Florida Department of Transportation

Bridge Inventory 2021 Annual Report

July 2021

Office of Maintenance
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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 Enterprise. 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 12,595 bridge-structures accounted for in the Florida DOT Bridge Management System. The FDOT has maintenance responsibility for 7,079 of the bridges, or 56.20%. County governments maintain 3,935 bridges (31.24%), city and towns maintain 1,279 bridges (10.15%), with the remaining 302 bridges (2.40%) maintained by others (see Figure 1).

The 7,079 bridges maintained by FDOT are divided by district and shown in Figure 2. District 2 has the most bridges, with 1,285 (18.15%), followed by District 5 (1156 bridges – 16.33%), District 1 (943 bridges – 13.32%), District 3 (832 bridges – 11.75%), District 4 (772 bridges - 10.91%), District 7 (743 bridges – 10.50%), Turnpike District (716 bridges – 10.11%), and District 6 (632 bridges – 8.93%). The number of bridges shown includes the 156 bridges maintained by the Dade County Expressway Authority (MDX) and 352 bridges maintained by the Central Florida Expressway Authority (CFX).

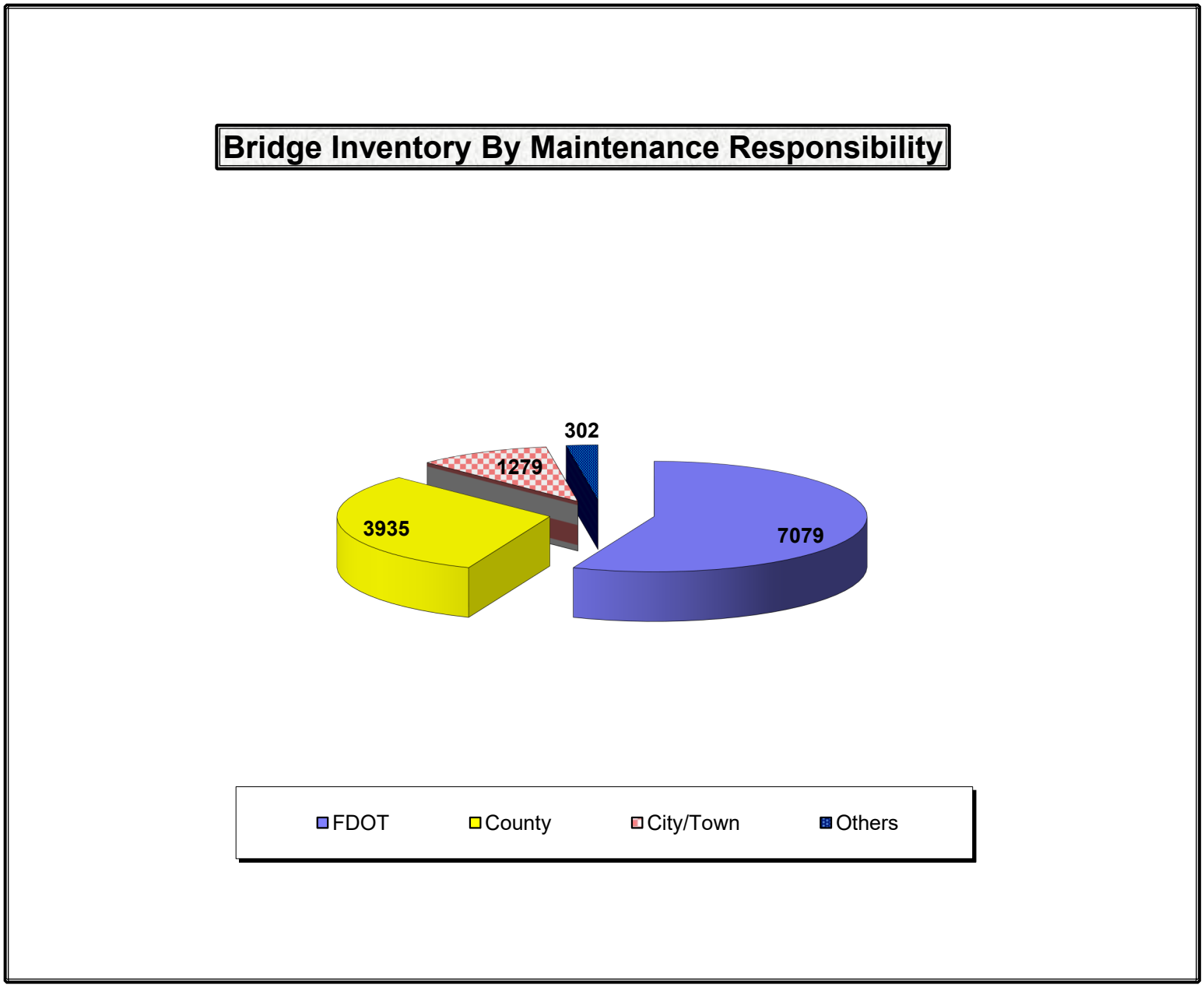

Figure 1

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

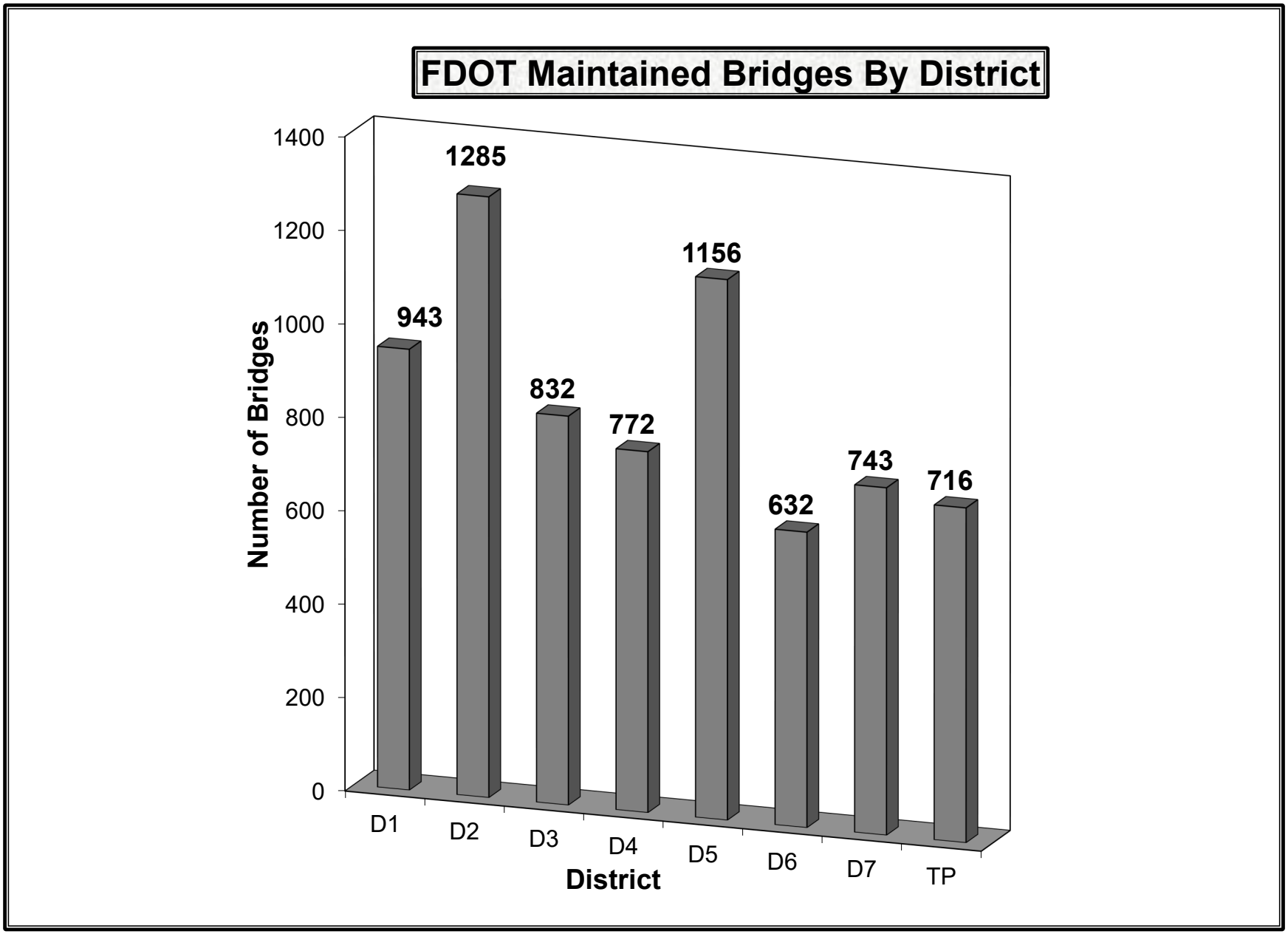

Figure 2

