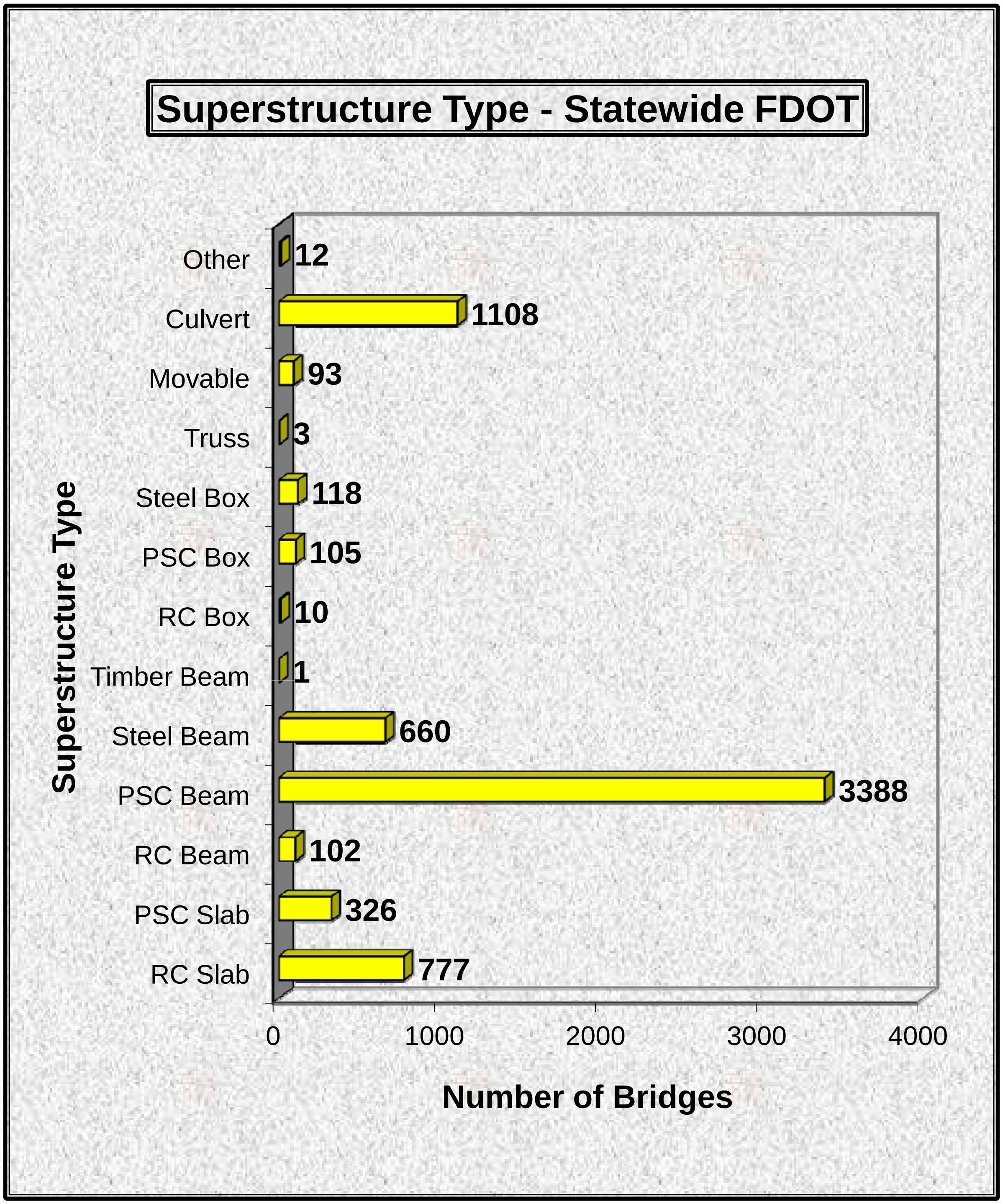

Superstructure Type - Statewide FDOT
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
12
1108
93
3
118
105
10
1
660
3388
102
326
777
0
1000
2000
3000
4000
Number of Bridges

Figure 10

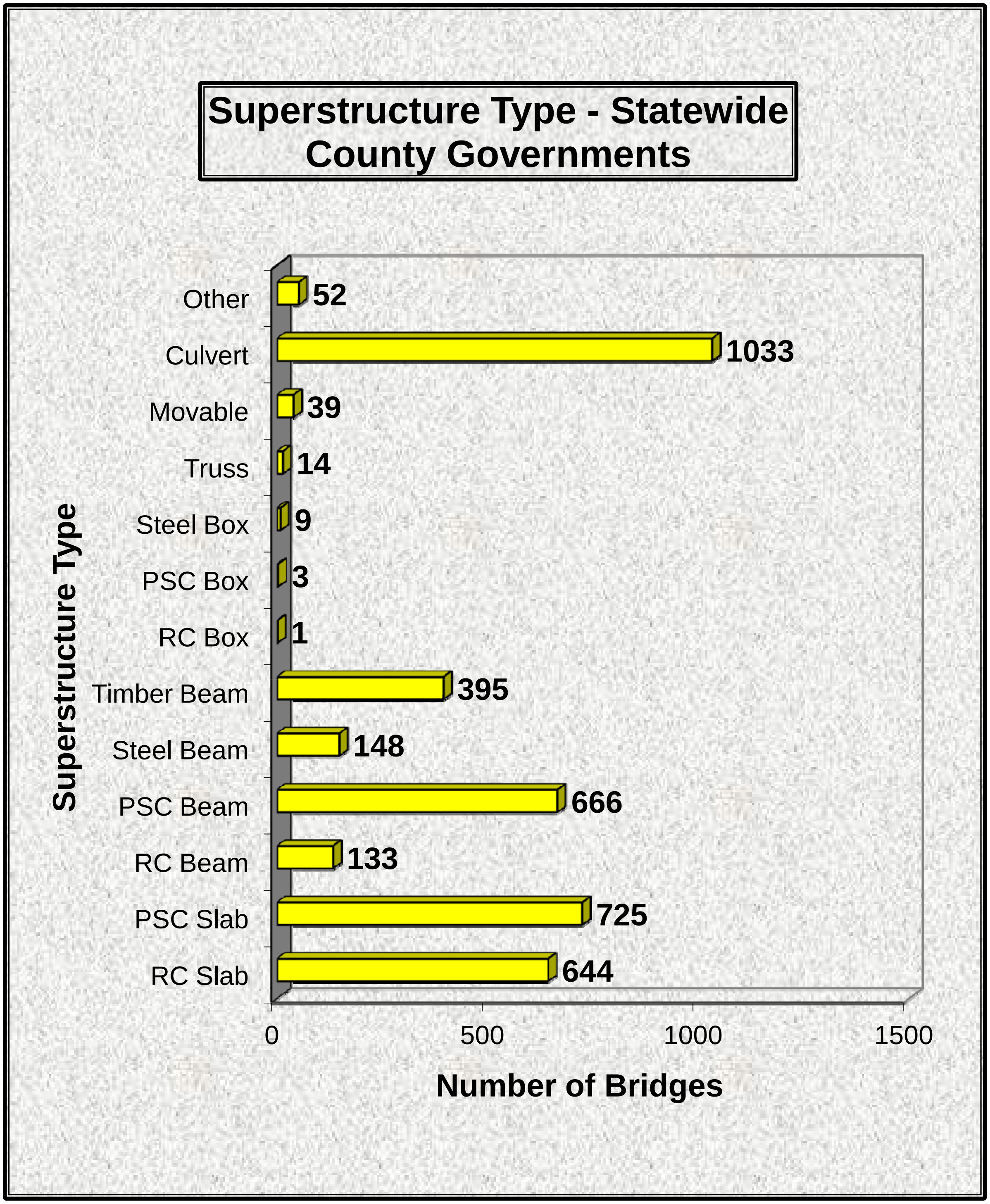

Superstructure Type - Statewide
County Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
52
1033
39
14
9
3
1
395
148
666
133
725
644
0
500
1000
1500
Number of Bridges

Figure 11

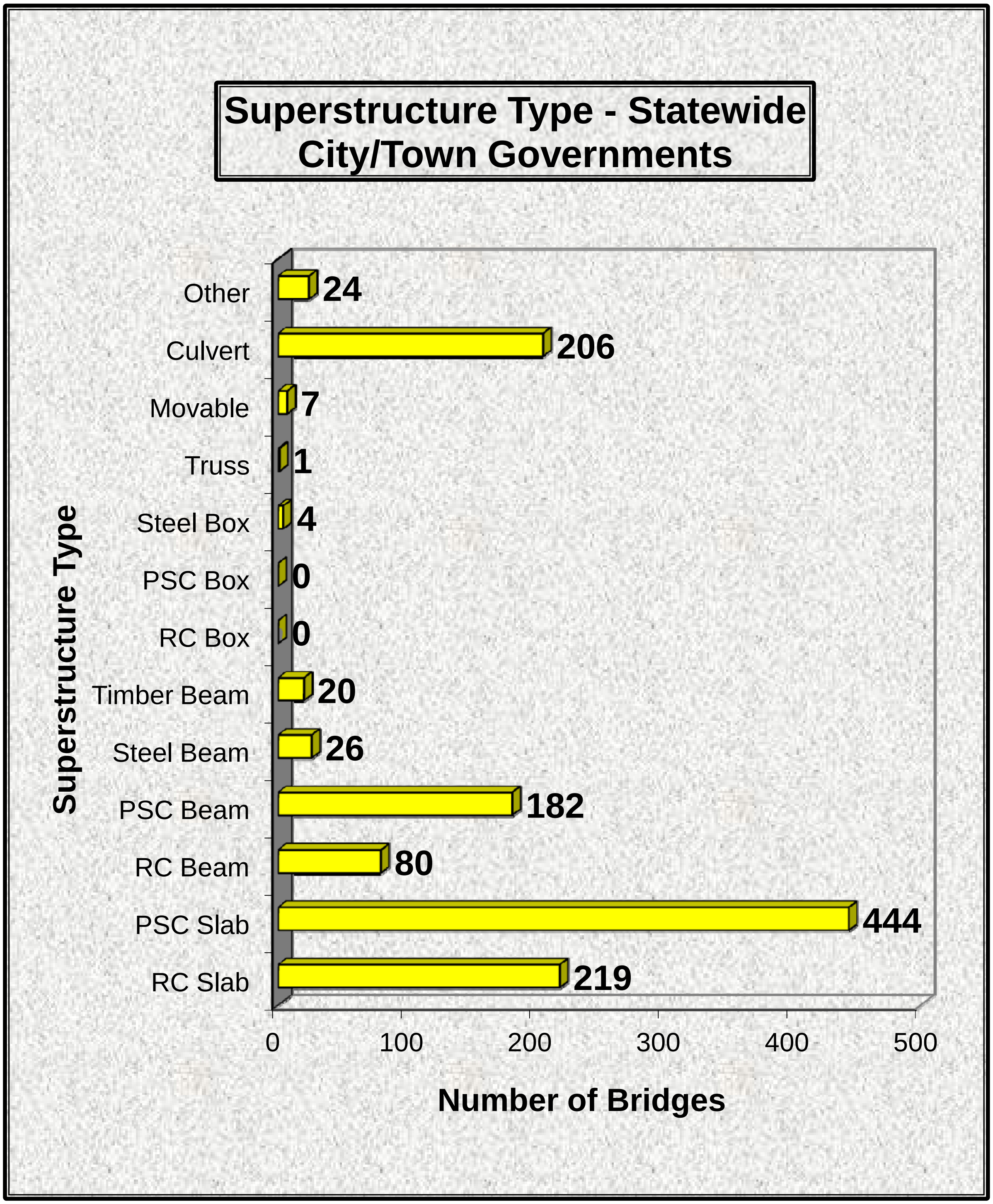

Superstructure Type - Statewide
City/Town Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
24
206
7
1
4
0
0
20
26
182
80
444
219
0
100
200
300
400
500
Number of Bridges

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 5,572 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 1,642 bridges, 29.47% of the total. 15.29% of the FDOT bridges fall into the 0 to 5,000 square foot range; 32.11% are in the 5,000 to 10,000 square foot range; and 23.13% 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 70.61% of their bridges under 5,000 square feet; with 16.38% between 5,000 and 10,000 square feet; 7.53% between 10,000 to 20,000 square feet; and only 5.47% over 20,000 square feet (see Figure 14). The results for the City/Town and Others groups are similar; with 76.88% 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, 31.13% of the District 1 bridges are less than 5,000 square feet and only 14.78% of their bridges are over 20,000 square feet. In contrast, only 13.92% of District 4 bridges are less than 5,000 square feet, while 32.77% 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	534	133	97	1	0	1	790
1,000-2,500	182	787	360	39	12	4	8	1392
2,500-5,000	646	666	275	13	9	0	11	0
5,000-7,500	923	294	93	4	8	0	12	1334
7,500-10,000	866	167	40	1	3	0	9	1086
10,000-20,000	1642	212	59	5	0	0	14	1932
20,000-40,000	712	91	22	0	0	0	2	827
40,000-80,000	309	40	13	1	1	0	5	369
80,000-160,000	155	14	4	1	3	0	0	177
>160,000	113	9	0	0	0	0	0	122
Total	5572	2814	999	161	37	4	62	9649

Table 5

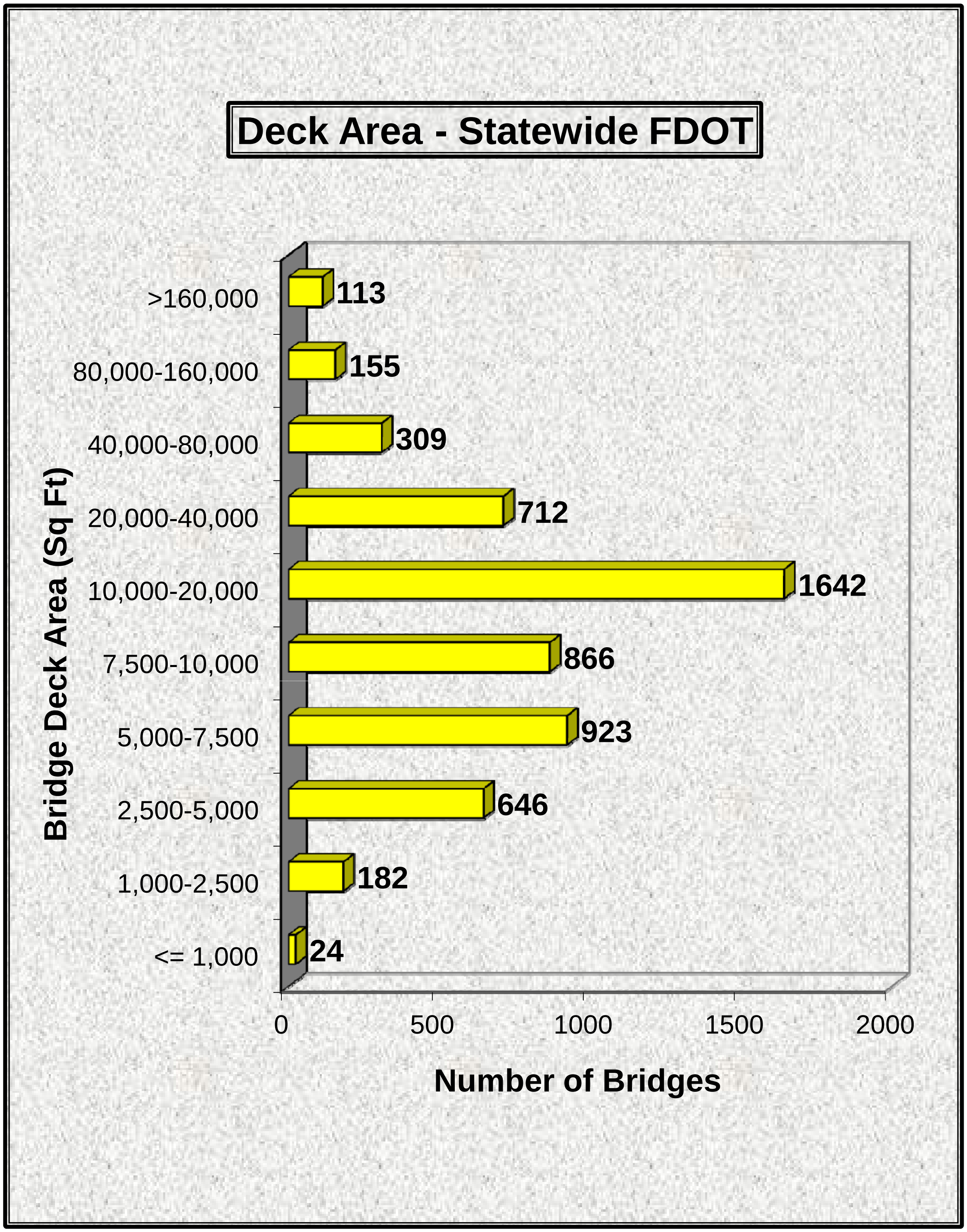
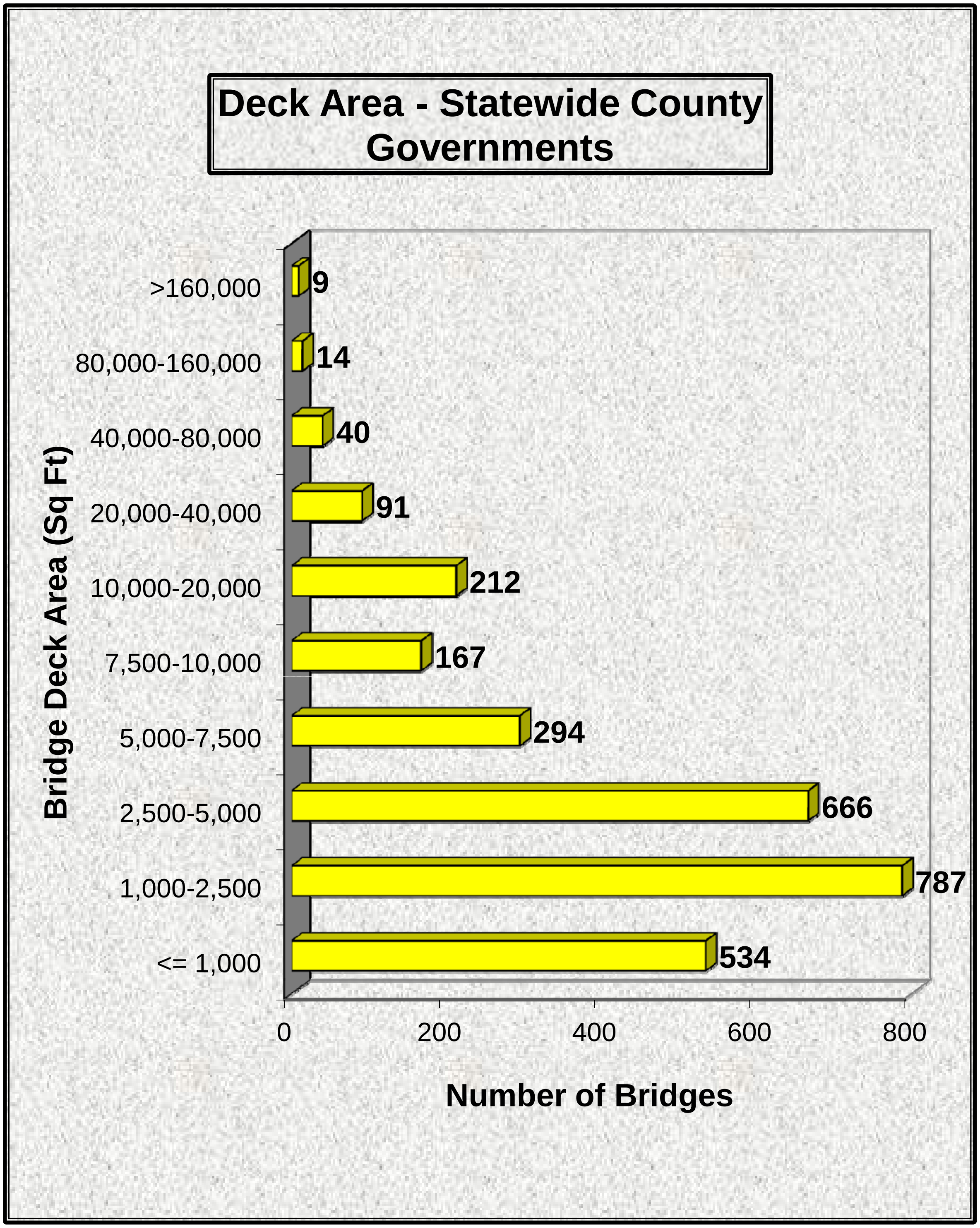
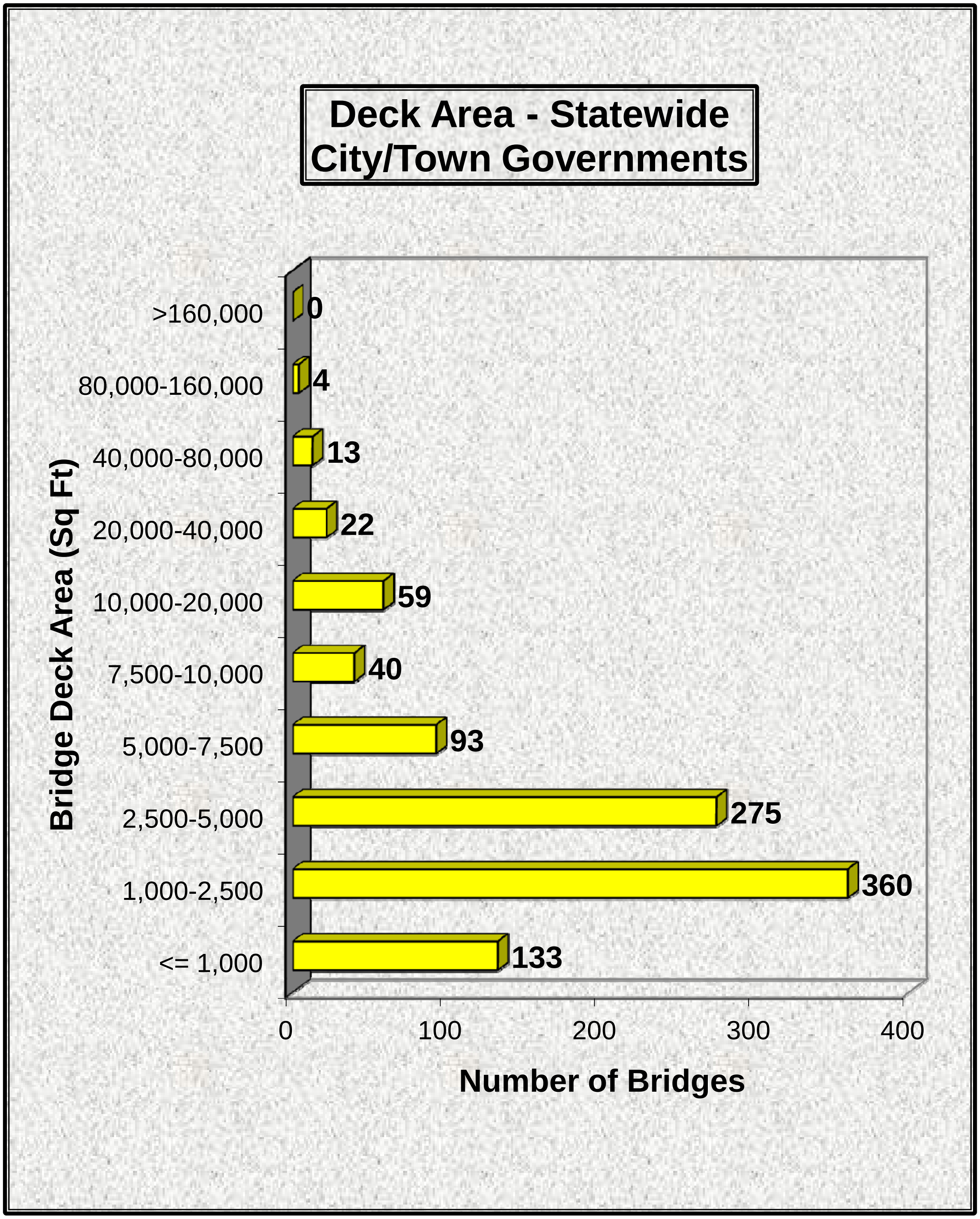

Deck Area - Statewide FDOT
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
113
155
309
712
1642
866
923
646
182
24
0
500
1000
1500
2000
Number of Bridges

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
9
14
40
91
212
167
294
666
787
534
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
4
13
22
59
40
93
275
360
133
0
100
200
300
400
Number of Bridges

Figure 15

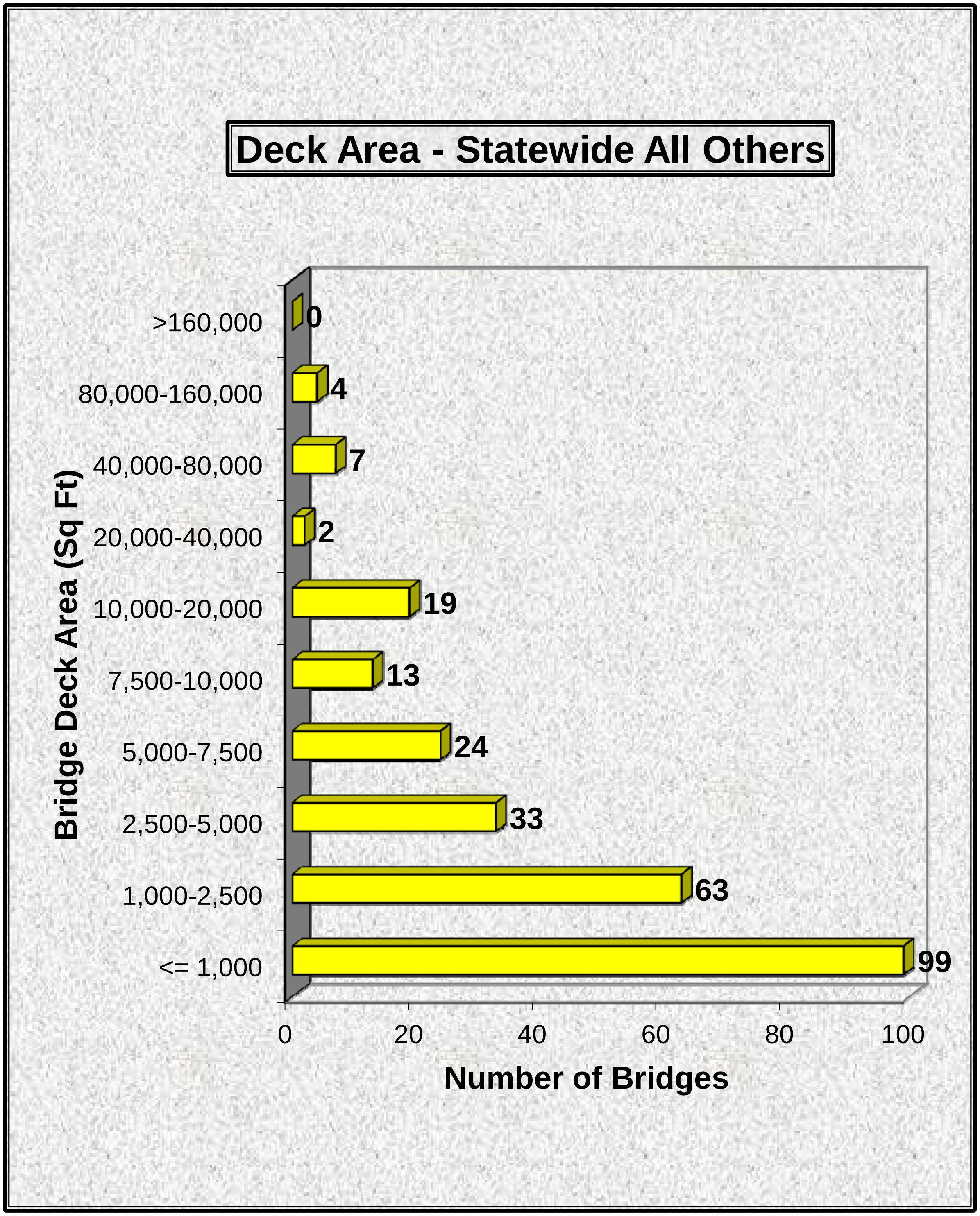

Deck Area - Statewide All Others
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
4
7
2
19
13
24
33
63
99
0
20
40
60
80
100
Number of Bridges

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	114	30	5	0	0	0	157
1,000-2,500	77	207	61	7	10	0	0	362
2,500-5,000	132	169	75	6	8	0	0	390
5,000-7,500	115	51	26	2	3	0	0	197
7,500-10,000	97	32	4	0	0	0	0	133
10,000-20,000	165	34	7	3	0	0	0	209
20,000-40,000	57	17	0	0	0	0	0	74
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	697	636	203	23	21	0	0	1580
District 2								
<= 1,000	5	59	12	13	0	0	0	89
1,000-2,500	26	62	61	2	0	0	0	151
2,500-5,000	93	62	26	1	0	0	0	182
5,000-7,500	162	24	13	0	0	0	0	199
7,500-10,000	169	11	14	0	0	0	0	194
10,000-20,000	267	12	9	0	0	0	2	290
20,000-40,000	93	6	6	0	0	0	0	105
40,000-80,000	44	3	3	1	0	0	0	51
80,000-160,000	35	0	0	1	0	0	0	36
>160,000	20	1	0	0	0	0	0	21
Total	914	240	144	18	0	0	2	1318
District 3								
<= 1,000	5	257	7	74	1	0	0	344
1,000-2,500	11	208	10	24	0	0	0	253
2,500-5,000	60	121	10	5	0	0	0	196
5,000-7,500	106	50	2	0	0	0	0	158
7,500-10,000	100	25	0	1	0	0	0	126
10,000-20,000	151	25	2	0	0	0	0	178
20,000-40,000	61	11	1	0	0	0	0	73
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	566	703	35	104	3	0	0	1411
District 4								
<= 1,000	0	19	49	0	0	0	0	68
1,000-2,500	22	112	115	0	0	0	0	249
2,500-5,000	77	140	88	1	0	0	0	306
5,000-7,500	69	66	13	1	0	0	0	149
7,500-10,000	57	24	7	0	0	0	0	88
10,000-20,000	253	49	12	0	0	0	0	314
20,000-40,000	139	22	1	0	0	0	0	162
40,000-80,000	59	5	0	0	0	0	0	64
80,000-160,000	20	2	0	0	0	0	0	22
>160,000	15	0	0	0	0	0	0	15
Total	711	439	285	2	0	0	0	1437

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	21	13	3	0	0	1	39
1,000-2,500	17	52	39	4	0	0	8	120
2,500-5,000	92	63	28	0	1	0	11	195
5,000-7,500	177	27	17	1	1	0	12	235
7,500-10,000	160	33	8	0	0	0	9	210
10,000-20,000	246	35	19	1	0	0	12	313
20,000-40,000	99	14	3	0	0	0	2	118
40,000-80,000	36	7	4	0	0	0	5	52
80,000-160,000	22	1	2	0	1	0	0	26
>160,000	13	0	0	0	0	0	0	13
Total	863	253	133	9	3	0	60	1321
District 6								
<= 1,000	1	19	4	2	0	0	0	26
1,000-2,500	12	70	32	2	0	4	0	120
2,500-5,000	64	64	28	0	0	0	0	156
5,000-7,500	67	35	13	0	0	0	0	115
7,500-10,000	60	16	4	0	0	0	0	80
10,000-20,000	170	18	5	1	0	0	0	194
20,000-40,000	118	9	4	0	0	0	0	131
40,000-80,000	47	6	2	0	1	0	0	56
80,000-160,000	27	2	0	0	0	0	0	29
>160,000	13	4	0	0	0	0	0	17
Total	579	243	92	5	1	4	0	924
District 7								
<= 1,000	4	45	18	0	0	0	0	67
1,000-2,500	13	76	42	0	2	0	0	133
2,500-5,000	29	47	20	0	0	0	0	96
5,000-7,500	78	41	9	0	4	0	0	132
7,500-10,000	110	26	3	0	3	0	0	142
10,000-20,000	190	39	5	0	0	0	0	234
20,000-40,000	93	12	7	0	0	0	0	112
40,000-80,000	51	10	2	0	0	0	0	63
80,000-160,000	20	1	1	0	0	0	0	22
>160,000	13	3	0	0	0	0	0	16
Total	601	300	107	0	9	0	0	1017
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	149	0	0	0	0	0	0	149
7,500-10,000	113	0	0	0	0	0	0	113
10,000-20,000	200	0	0	0	0	0	0	200
20,000-40,000	52	0	0	0	0	0	0	52
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