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX 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 7,079 bridges maintained by FDOT, approximately 12.43% were constructed prior to 1960, about 35.80% were constructed in the 1960's and 1970's, with the remaining 51.77% having been built since 1980 (see Figure 3).

Similar results can be seen with the statewide bridge inventory of county government maintained bridges with 16.62% constructed prior to 1960, 31.64% constructed in the 1960's and 1970's, and 51.74% since 1980 (see Figure 4).

The city and town maintained bridges are very similar as well, with 15.95% constructed prior to 1960, 36.90% constructed in the 1960's and 1970's, and 47.15% since 1980 (see Figure 5).

An examination of the distribution of the decade of construction by FDOT District, for the 7,079 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 1 – 21.21%, District 2 – 19.61%, District 3 – 15.99%, District 4 – 4.92%, District 5 – 7.18%, District 6 – 9.34%, District 7 – 9.42%, and the Turnpike – 6.28%. 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.

Bridge Inventory By Decade Built								
	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
Statewide								
>1930s	144	87	43	1	0	4	0	279
1940s	200	127	18	2	0	0	0	347
1950s	536	440	143	10	0	0	0	1129
1960s	1319	763	193	19	6	0	2	2302
1970s	1215	482	279	4	10	0	8	1998
1980s	877	490	215	16	8	0	16	1622
1990s	896	628	159	38	9	0	22	1752
2000s	975	490	134	53	8	0	10	1670
2010s	857	399	83	21	9	0	22	1391
Total	7079	3935	1279	166	51	4	81	12595

Table 1

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

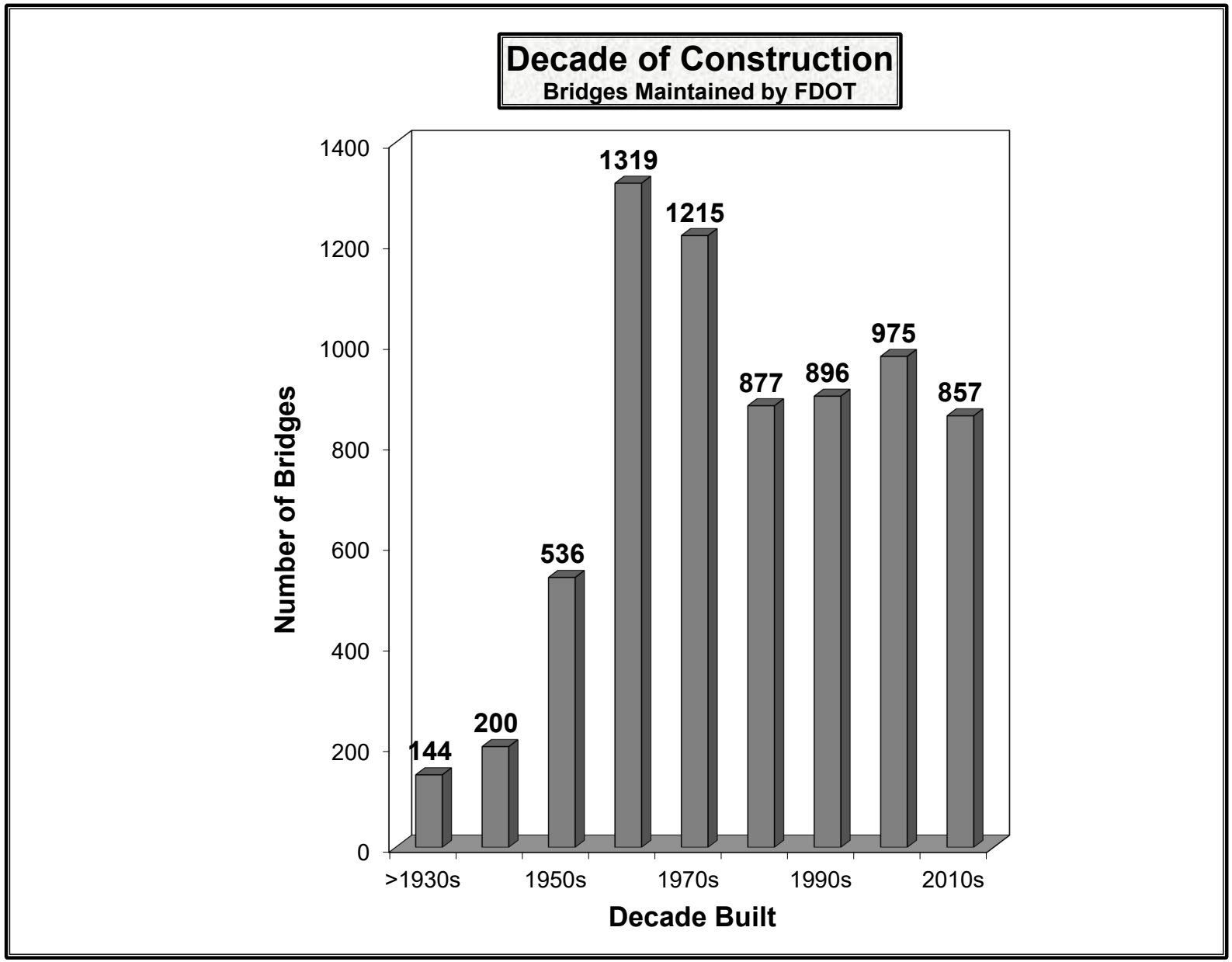

Figure 3

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

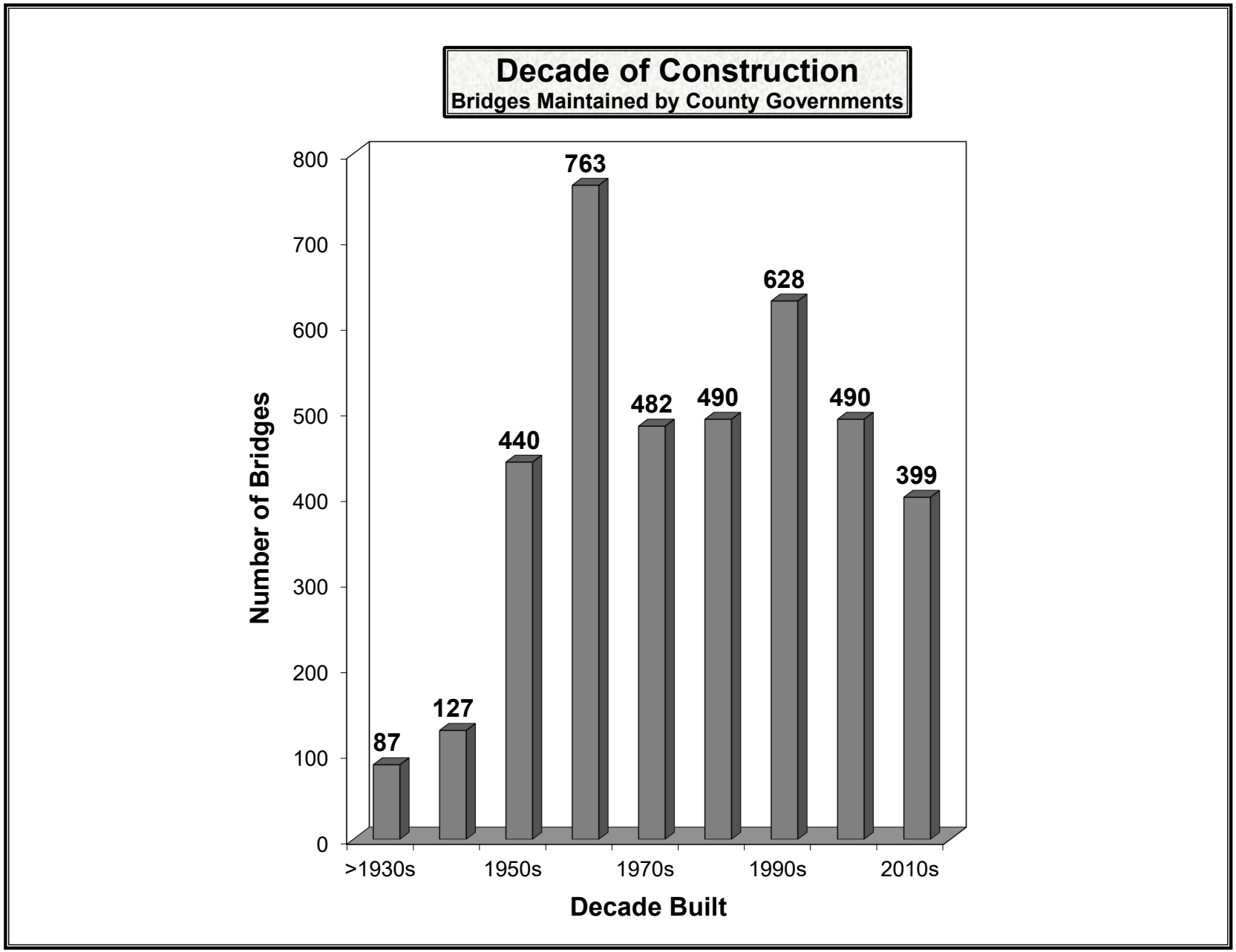

Figure 4

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

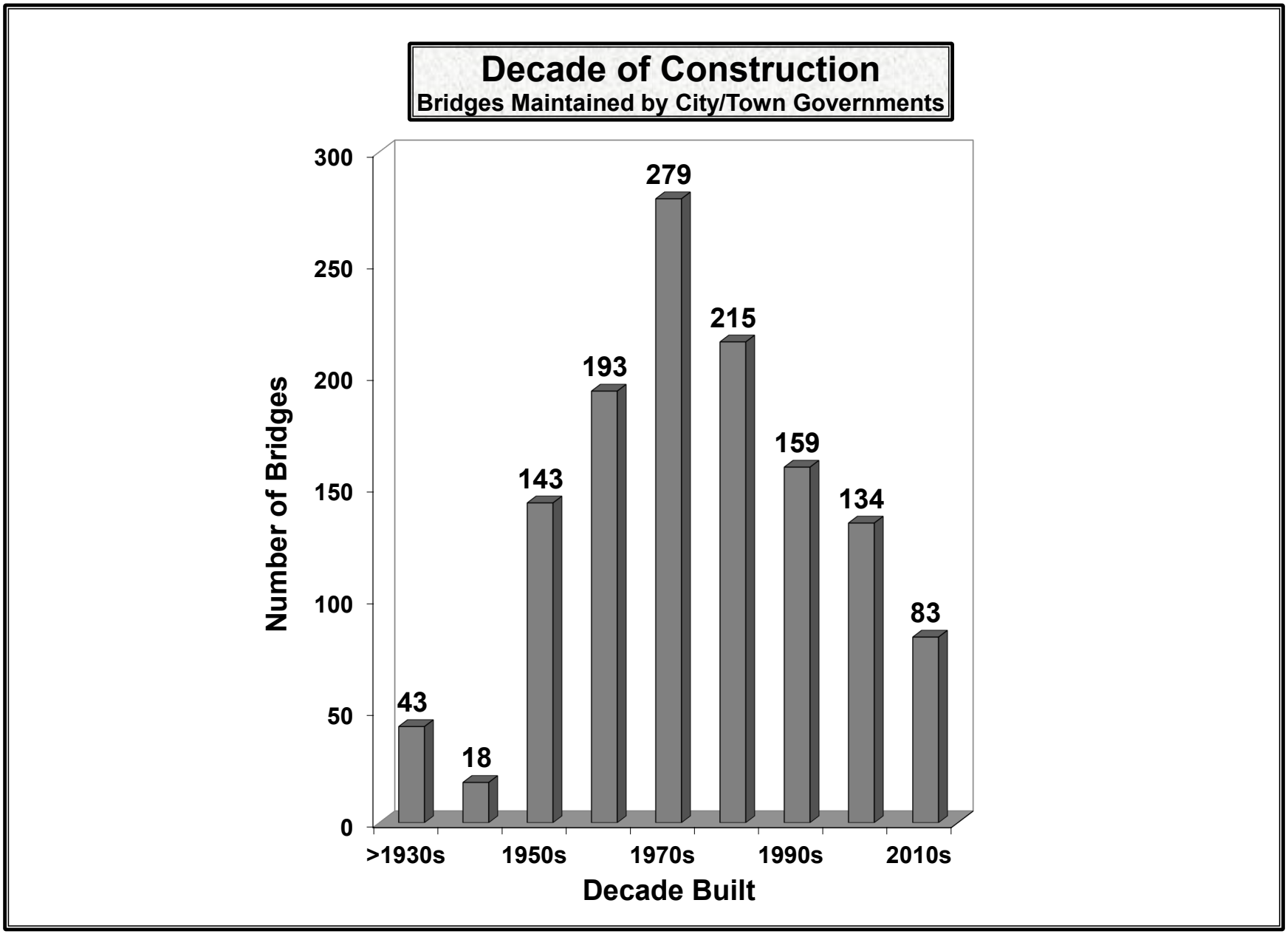

Figure 5

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

Bridge Inventory by Decade Built (Districts 1 thru 4)																
	Maintenance Responsibility								Maintenance Responsibility							
	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
	District 1								District 3							
>1930s	21	8	5	0	0	0	0	34	10	23	0	1	0	0	0	34
1940s	58	24	2	1	0	0	0	85	51	31	1	1	0	0	0	84
1950s	121	99	13	1	0	0	0	234	72	130	4	0	0	0	0	206
1960s	110	203	36	6	6	0	0	361	101	145	5	5	0	0	0	256
1970s	151	131	83	0	3	0	0	368	284	84	7	3	2	0	0	380
1980s	177	135	48	1	5	0	0	366	58	63	8	13	0	0	1	143
1990s	138	125	27	6	8	0	0	304	103	185	11	26	0	0	0	325
2000s	97	101	22	4	1	0	0	225	68	153	10	41	1	0	0	273
2010s	64	95	14	5	1	0	0	179	79	125	5	8	0	0	0	217
Total	937	921	250	24	24	0	0	2156	826	939	51	98	3	0	1	1918
	District 2								District 4							
>1930s	53	14	4	0	0	0	0	71	4	4	6	0	0	0	0	14
1940s	59	49	3	0	0	0	0	111	1	2	4	0	0	0	0	7
1950s	140	112	32	4	0	0	0	288	33	35	59	5	0	0	0	132
1960s	407	93	33	1	0	0	0	534	70	66	54	4	0	0	1	195
1970s	191	39	31	0	0	0	1	262	145	71	66	0	0	0	0	282
1980s	45	46	29	0	0	0	0	120	226	71	54	1	0	0	0	352