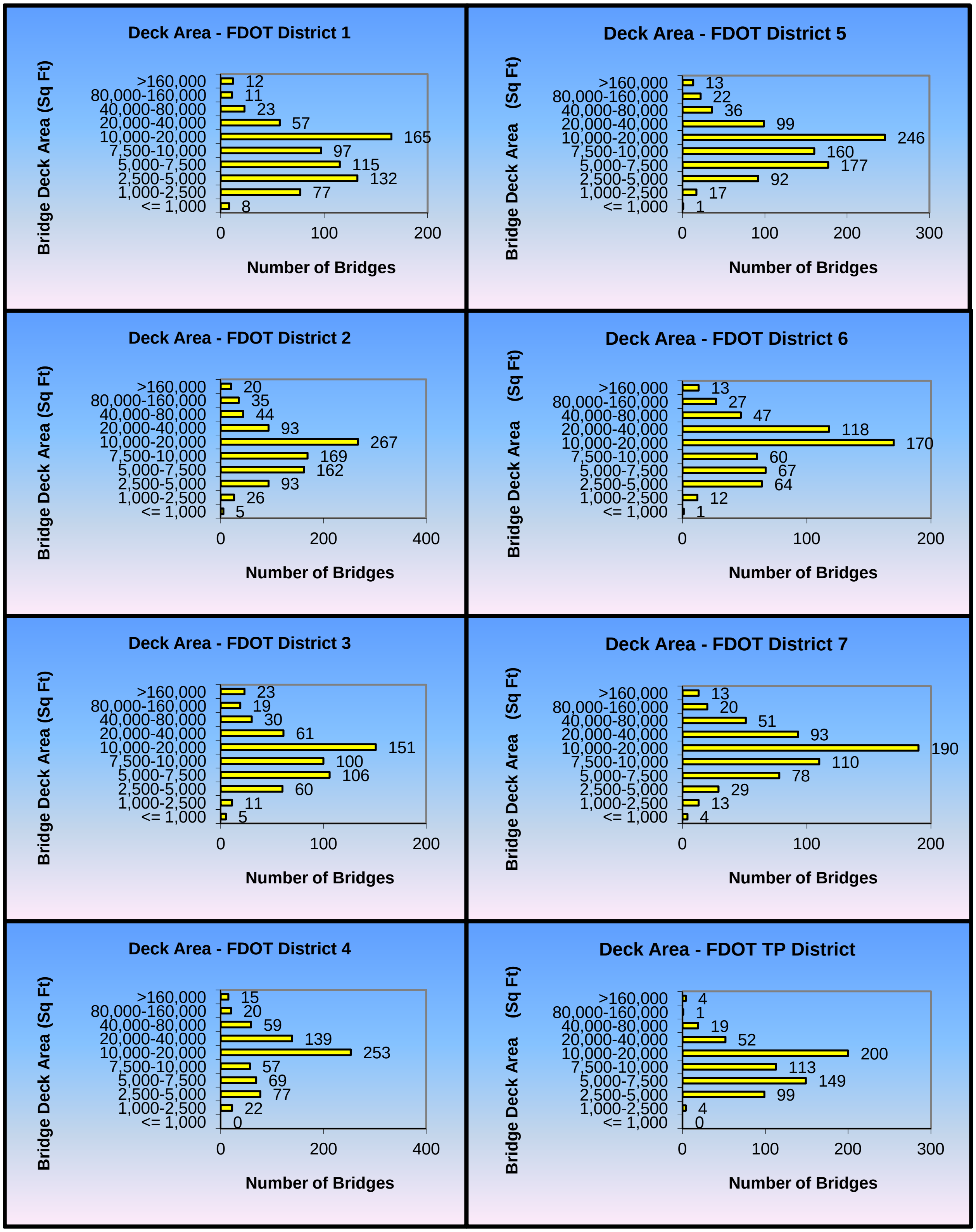

Deck Area - FDOT District 1
Bridge Deck Area (Sq Ft)
>160,000 12
80,000-160,000 11
40,000-80,000 23
20,000-40,000 57
10,000-20,000 165
7,500-10,000 97
5,000-7,500 115
2,500-5,000 132
1,000-2,500 77
<= 1,000 8
0 100 200
Number of Bridges
Deck Area - FDOT District 5
Bridge Deck Area (Sq Ft)
>160,000 13
80,000-160,000 22
40,000-80,000 36
20,000-40,000 99
10,000-20,000 246
7,500-10,000 160
5,000-7,500 177
2,500-5,000 92
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 44
20,000-40,000 93
10,000-20,000 267
7,500-10,000 169
5,000-7,500 162
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 27
40,000-80,000 47
20,000-40,000 118
10,000-20,000 170
7,500-10,000 60
5,000-7,500 67
2,500-5,000 64
1,000-2,500 12
<= 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 30
20,000-40,000 61
10,000-20,000 151
7,500-10,000 100
5,000-7,500 106
2,500-5,000 60
1,000-2,500 11
<= 1,000 5
0 100 200
Number of Bridges
Deck Area - FDOT District 7
Bridge Deck Area (Sq Ft)
>160,000 13
80,000-160,000 20
40,000-80,000 51
20,000-40,000 93
10,000-20,000 190
7,500-10,000 110
5,000-7,500 78
2,500-5,000 29
1,000-2,500 13
<= 1,000 4
0 100 200
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 59
20,000-40,000 139
10,000-20,000 253
7,500-10,000 57
5,000-7,500 69
2,500-5,000 77
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 52
10,000-20,000 200
7,500-10,000 113
5,000-7,500 149
2,500-5,000 99
1,000-2,500 4
<= 1,000 0
0 100 200 300
Number of Bridges

Figure 17

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 95.17% of the FDOT maintained bridges are in excellent or good condition. However, the number drops to 87.29% for County bridges, 86.97% for City/Town bridges, and 89.32% 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	761	338	76	6	10	0	8	1199
	Good	5618	3033	979	132	36	4	55	9857
	Fair	249	342	107	17	1	0	1	717
	Poor	75	149	51	9	1	0	1	286
	Total	6703	3862	1213	164	48	4	65	12059
District 1	Excellent	55	78	17	0	0	0	0	150
	Good	837	771	222	21	22	0	0	1873
	Fair	28	48	5	3	0	0	0	84
	Poor	3	11	3	0	0	0	0	17
	Total	923	908	247	24	22	0	0	2124
District 2	Excellent	57	30	10	0	0	0	0	97
	Good	1079	315	149	7	0	0	1	1551
	Fair	53	89	22	7	0	0	0	171
	Poor	15	52	14	4	0	0	1	86
	Total	1204	486	195	18	0	0	2	1905
District 3	Excellent	88	62	2	5	0	0	0	157
	Good	661	710	40	90	3	0	1	1505
	Fair	31	123	5	5	0	0	0	164
	Poor	21	49	2	4	0	0	0	76
	Total	801	944	49	104	3	0	1	1902
District 4	Excellent	148	50	10	1	0	0	0	209
	Good	572	379	218	0	0	0	0	1169
	Fair	20	28	53	1	0	0	0	102
	Poor	14	3	11	0	0	0	0	28
	Total	754	460	292	2	0	0	0	1508
District 5	Excellent	114	51	17	0	8	0	7	197
	Good	863	297	139	10	3	0	53	1365
	Fair	46	19	6	1	0	0	1	73
	Poor	15	13	3	0	0	0	0	31
	Total	1038	380	165	11	11	0	61	1666
District 6	Excellent	124	39	10	0	0	0	0	173
	Good	436	183	69	4	0	4	0	696
	Fair	21	23	3	0	1	0	0	48
	Poor	3	8	12	1	0	0	0	24
	Total	584	253	94	5	1	4	0	941
District 7	Excellent	104	28	10	0	2	0	1	145
	Good	553	378	142	0	8	0	0	1081
	Fair	39	12	13	0	0	0	0	64
	Poor	3	13	6	0	1	0	0	23
	Total	699	431	171	0	11	0	1	1313
District 8	Excellent	71	0	0	0	0	0	0	71
	Good	617	0	0	0	0	0	0	617
	Fair	11	0	0	0	0	0	0	11
	Poor	1	0	0	0	0	0	0	1
	Total	700	0	0	0	0	0	0	700

Table 8

NOTE: The number of FDOT bridges includes 127 MDX bridges and 288 OOCEA bridges.

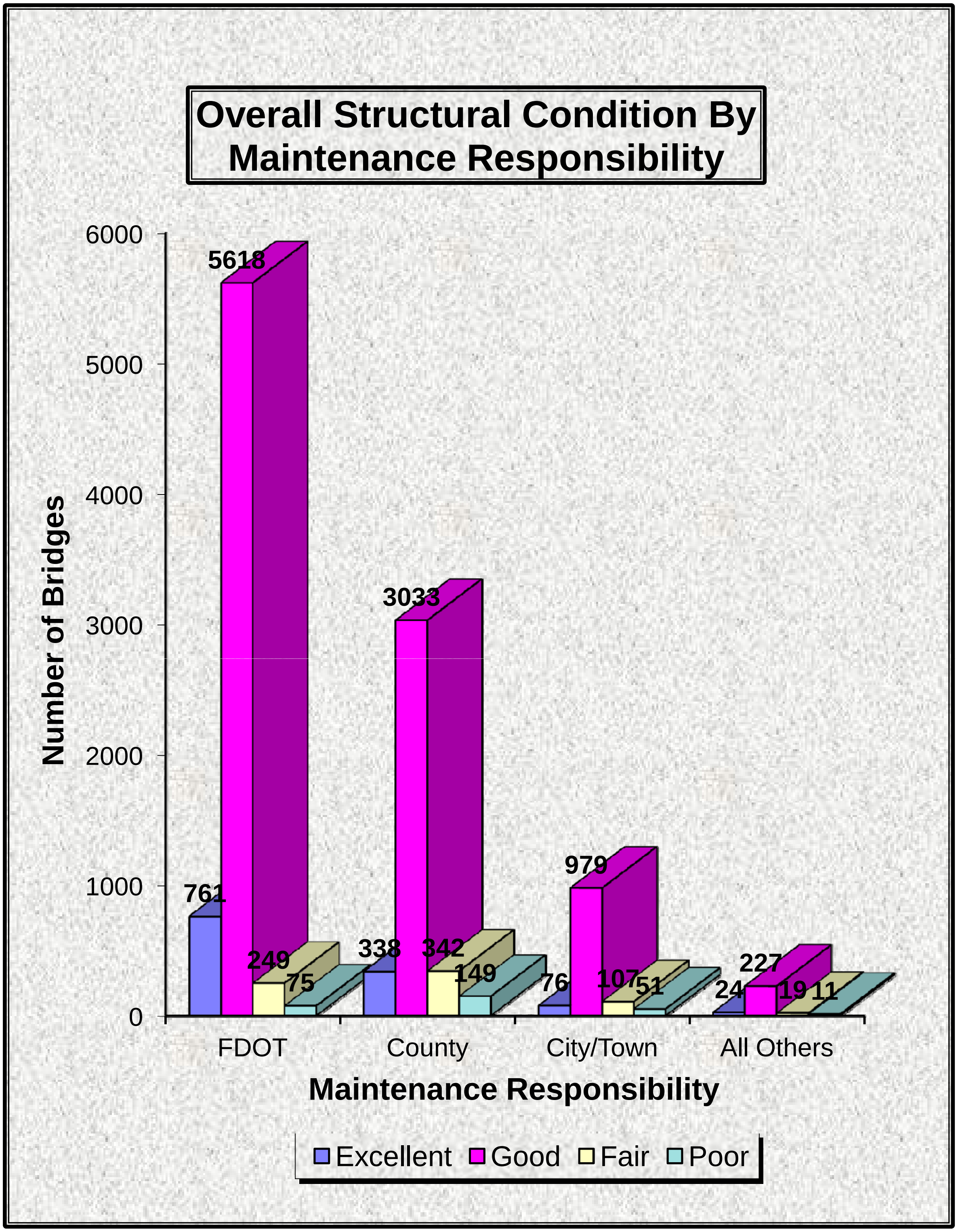

Overall Structural Condition By Maintenance Responsibility
Number of Bridges
6000
5000
4000
3000
2000
1000
0
5618
3033
979
761
249
75
338
342
149
76
107
51
24
227
19
11
FDOT
County
City/Town
All Others
Maintenance Responsibility
Excellent
Good
Fair
Poor

Figure 18

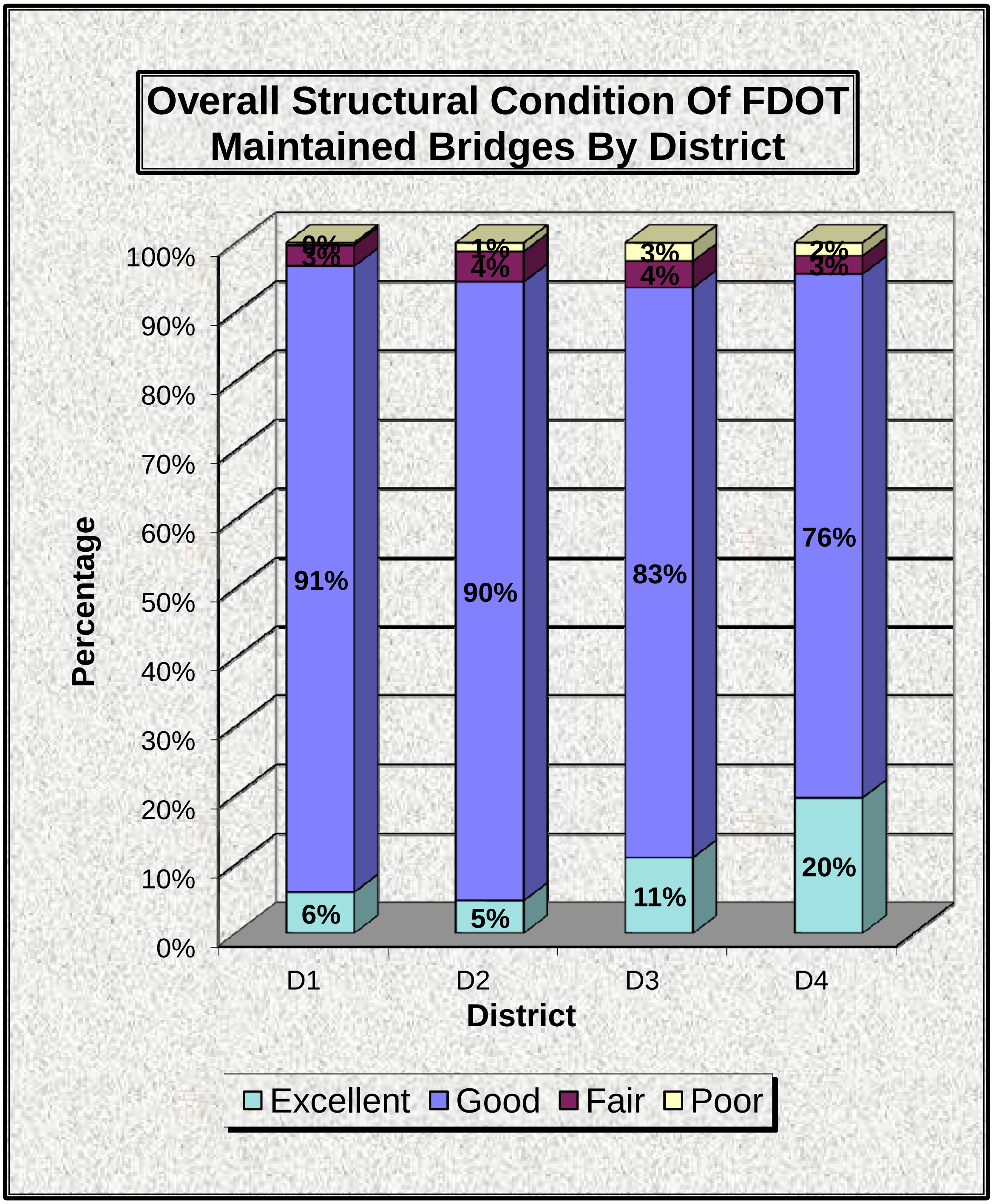

Overall Structural Condition Of FDOT Maintained Bridges By District
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0%
3%
91%
6%
1%
4%
90%
5%
3%
4%
83%
11%
2%
3%
76%
20%
D1
D2
D3
D4
District
Excellent
Good
Fair
Poor

Figure 19

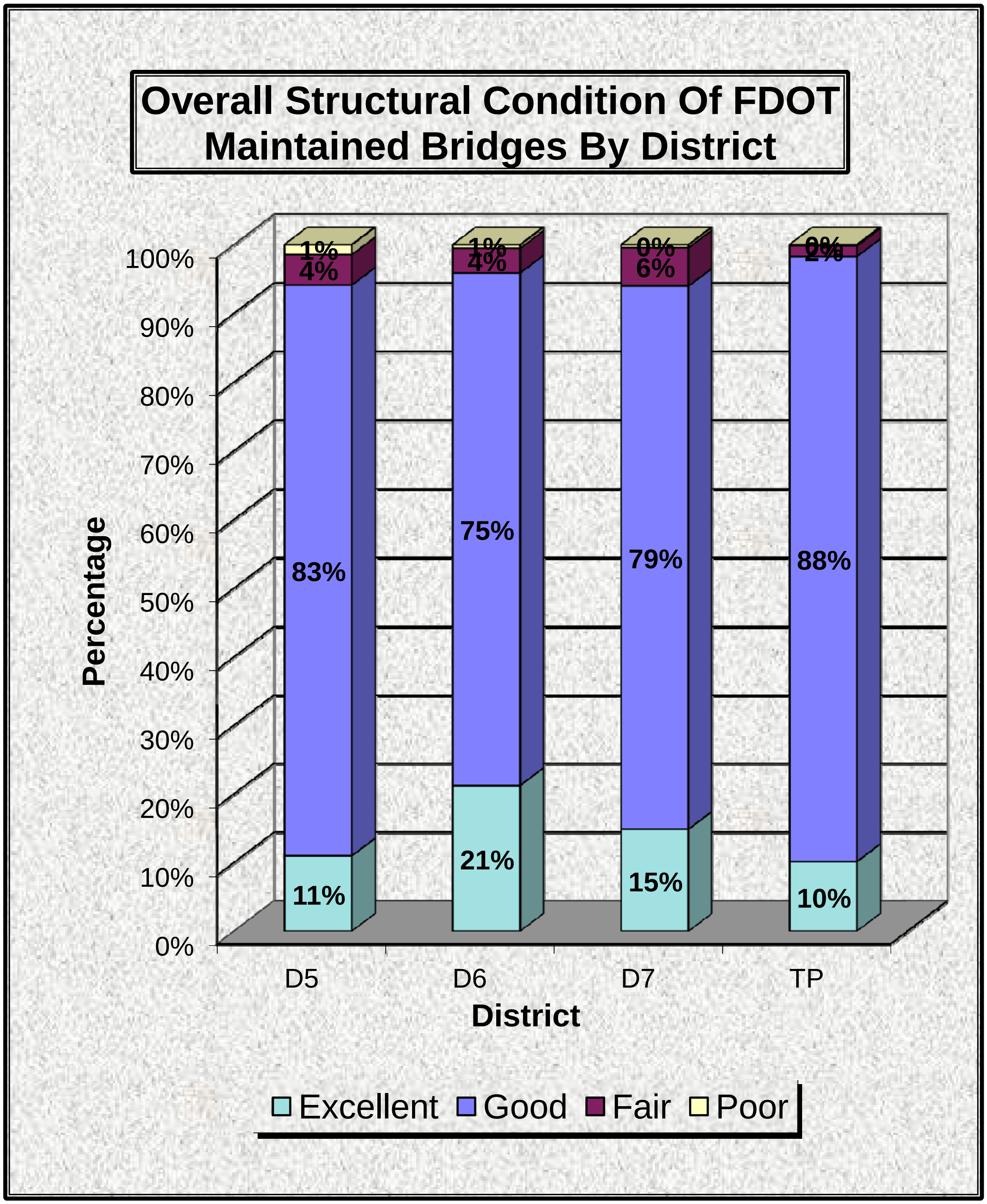

Overall Structural Condition Of FDOT Maintained Bridges By District
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
1%
4%
83%
11%
1%
4%
75%
21%
0%
6%
79%
15%
0%
2%
88%
10%
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor

Figure 20

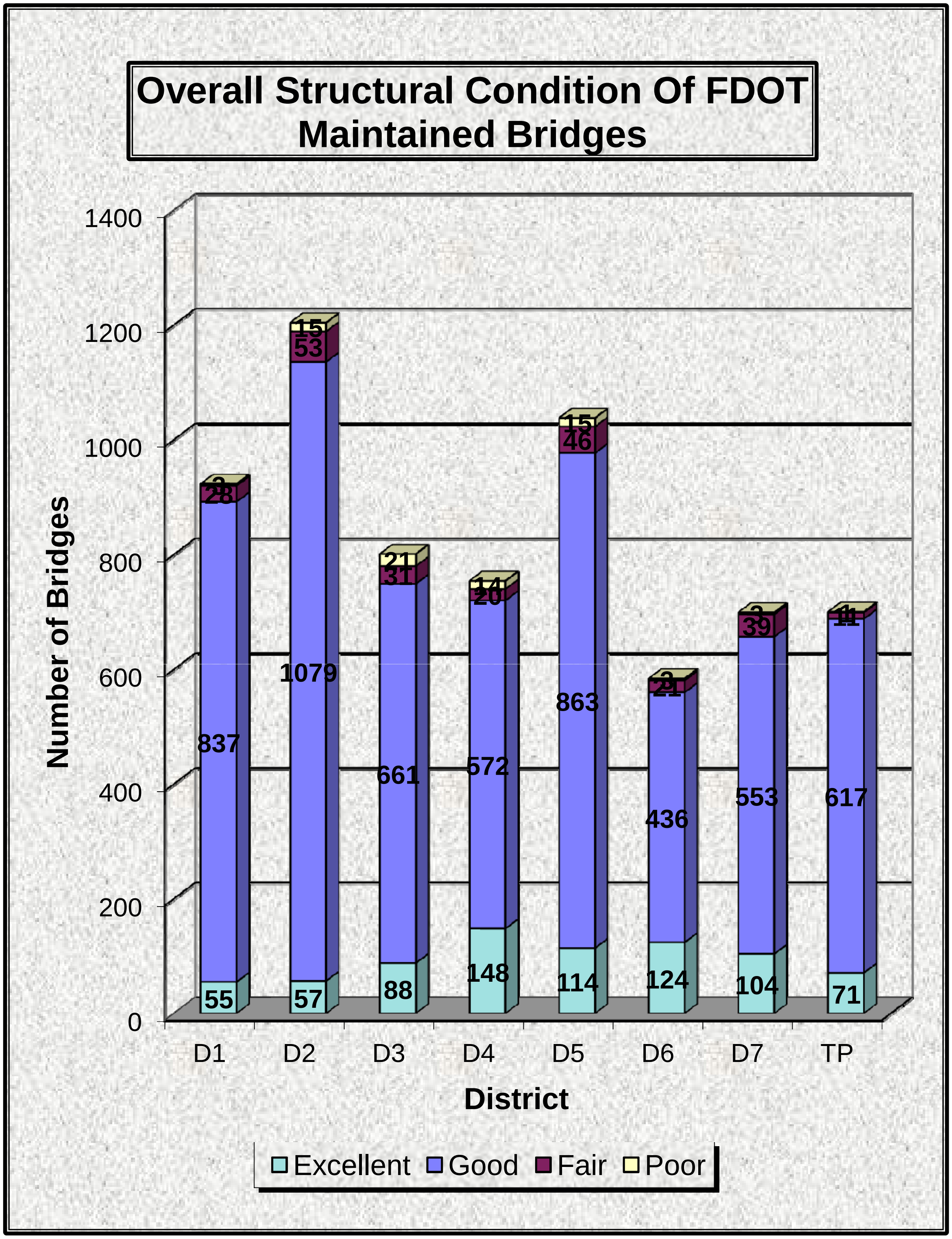
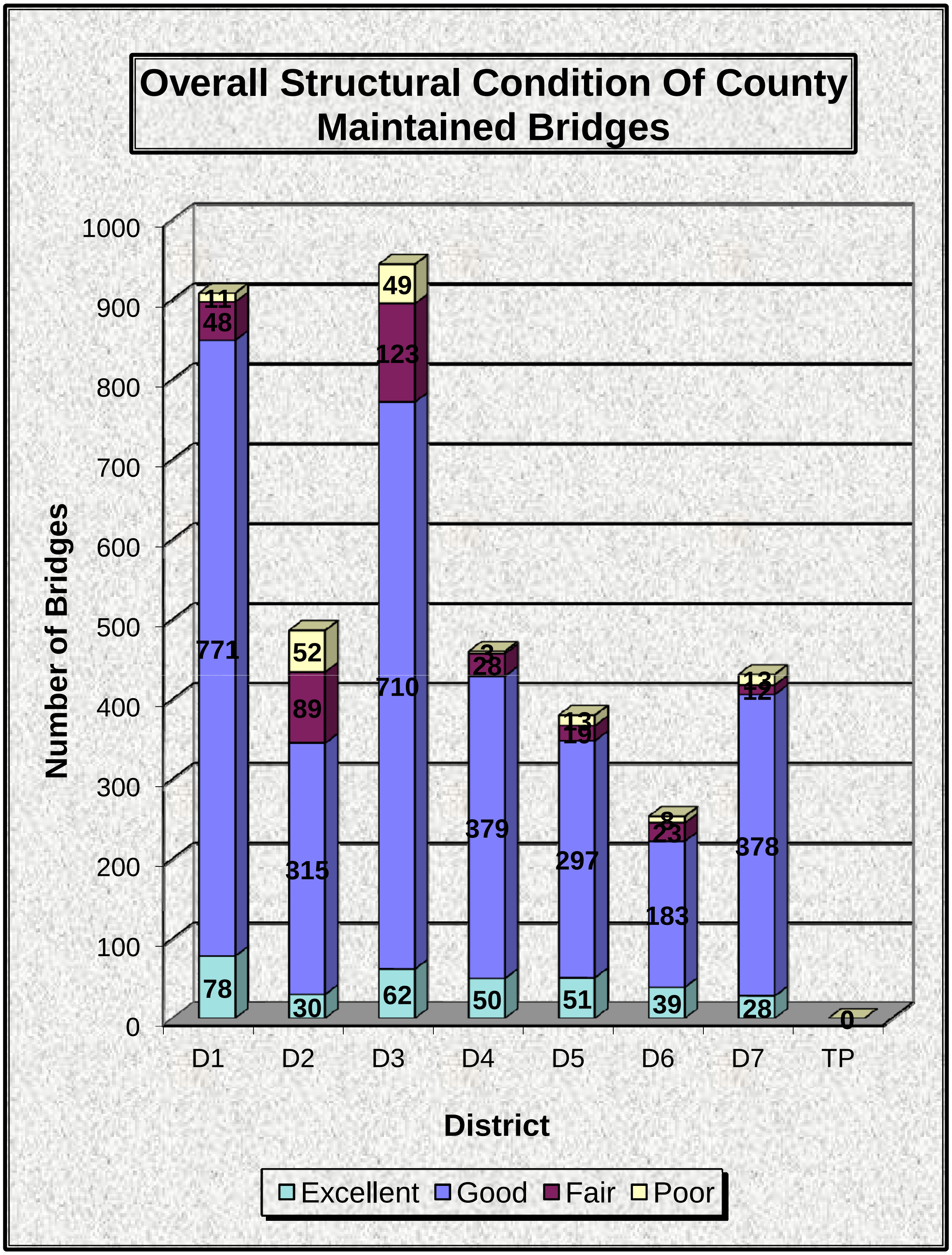

Overall Structural Condition Of FDOT Maintained Bridges
Number of Bridges
1400
1200
1000
800
600
400
200
0
D1
D2
D3
D4
D5
D6
D7
TP
District
55
837
28
57
1079
53
15
88
661
31
21
148
572
20
14
114
863
46
15
124
436
21
104
553
39
71
617
11
Excellent
Good
Fair
Poor

Figure 21



Overall Structural Condition Of County Maintained Bridges
Number of Bridges
1000
900
800
700
600
500
400
300
200
100
0
D1
D2
D3
D4
D5
D6
D7
TP
11
48
771
78
52
89
315
30
49
123
710
62
28
379
50
297
51
23
183
39
378
28
0
District
Excellent
Good
Fair
Poor

Figure 22

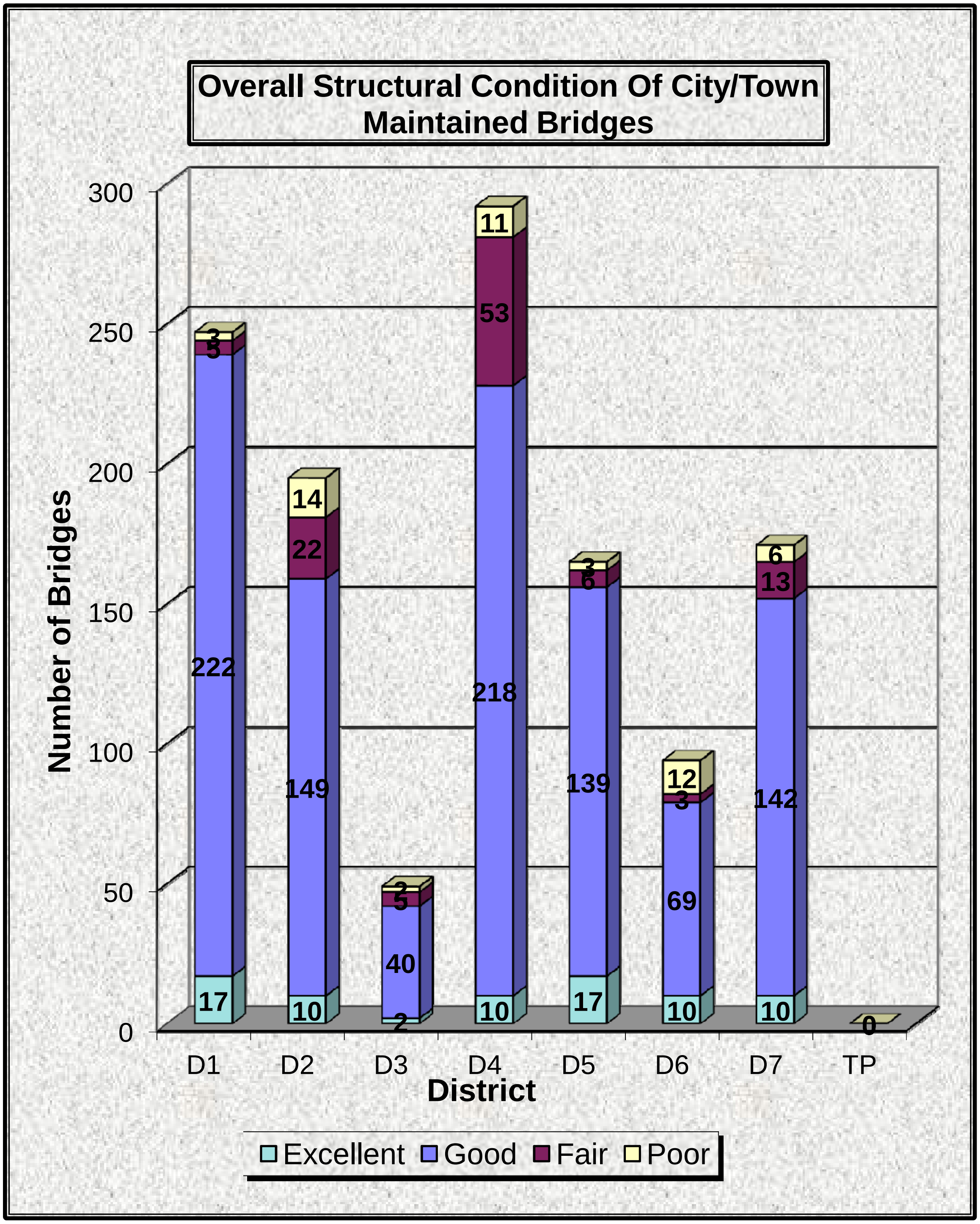
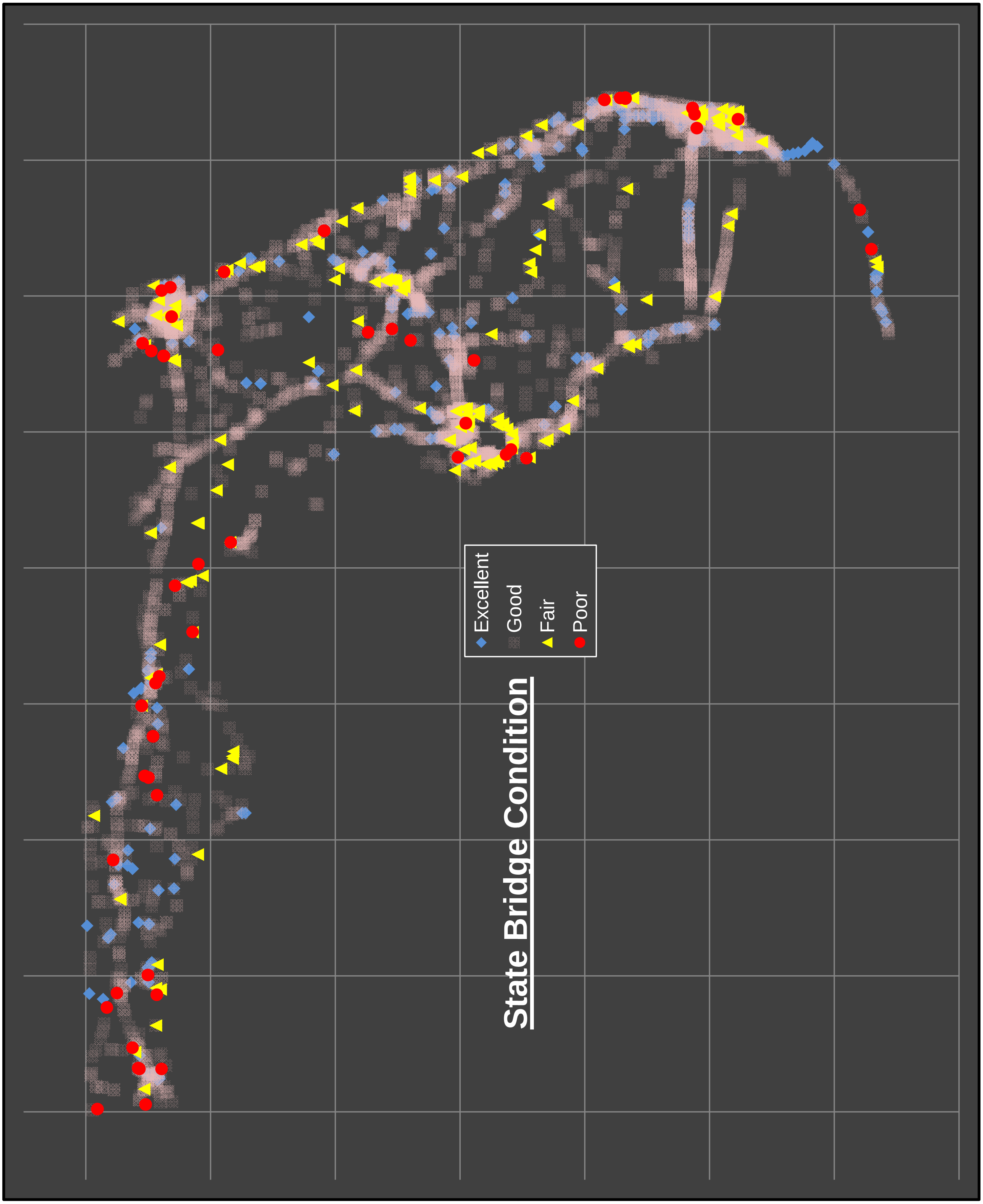