1990s	96	45	27	2	0	0	0	170	99	105	17	1	0	0	0	222
2000s	146	53	37	3	0	0	1	240	124	65	18	3	0	0	0	210
2010s	147	42	16	1	0	0	0	206	67	42	20	1	0	0	1	131
Total	1284	493	212	11	0	0	2	2002	769	461	298	15	0	0	2	1545

Table 2

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

Bridge Inventory by Decade Built (Districts 5 thru 8)																
	Maintenance Responsibility								Maintenance Responsibility							
	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
	District 5								District 7							
>1930s	24	10	4	0	0	0	0	38	29	10	14	0	0	0	0	53
1940s	11	10	2	0	0	0	0	23	10	4	3	0	0	0	0	17
1950s	48	24	5	0	0	0	0	77	31	18	17	0	0	0	0	66
1960s	199	60	10	0	0	0	1	270	105	99	37	1	0	0	0	242
1970s	129	36	53	1	0	0	7	226	110	89	23	0	5	0	0	227
1980s	77	77	39	1	0	0	15	209	167	72	20	0	3	0	0	262
1990s	151	64	28	3	0	0	22	268	64	90	39	0	1	0	0	194
2000s	232	56	25	2	4	0	8	327	122	39	14	0	2	0	1	178
2010s	252	59	19	5	3	0	21	359	101	19	6	0	1	0	0	127
Total	1123	396	185	12	7	0	74	1797	739	440	173	1	12	0	1	1366
	District 6								Turnpike							
>1930s	3	18	10	0	0	4	0	35	0	0	0	0	0	0	0	0
1940s	10	7	3	0	0	0	0	20	0	0	0	0	0	0	0	0
1950s	46	22	13	0	0	0	0	81	45	0	0	0	0	0	0	45
1960s	214	97	18	2	0	0	0	331	113	0	0	0	0	0	0	113
1970s	73	32	16	0	0	0	0	121	132	0	0	0	0	0	0	132
1980s	64	26	17	0	0	0	0	107	63	0	0	0	0	0	0	63
1990s	48	14	10	0	0	0	0	72	197	0	0	0	0	0	0	197
2000s	73	23	8	0	0	0	0	104	113	0	0	0	0	0	0	113