Overall Structural Condition Of City/Town Maintained Bridges
Number of Bridges
300
250
200
150
100
50
0
District
D1
D2
D3
D4
D5
D6
D7
TP
17
222
5
3
10
149
22
14
2
40
5
2
10
218
53
11
17
139
6
3
10
69
3
12
10
142
13
6
0
Excellent
Good
Fair
Poor

Figure 23


State Bridge Condition
Excellent
Good
Fair
Poor

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 236 structurally deficient bridges in Florida, with over 55.51% having county maintenance responsibility. Fifty-three (22.46%) 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 76.34% of the County Government maintained structurally deficient bridges are concentrated within District 2 and 3. Over 63.64% 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	53	131	44	8	0	0	0	236
District 1	3	8	2	0	0	0	0	13
District 2	14	51	14	4	0	0	0	83
District 3	20	49	2	4	0	0	0	75
District 4	6	3	14	0	0	0	0	23
District 5	5	7	2	0	0	0	0	14
District 6	3	7	8	0	0	0	0	18
District 7	2	6	2	0	0	0	0	10
District 8	0	0	0	0	0	0	0	0

Table 9

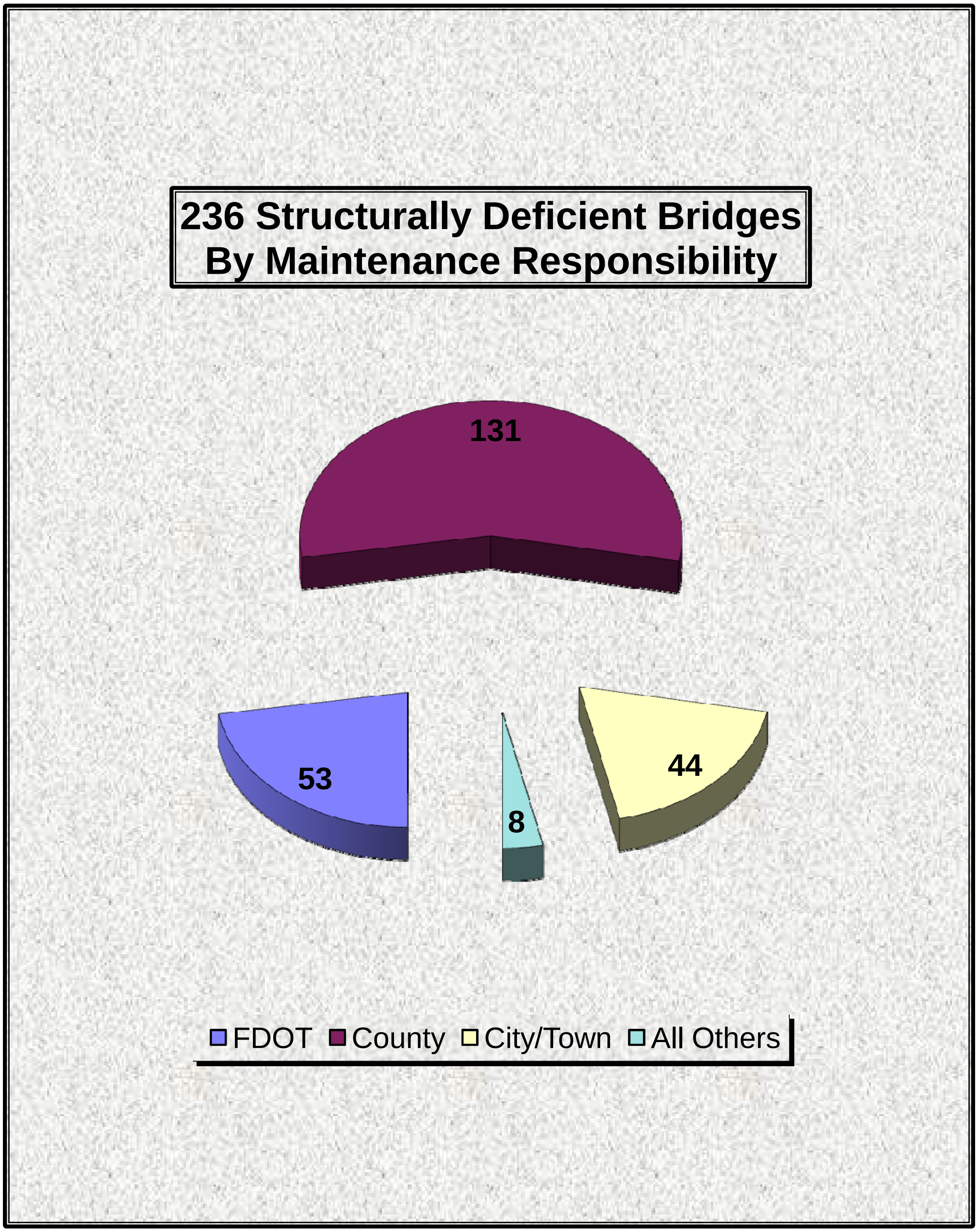

236 Structurally Deficient Bridges
By Maintenance Responsibility
131
53
8
44
FDOT
County
City/Town
All Others

Figure 25

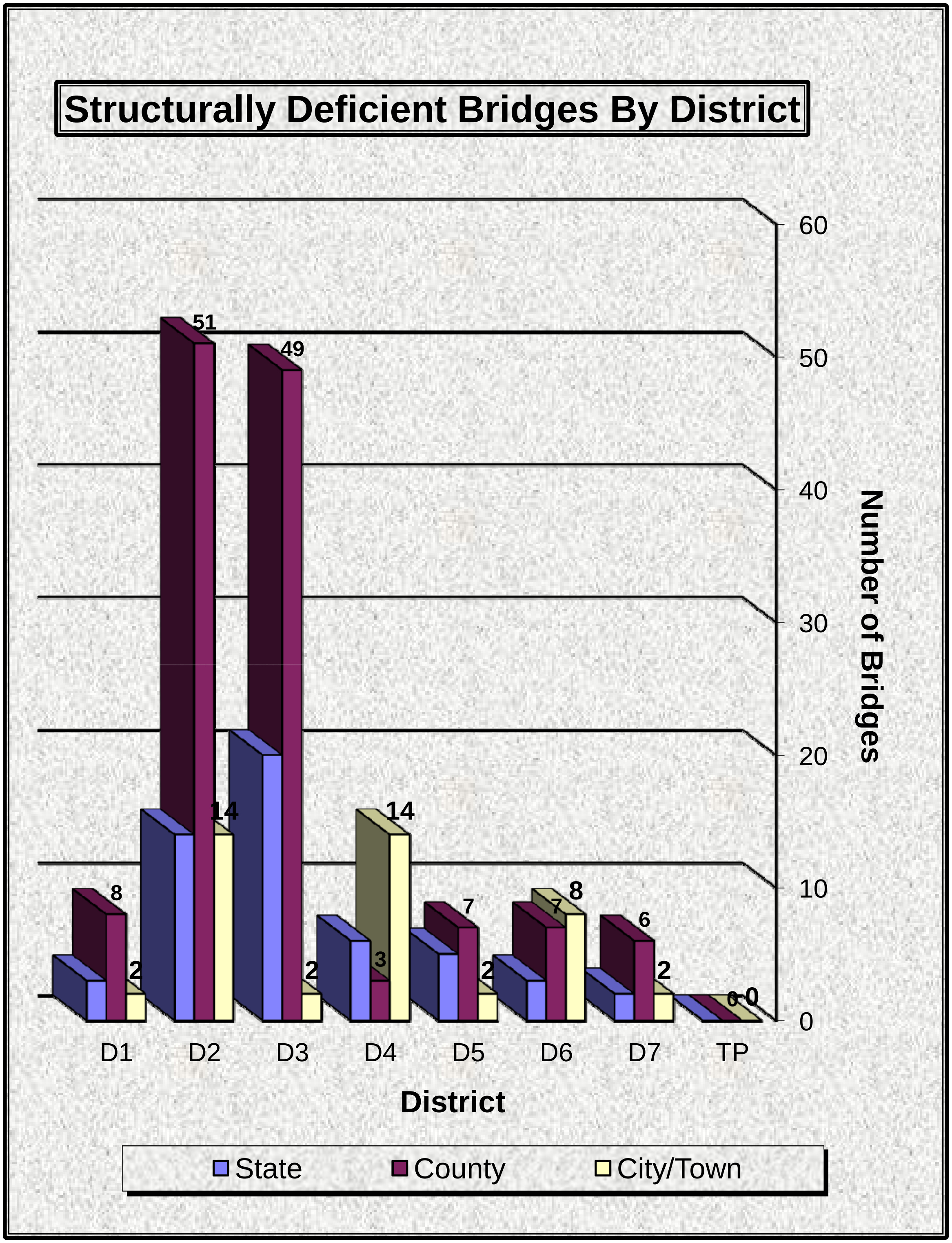

Structurally Deficient Bridges By District
8
2
51
14
49
2
3
14
7
2
7
8
6
2
0 0 0
60
50
40
30
20
10
0
Number of Bridges
D1
D2
D3
D4
D5
D6
D7
TP
District
State
County
City/Town

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 812 posted or closed bridges in Florida, with County Governments having maintenance responsibility for over 75.49% of the total. City and Town Governments are responsible for the maintenance of over 18.97% of the total, while the FDOT is responsible for only 7 of the 812 bridges (0.86%) (see Figure 27). The number of posted County bridges (613 bridges) is much greater than the number of structurally deficient County bridges (131), 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 7 posted or closed bridges maintained by the FDOT, Districts 1, 3, and Turnpike had none, and District 6 constituted 42.86% of the posted or closed bridges (see Figure 29). Seventy-one percent (71.13%) of the posted or closed bridges maintained by County Governments are concentrated within Districts 2 and 3 (see Figure 30). Eighty-three (53.90%) of the posted or closed bridges maintained by City/Town Governments are concentrated within Districts 2 and 4 (see Figure 31). Statewide, 64.41% 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	604	148	35	0	0	0	789
Closed	5	9	6	2	1	0	0	23
Total	7	613	154	37	1	0	0	812
District 1								
Posted	0	94	24	3	0	0	0	121
Closed	0	0	0	0	0	0	0	0
Total	0	94	24	3	0	0	0	121
District 2								
Posted	1	96	40	7	0	0	0	144
Closed	0	4	1	1	0	0	0	6
Total	1	100	41	8	0	0	0	150
District 3								
Posted	0	340	9	21	0	0	0	370
Closed	0	2	1	0	0	0	0	3
Total	0	342	10	21	0	0	0	373
District 4								
Posted	1	25	41	0	0	0	0	67
Closed	0	0	1	0	0	0	0	1
Total	1	25	42	0	0	0	0	68
District 5								
Posted	0	23	21	4	0	0	0	48
Closed	1	1	1	0	0	0	0	3
Total	1	24	22	4	0	0	0	51
District 6								
Posted	0	18	9	0	0	0	0	27
Closed	3	2	2	1	1	0	0	9
Total	3	20	11	1	1	0	0	36
District 7								
Posted	0	8	4	0	0	0	0	12
Closed	1	0	0	0	0	0	0	1
Total	1	8	4	0	0	0	0	13
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

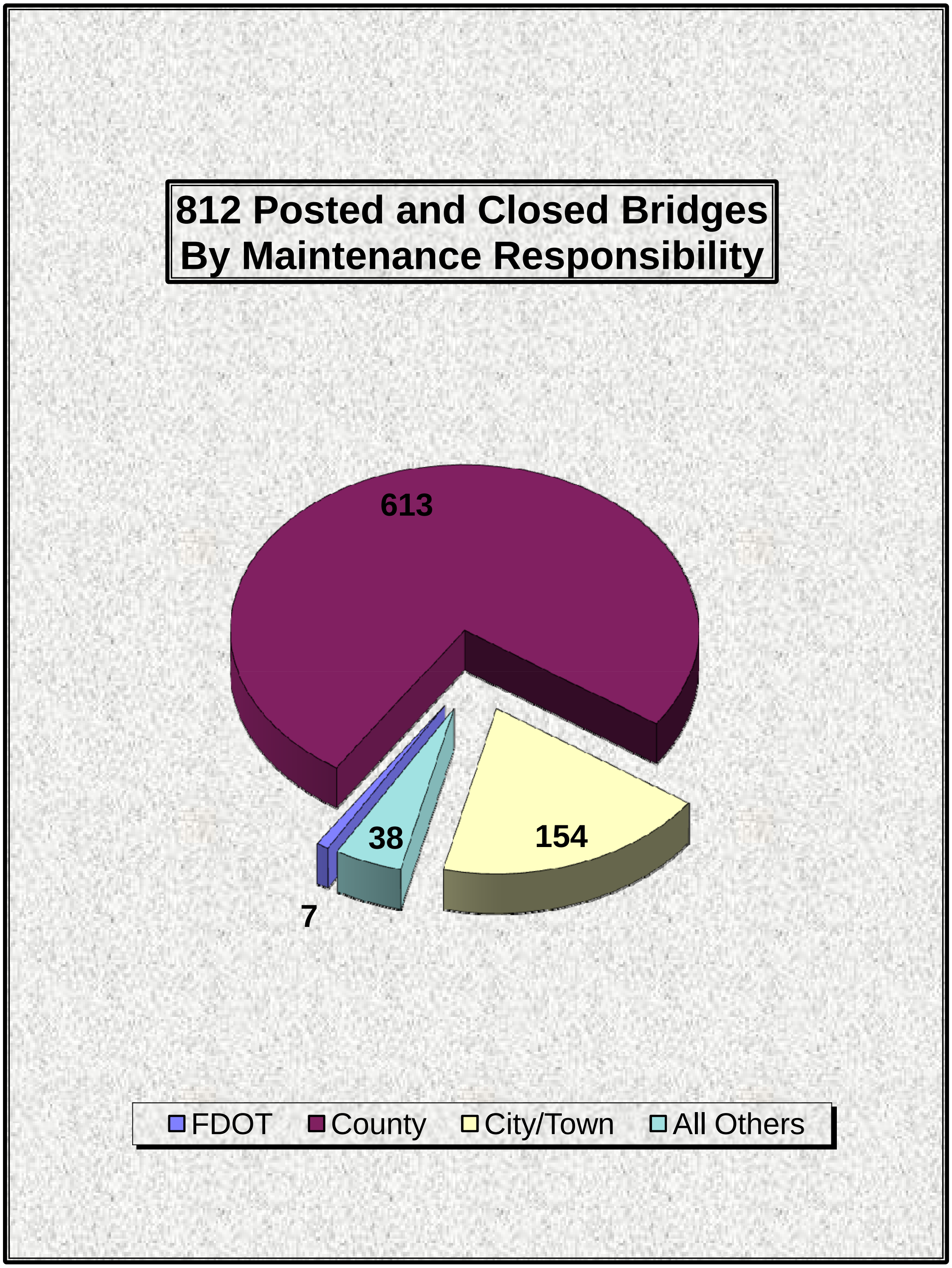

812 Posted and Closed Bridges
By Maintenance Responsibility
613
38
154
7
FDOT
County
City/Town
All Others

Figure 27

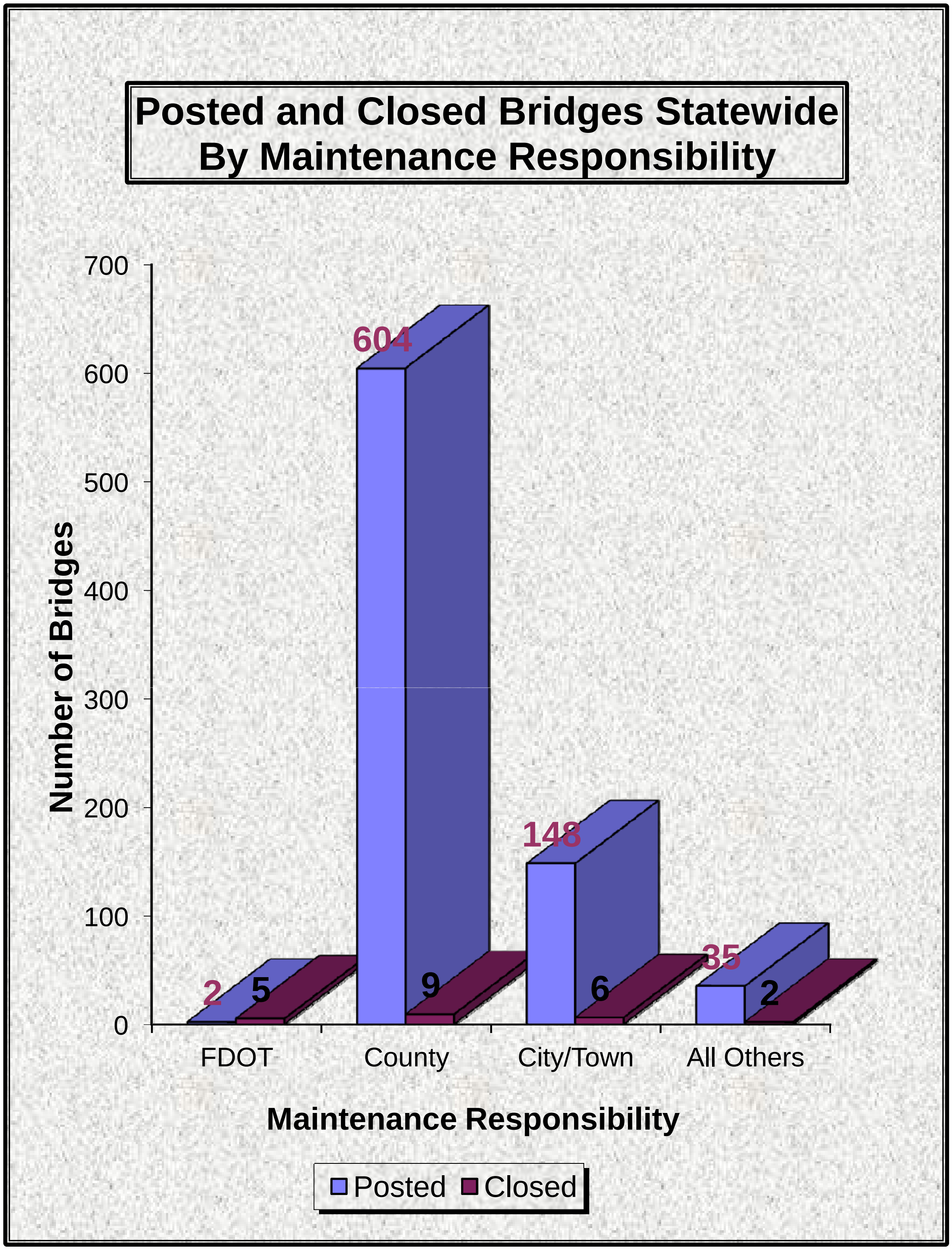

Posted and Closed Bridges Statewide
By Maintenance Responsibility
Number of Bridges
700
600
500
400
300
200
100
0
604
148
35
2
5
9
6
2
FDOT
County
City/Town
All Others
Maintenance Responsibility
Posted
Closed

Figure 28

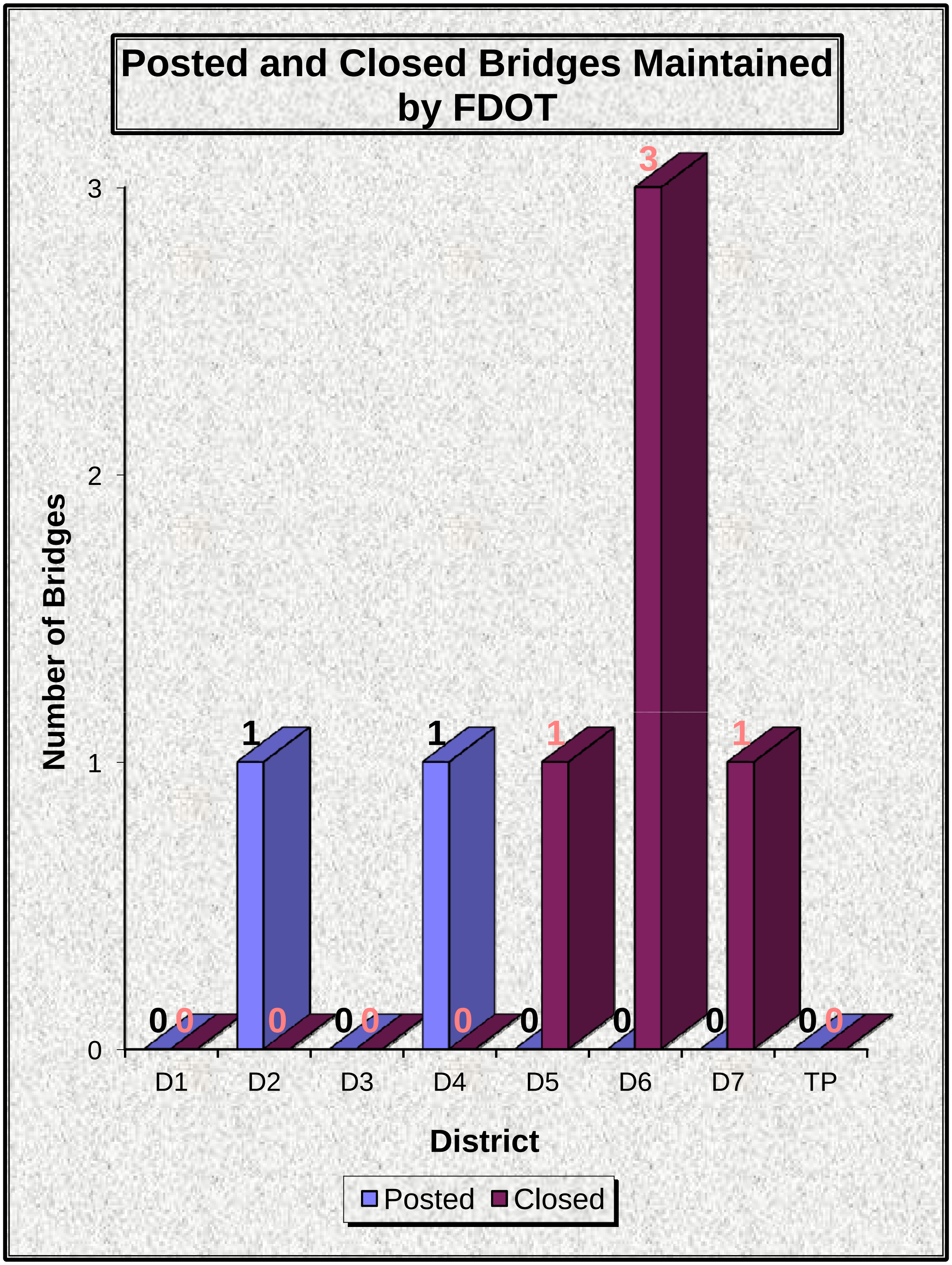

Posted and Closed Bridges Maintained by FDOT
Number of Bridges
0
1
2
3
District
D1
D2
D3
D4
D5
D6
D7
TP
0 0
1 0
0 0
1 0
0 1
0 3
0 1
0 0
Posted
Closed

Figure 29

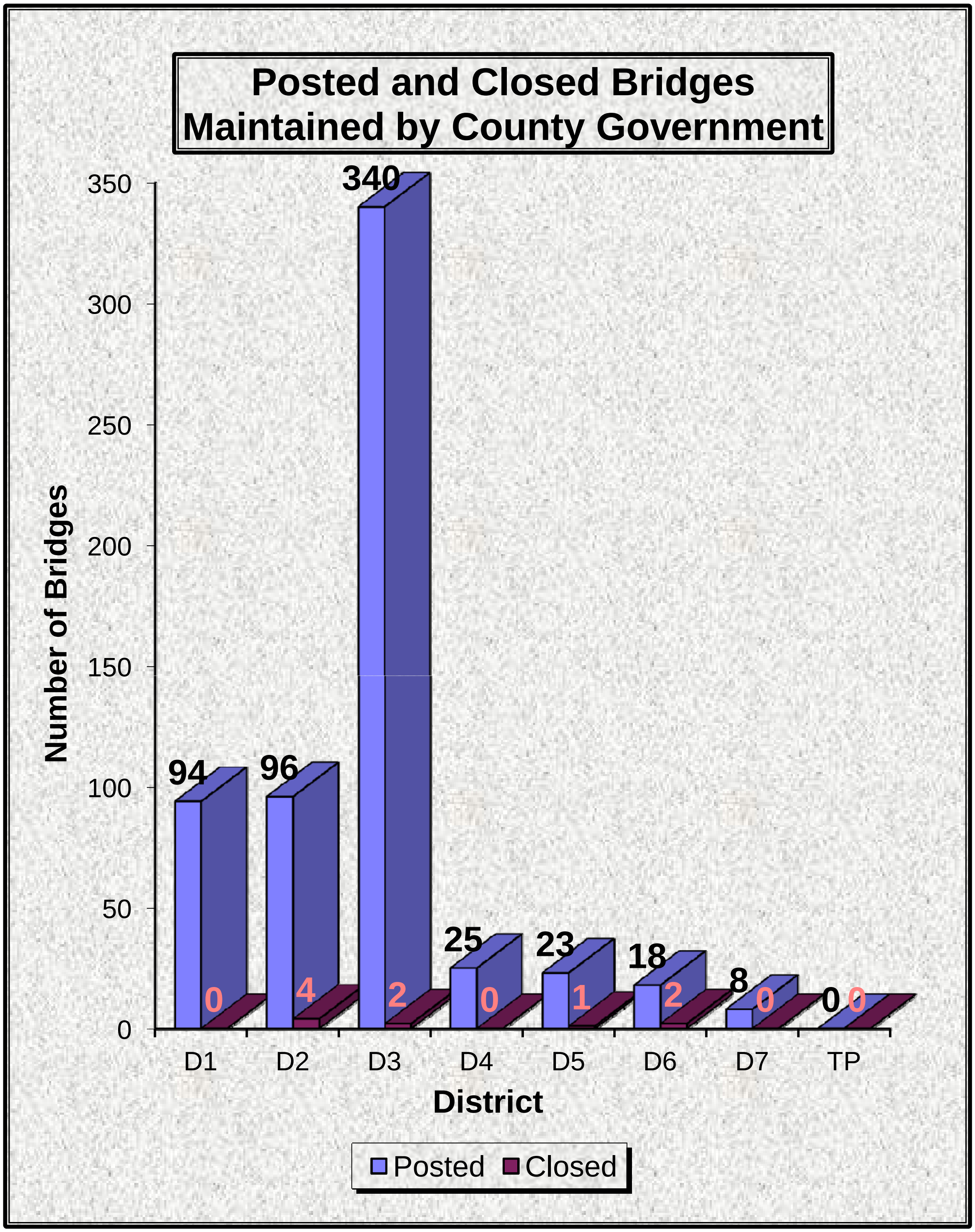

Posted and Closed Bridges
Maintained by County Government
Number of Bridges
350
300
250
200
150
100
50
0
94
96
340
25
23
18
8
0
0
4
2
0
1
2
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 30

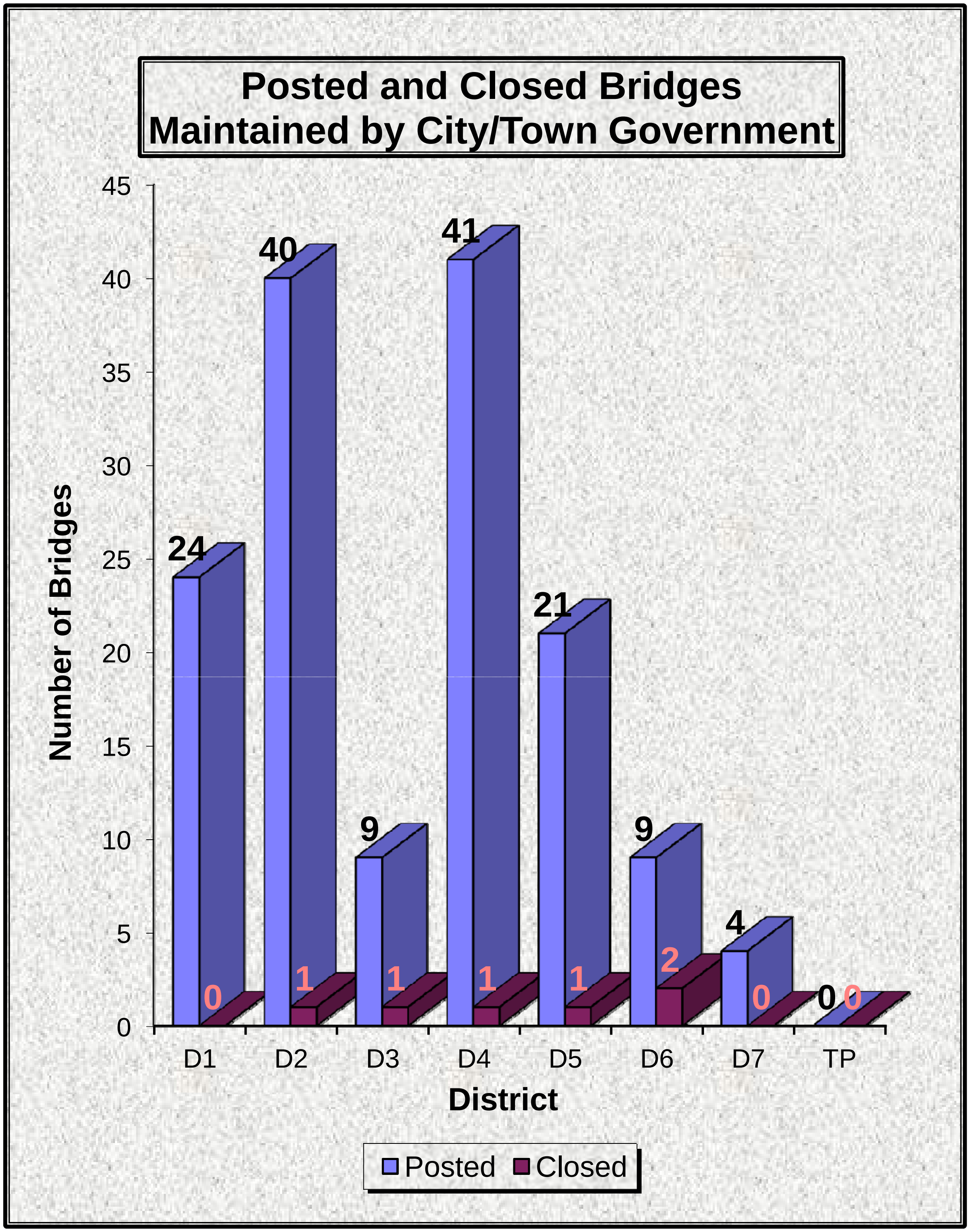

Posted and Closed Bridges
Maintained by City/Town Government
45
40
35
30
25
20
15
10
5
0
Number of Bridges
24
40
9
41
21
9
4
0
0
1
1
1
1
2
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

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 1,745 functionally obsolete bridges in Florida, about 14.47% of the total. The FDOT has maintenance responsibility for over 42.01% 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	733	619	293	77	9	0	14	1745
District 1	71	164	85	7	2	0	0	329
District 2	162	42	22	5	0	0	0	231
District 3	32	120	3	59	0	0	1	215
District 4	52	100	74	1	0	0	0	227
District 5	120	40	46	3	1	0	12	222
District 6	158	78	22	2	0	0	0	260
District 7	81	75	41	0	6	0	1	204
District 8	57	0	0	0	0	0	0	57