2010s	97	17	3	1	4	0	0	122	50	0	0	0	0	0	0	50
Total	628	256	98	3	4	4	0	993	713	0	0	0	0	0	0	713

Table 3

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

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 15.69% of the total inventory. Similarly, slab bridges maintained by counties are 35.76%, and by cities and towns are 53.32%.

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 62.73% of the state maintained inventory, 33.44% of the county bridges, and 24.71% 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 0.16% 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 15.86% of the state maintained bridges. County inventories include 27.65% culverts, and city/towns include 19.23% 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 1.24% of the total state bridge inventory. County inventories include 1.02% movables, and city/towns include 0.63% movable bridges.

Figures

Figures 6 through 9 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	801	641	216	14	9	0	4	1685
PSC Slab	310	766	466	21	14	4	11	1592
RC Beam	104	141	72	3	0	0	0	320
PSC Beam	3671	717	196	19	12	0	53	4668
Steel Beam	665	152	28	35	7	0	6	893
Timber Beam	1	306	20	31	0	0	0	358
RC Box	3	1	1	0	0	0	0	5
PSC Box	154	4	0	0	0	0	0	158
Steel Box	144	9	4	1	0	0	1	159
Truss	3	14	2	31	2	0	0	52
Movable	88	40	8	1	0	0	1	138
Culvert	1123	1088	246	3	6	0	5	2471
Other	12	56	20	7	1	0	0	96
Total	7079	3935	1279	166	51	4	81	12595

Table 4

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

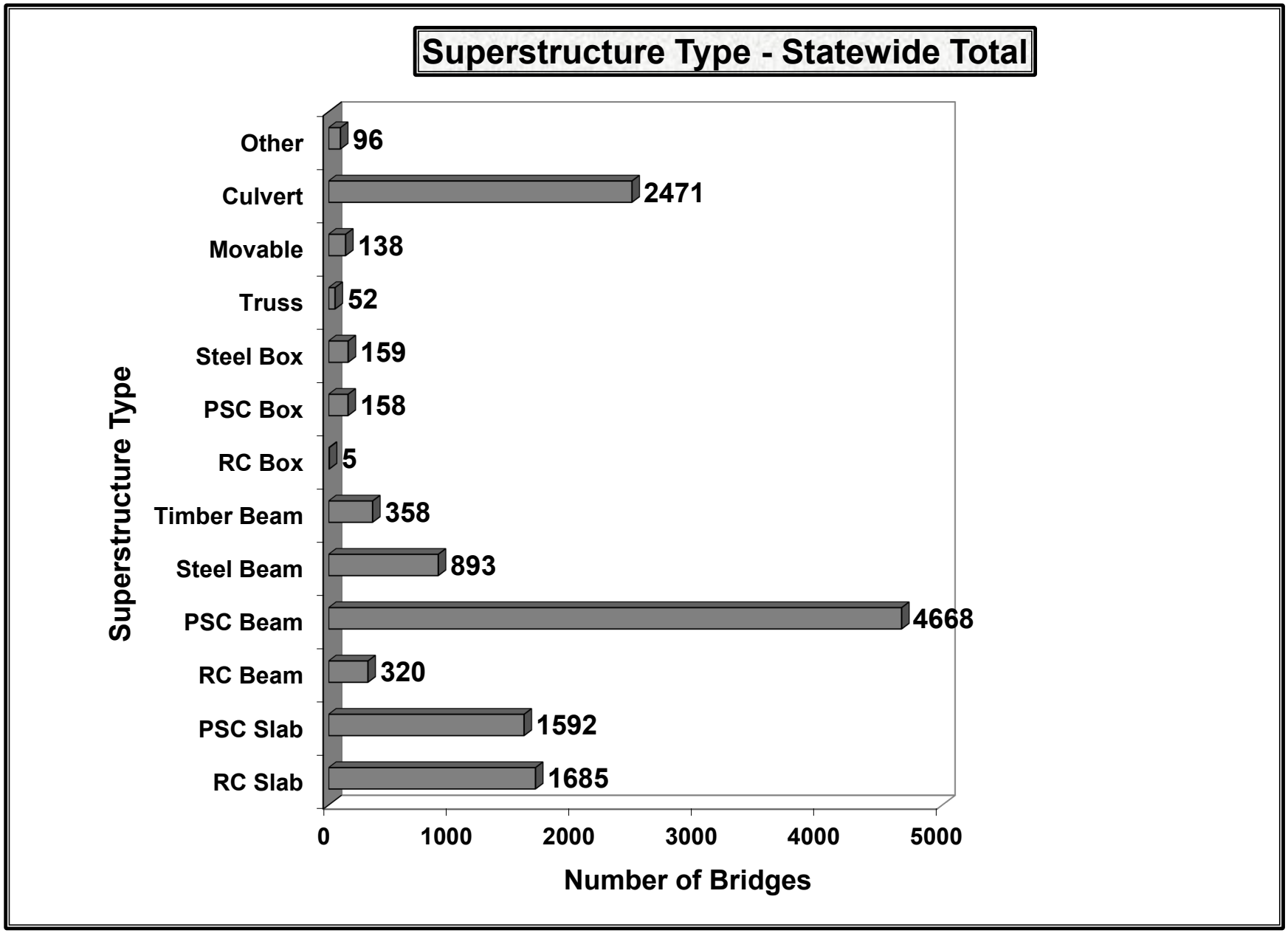
Superstructure Type - Statewide Total
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
96
2471
138
52
159
158
5
358
893
4668
320
1592
1685
0
1000
2000
3000
4000
5000
Number of Bridges