Table 11

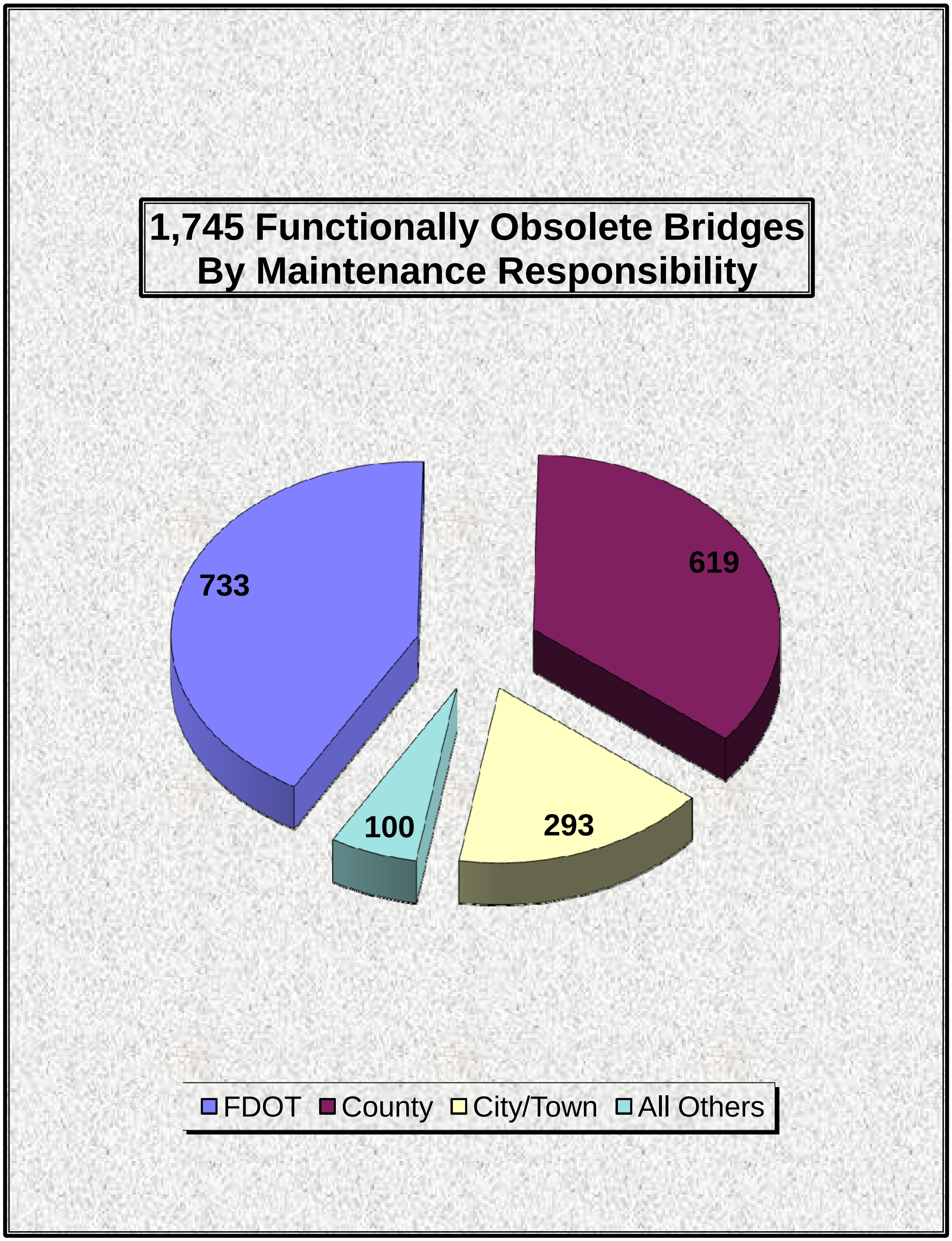

1,745 Functionally Obsolete Bridges
By Maintenance Responsibility
733
619
100
293
FDOT
County
City/Town
All Others

Figure 32

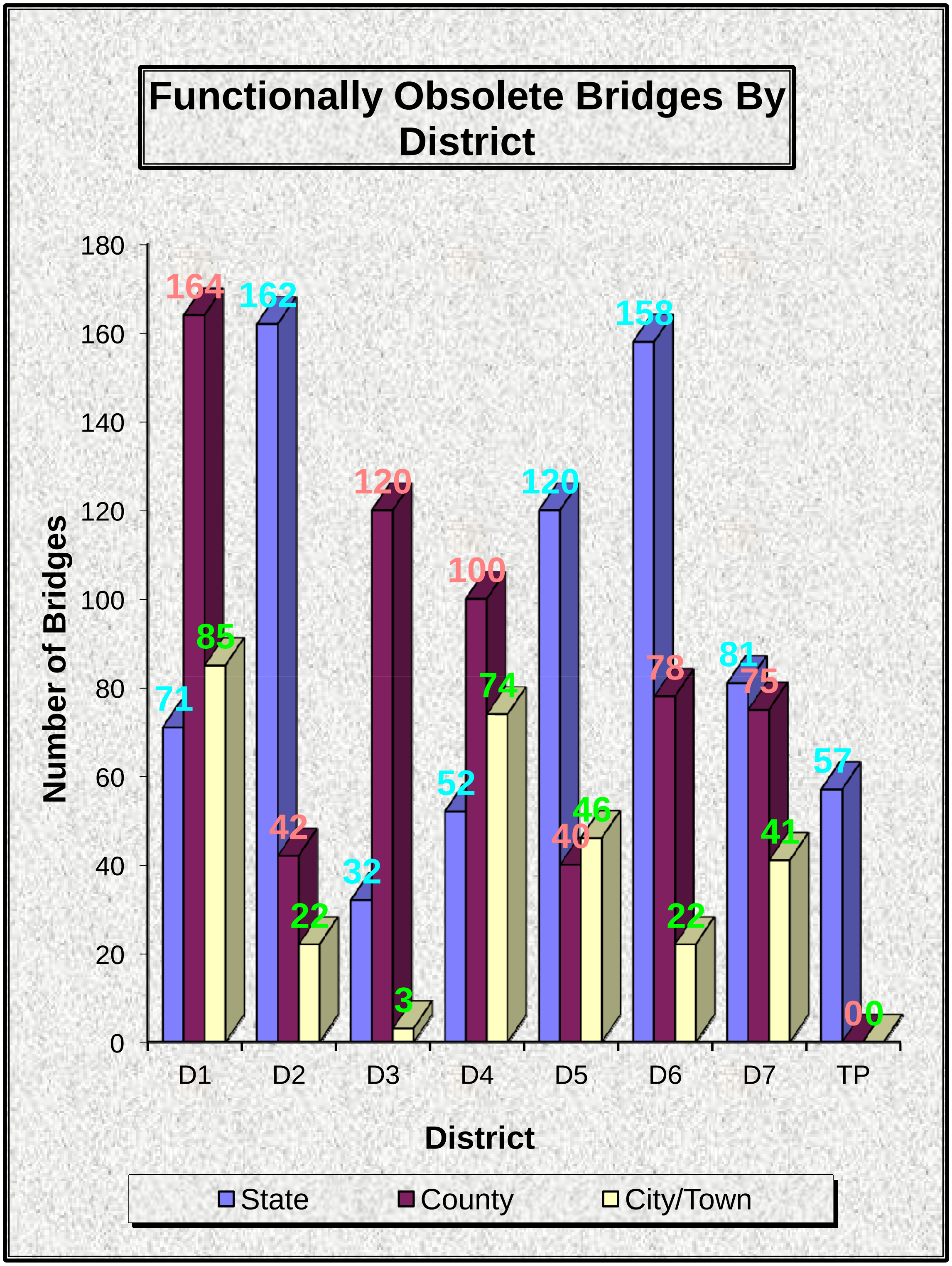

Functionally Obsolete Bridges By District
Number of Bridges
180
160
140
120
100
80
60
40
20
0
164
162
71
85
42
22
32
120
3
52
100
74
120
40
46
158
78
22
81
75
41
57
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
State
County
City/Town

Figure 33

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	56,913	251,804	574,979	720,181	617,792	654,799	1,677,094	1,106,852	141,893	5,802,307
P/C Slab	39,386	0	84,678	923,218	784,051	718,183	337,609	36,146	137,118	3,060,389
R/C Beam	231,881	218,879	590,970	0	0	0	0	31,402	79,365	1,152,498
P/C Beam	21,056	0	3,342,265	13,393,476	16,249,946	15,330,371	12,493,851	15,526,609	1,484,892	77,842,465
Steel Beam	471,618	228,833	2,323,383	4,848,699	7,342,470	2,770,827	3,171,738	3,628,242	460,492	25,246,302
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	38,500	130,923
P/C Box	0	0	0	0	0	0	0	294,771	19,268	314,039
Steel Box	0	0	0	0	110,928	1,335,642	1,529,314	1,438,828	60,713	4,475,425
Truss	223,246	0	428,297	250,885	0	0	0	0	0	902,428
Movable	328,865	87,844	718,302	636,588	659,492	1,246,975	474,164	564,115	67,337	4,783,683
Culvert	85,938	126,259	321,486	627,548	352,858	146,667	161,107	188,125	25,310	2,035,298
Other	23,724	20,050	130,729	0	0	6,715,593	2,916,778	4,714,692	204,797	14,726,362
Total	1,482,628	933,669	8,515,089	21,442,416	26,169,125	28,919,056	22,919,234	27,529,783	2,719,684	140,630,684

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	6,830	30,492	69,612	94,712	88,343	95,217	246,468	157,378	19,020	808,072
P/C Slab	5,908	0	12,702	138,483	117,608	107,727	50,641	5,422	20,568	459,058
R/C Beam	22,029	20,794	56,142	0	0	0	0	2,983	8,063	110,010
P/C Beam	2,211	0	350,938	1,406,315	1,712,620	1,620,865	1,366,891	1,679,861	158,496	8,298,197
Steel Beam	52,745	26,721	268,351	610,622	874,591	352,039	399,157	451,163	57,940	3,093,329
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	5,775	19,638
P/C Box	0	0	0	0	0	0	22,849	42,742	2,794	68,385
Steel Box	0	0	0	0	16,639	200,346	229,397	215,824	9,107	671,314
Truss	39,068	0	74,952	43,905	0	0	0	0	0	157,925
Movable	95,083	26,893	242,578	234,201	164,878	177,745	153,593	177,407	32,236	1,304,615
Culvert	8,164	11,995	30,541	59,617	33,522	13,933	15,305	17,872	2,404	193,353
Other	3,559	3,008	19,609	0	0	1,007,339	437,517	707,204	30,720	2,208,954
Total	235,596	119,902	1,125,425	2,594,073	3,015,939	3,575,213	2,921,819	3,457,855	347,123	17,392,945

Table 13

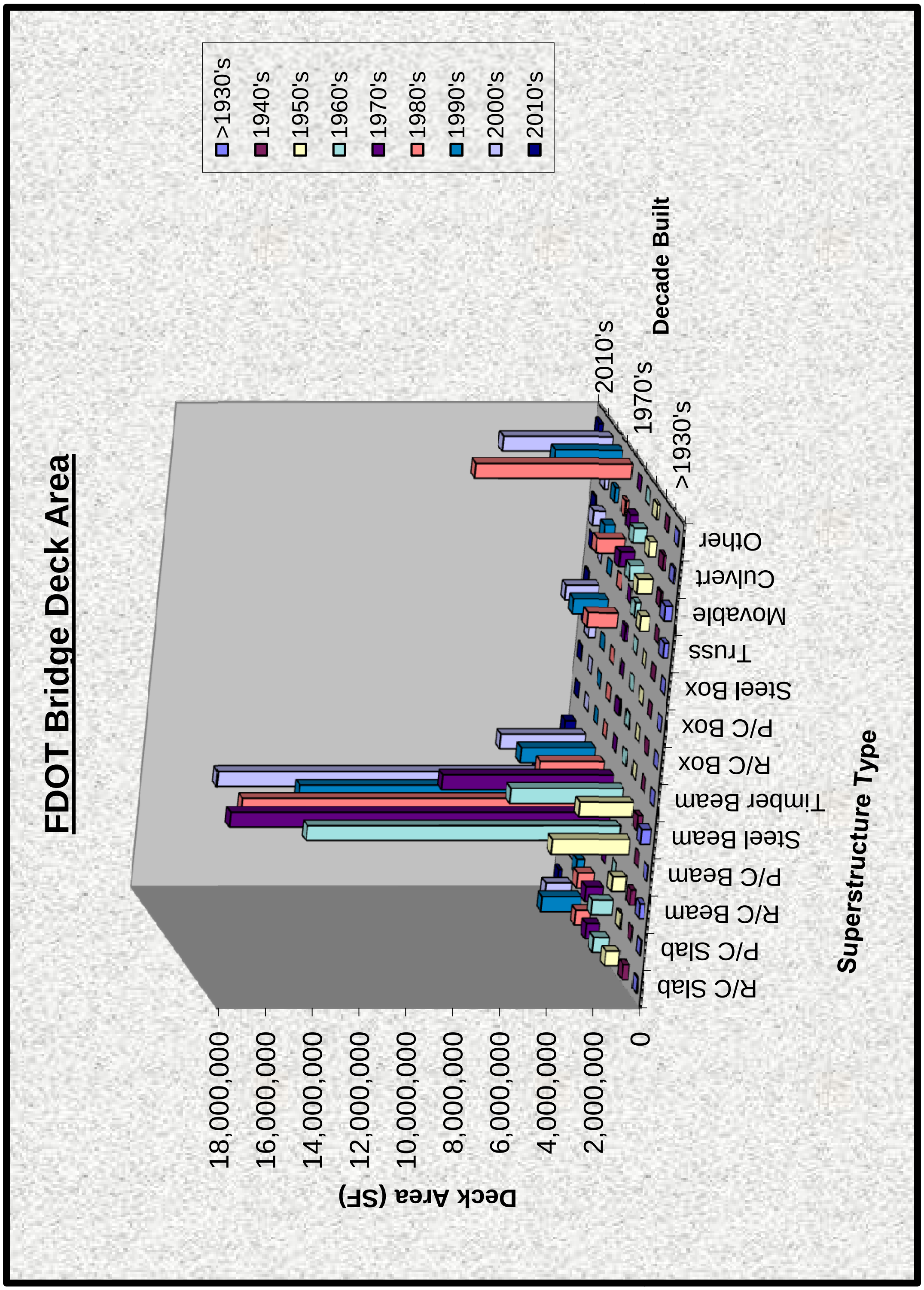

FDOT Bridge Deck Area
Deck Area (SF)
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Superstructure Type
>1930's
1970's
2010's
Decade Built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

Figure 43

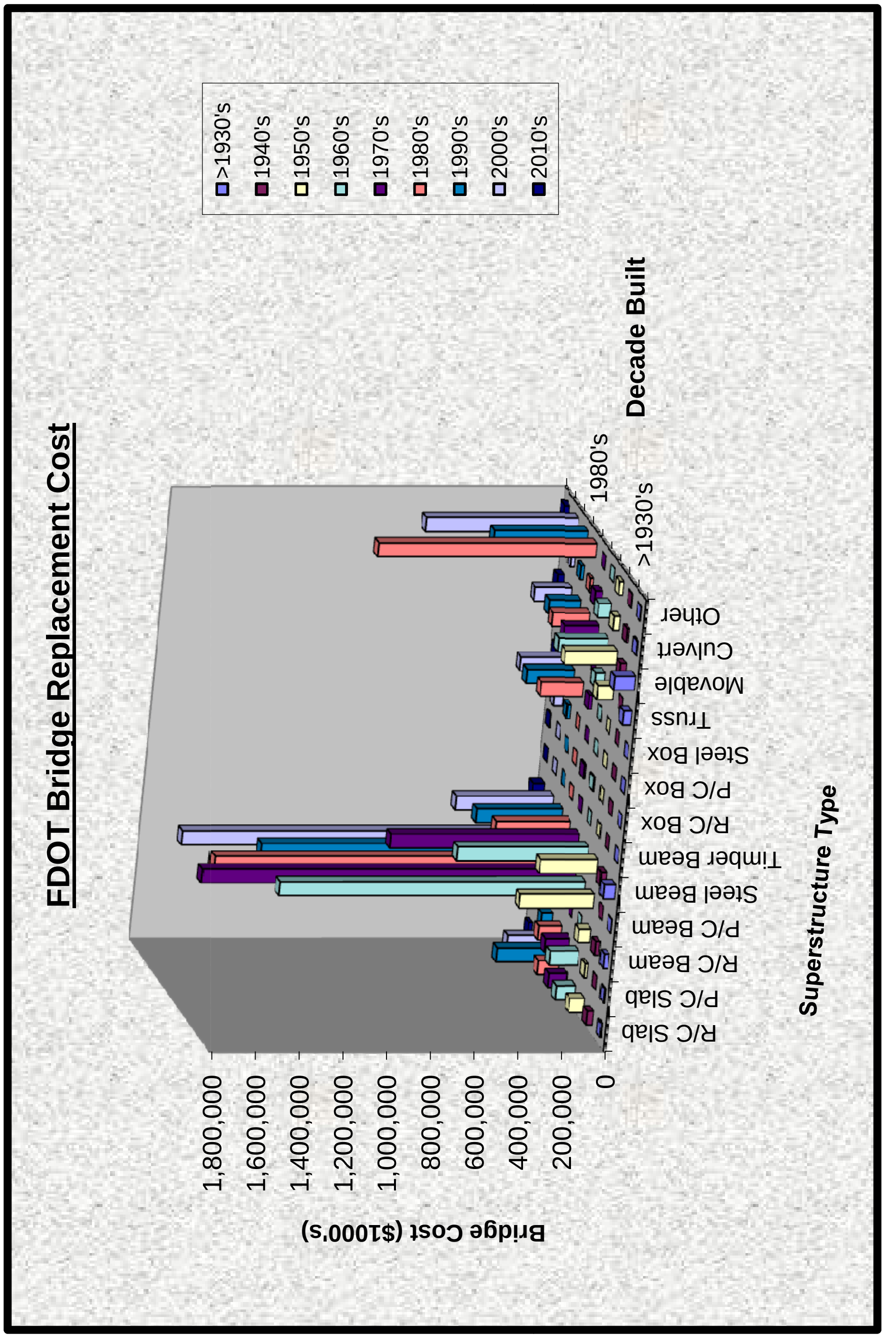

FDOT Bridge Replacement Cost
Bridge Cost ($1000's)
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Superstructure Type
>1930's
1980's
Decade Built
>1930's
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	65,709	365,569	301,077	223,301	75,882	297,499	153,591	0	1,482,628
1940's	181,518	339,608	235,208	25,485	33,515	91,664	26,671	0	933,669
1950's	911,316	2,155,049	783,454	504,851	629,632	1,529,552	1,398,076	603,158	8,515,089
1960's	1,502,807	5,472,608	2,174,727	1,211,827	3,916,034	4,095,676	2,257,372	811,365	21,442,416
1970's	2,177,133	5,981,801	4,349,806	4,216,188	1,506,698	2,118,857	3,908,578	1,910,065	26,169,125
1980's	3,694,076	2,381,795	2,591,753	6,494,210	1,098,082	5,616,014	5,874,638	1,168,489	28,919,056
1990's	1,867,782	2,750,925	5,286,571	3,090,473	2,359,281	1,465,085	3,288,413	2,810,706	22,919,234
2000's	2,997,040	5,284,997	4,908,990	3,703,195	3,303,989	1,311,243	4,199,689	1,820,640	27,529,783
2010's	305,106	813,029	250,565	0	411,196	379,874	361,952	95,290	2,617,011
Total	13,702,487	25,545,382	20,882,149	19,469,531	13,334,309	16,905,464	21,468,979	9,219,713	140,528,012

Table 14

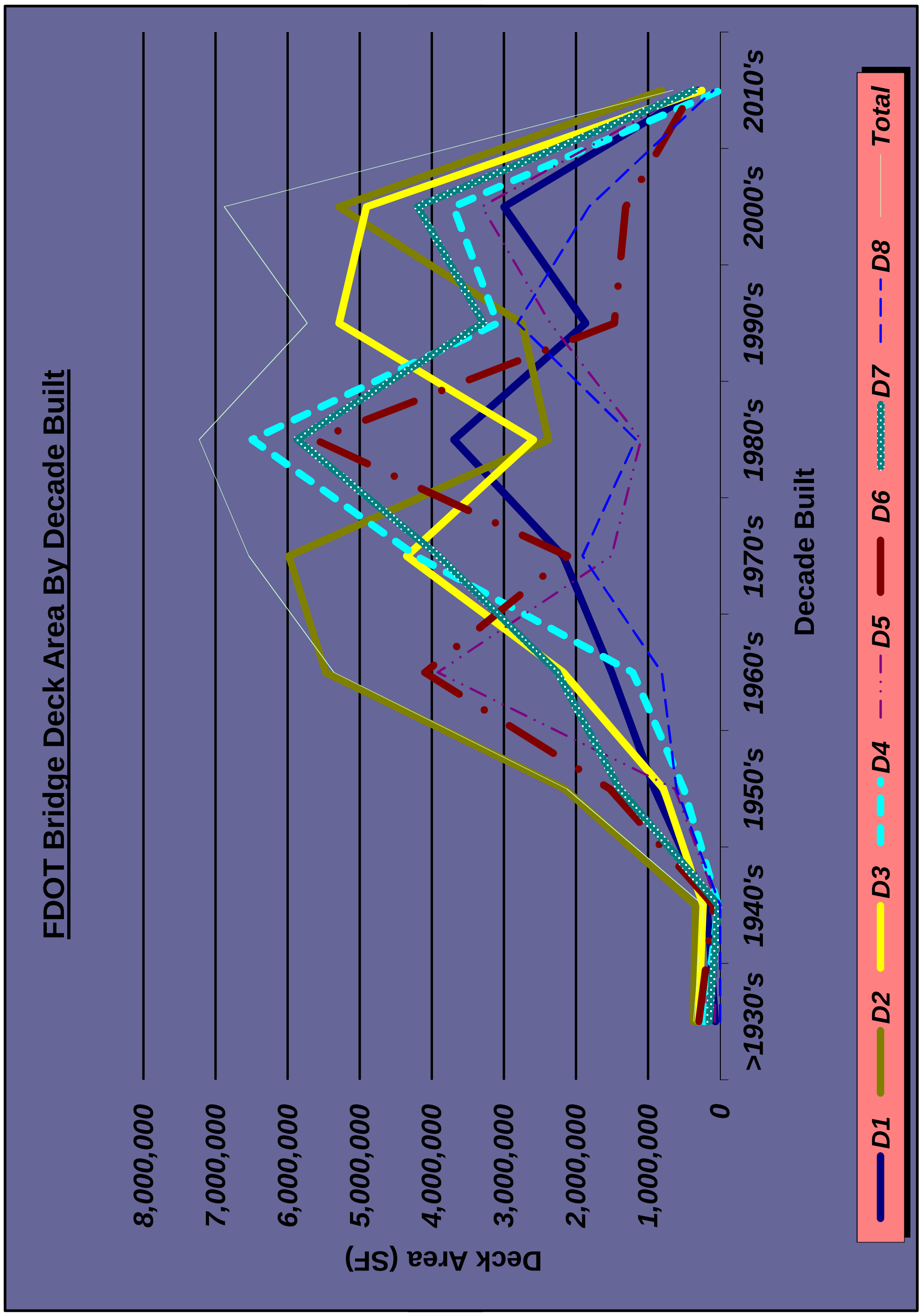

FDOT Bridge Deck Area By Decade Built
Deck Area (SF)
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
D8
Total

Figure 45

FDOT Bridge Replacement Cost ($1000's)									
	District								
	D1	D2	D3	D4	D5	D6	D7	D8	Total
>1930's	6,700	56,193	48,121	29,842	8,484	43,867	42,388	0	235,596
1940's	31,983	43,472	26,021	2,511	3,593	9,578	2,744	0	119,902
1950's	121,079	273,988	81,844	167,869	74,009	184,982	155,919	65,735	1,125,425
1960's	193,647	633,001	256,257	225,742	442,668	482,265	267,798	92,695	2,594,073
1970's	256,010	676,803	504,902	492,081	177,453	273,848	432,882	201,959	3,015,939
1980's	426,874	308,703	328,752	800,984	135,407	708,934	737,902	127,656	3,575,213
1990's	234,113	341,231	684,860	431,372	297,200	215,651	404,625	312,767	2,921,819
2000's	381,404	613,420	593,981	525,268	389,885	166,634	582,497	204,767	3,457,855
2010's	33,456	96,673	29,046	0	48,860	64,179	50,426	10,205	332,846
Total	1,685,266	3,043,483	2,553,785	2,675,670	1,577,559	2,149,939	2,677,182	1,015,783	4,344,667

Table 15

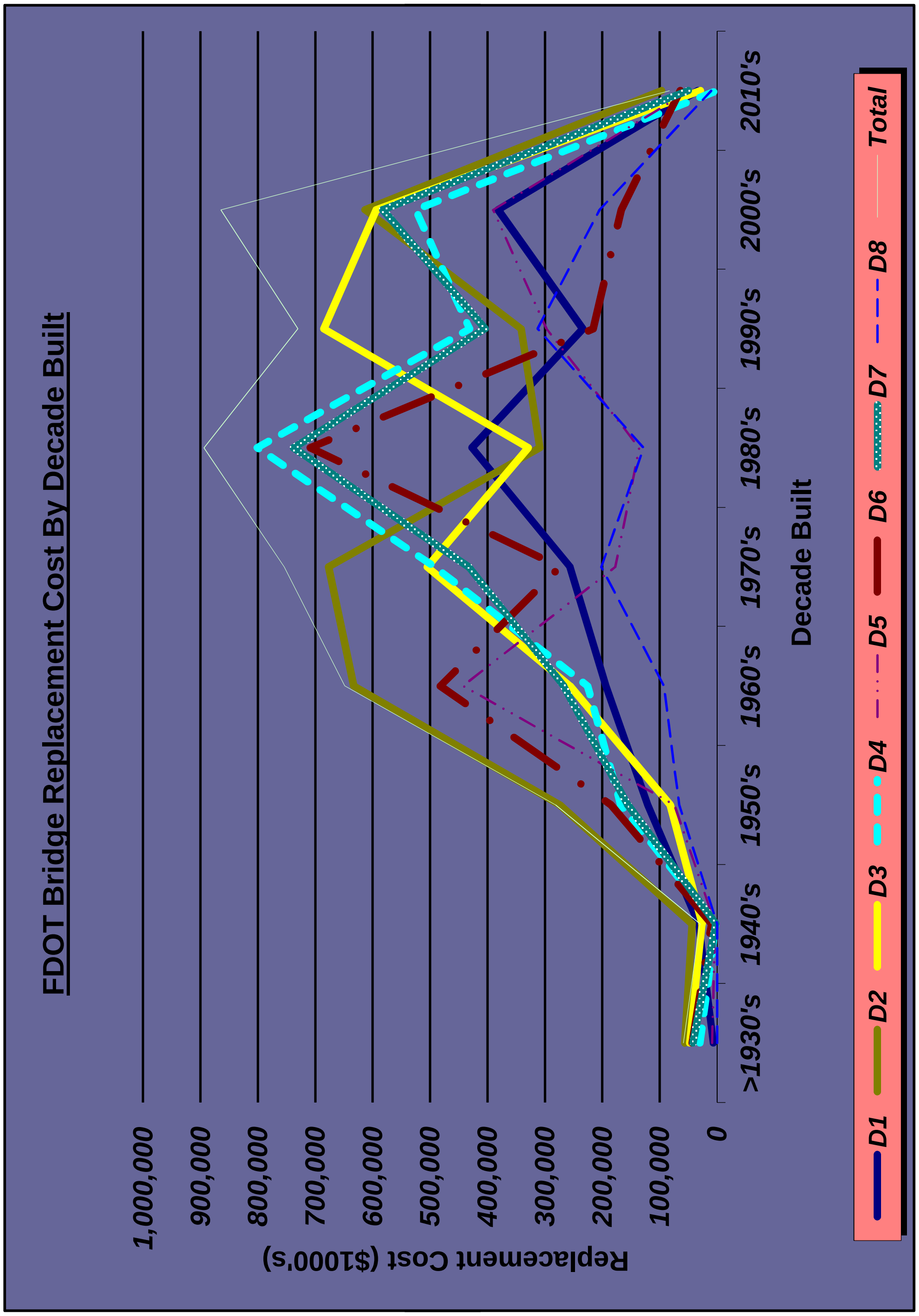

FDOT Bridge Replacement Cost By Decade Built
Replacement Cost ($1000's)
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
D8
Total

Figure 46

FDOT Inventory of Water Crossing (WC) vs. Non-Water Crossing (NWC) Bridges				
District	Deck Area (SF)		Bridge Cost ($1000's)	
	WC	NWC	WC	NWC
1	10,069,098	3,277,629	1,272,338	379,131
2	16,558,100	8,456,749	1,999,202	993,881
3	17,231,522	3,318,678	2,117,282	404,968
4	10,078,518	9,426,488	1,568,429	1,115,135
5	7,978,074	5,029,972	991,387	555,177
6	10,795,423	6,106,511	1,454,876	694,727
7	13,084,060	8,101,367	1,692,450	957,794
8	3,546,616	5,536,580	389,761	613,053
Total	89,341,411	49,253,975	11,485,725	5,713,866

Table 16

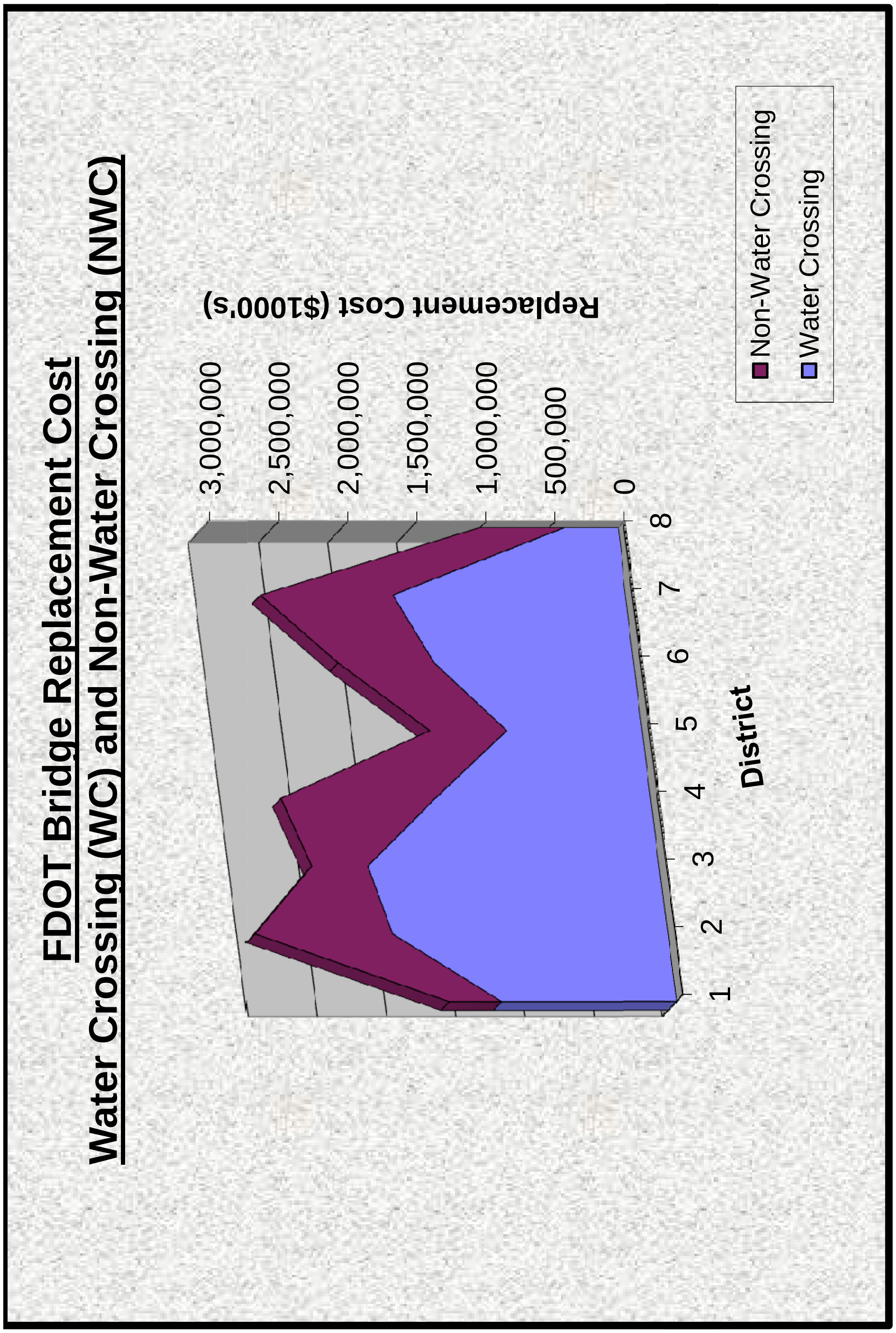

FDOT Bridge Replacement Cost
Water Crossing (WC) and Non-Water Crossing (NWC)
Replacement Cost ($1000's)
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
1
2
3
4
5
6
7
8
District
Non-Water Crossing
Water Crossing

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 12,059 bridges accounted for in Florida. The FDOT has maintenance responsibility for 6,703 of the bridges, or 55.59%. County governments maintain 3,862 bridges (32.03%), city and towns maintain 1,213 bridges (10.06%), with the remaining 281 bridges (2.33%) maintained by others. 16.0% of all bridges currently in service in Florida were constructed prior to 1960; 38.83% were constructed in the 1960's and 1970's, while the remaining 45.16% 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 (38.83% of the inventory) of bridges built during the 1960's and 1970's.

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