Figure 6

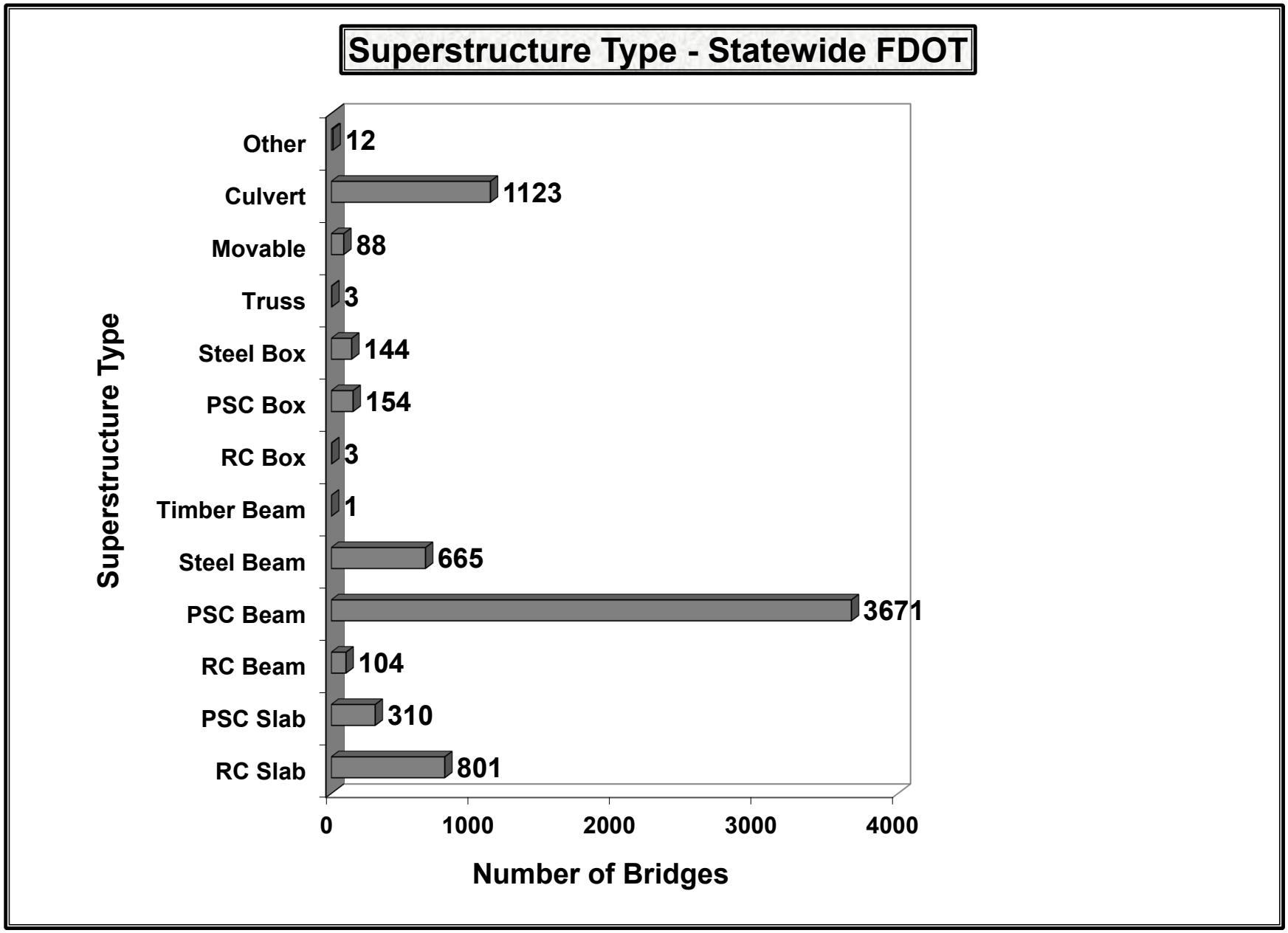
Superstructure Type - Statewide FDOT
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
12
1123
88
3
144
154
3
1
665
3671
104
310
801
0
1000
2000
3000
4000
Number of Bridges

Figure 7

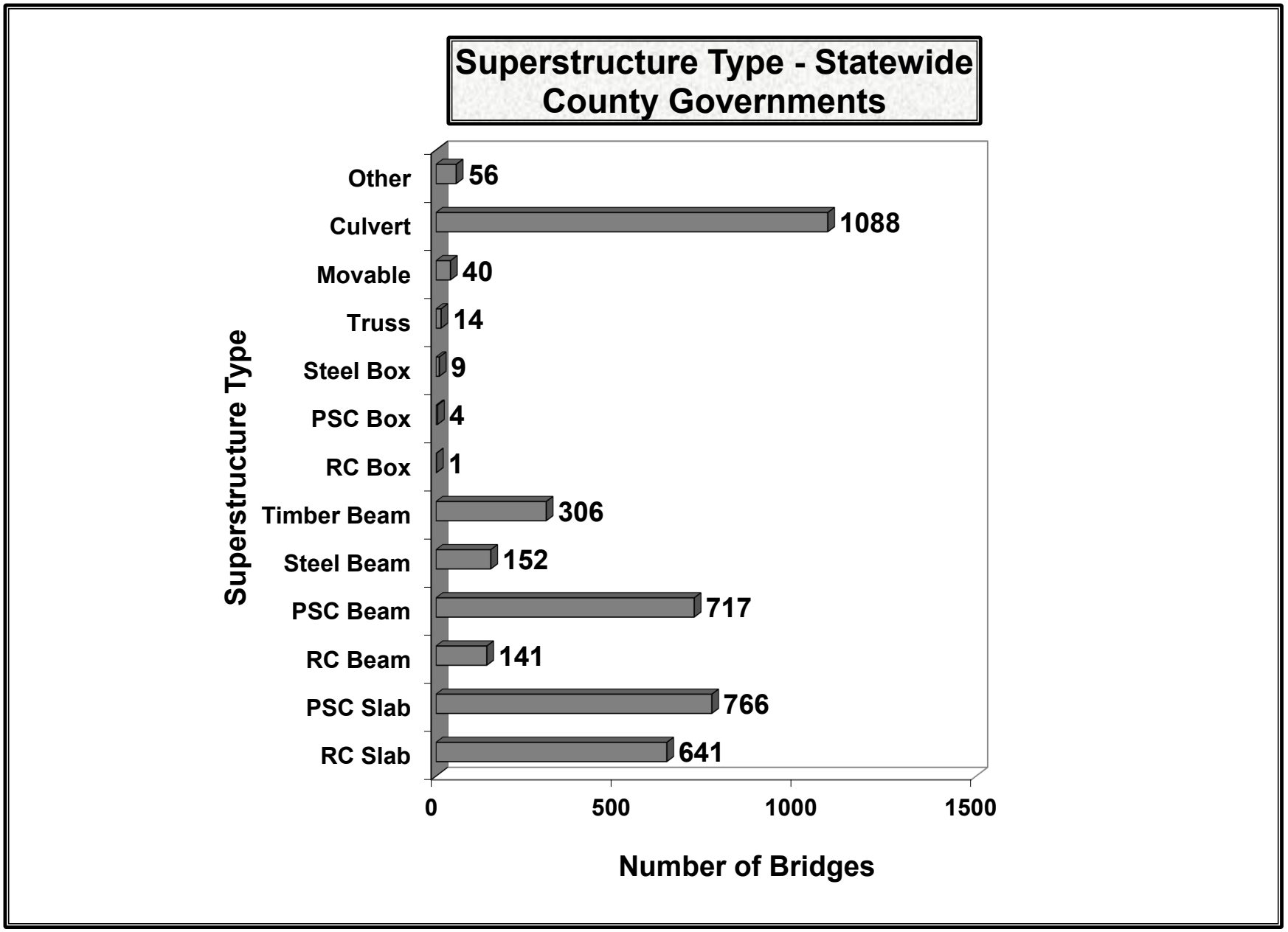
Superstructure Type - Statewide
County Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
56
1088
40
14
9
4
1
306
152
717
141
766
641
0
500
1000
1500
Number of Bridges

Figure 8

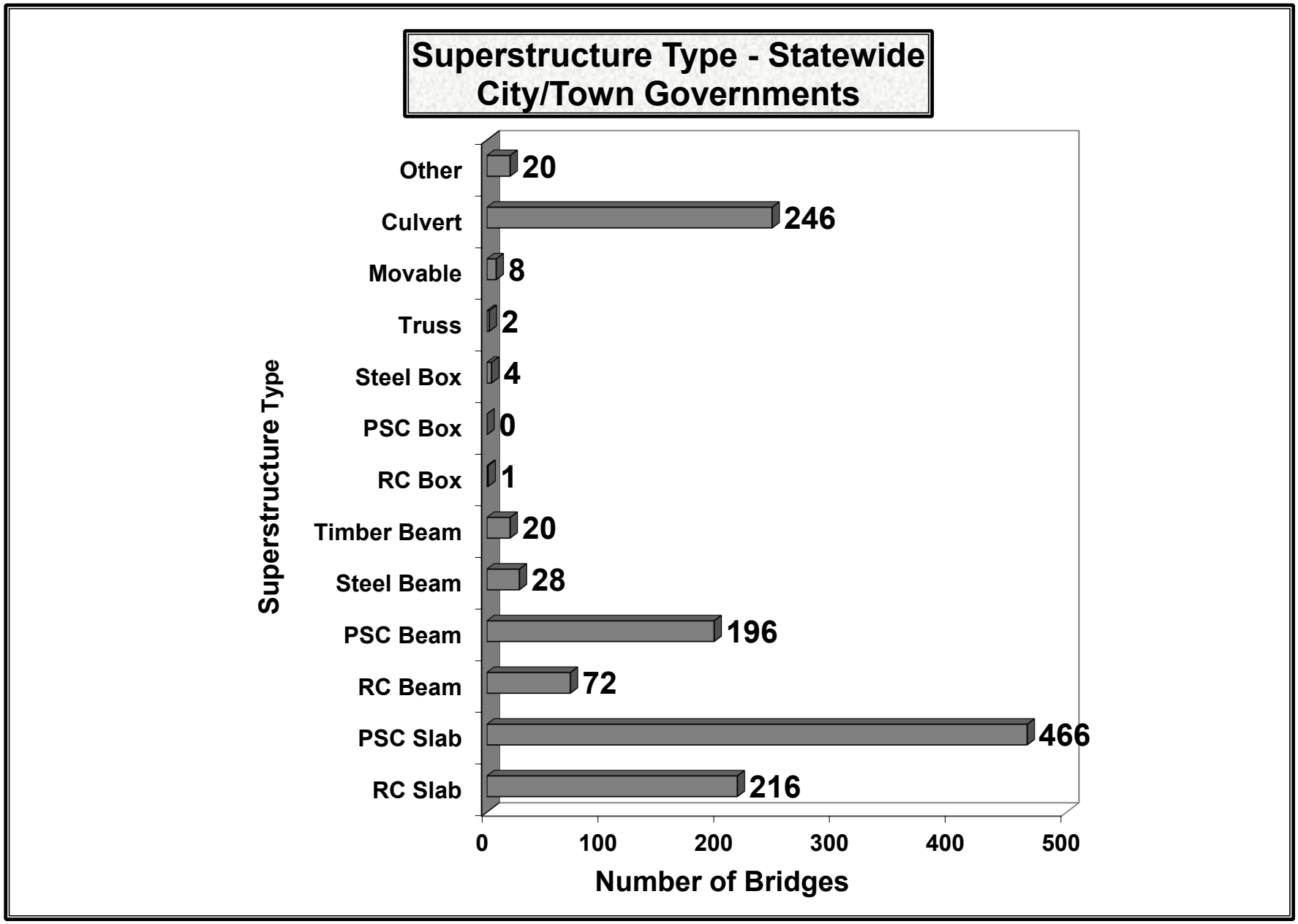
Superstructure Type - Statewide
City/Town Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
20
246
8
2
4
0
1
20
28
196
72
466
216
0
100
200
300
400
500
Number of Bridges

Figure 9

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 10 presents the 5,956 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 1,867 bridges, 31.35% of the total. 11.60% of the FDOT bridges fall into the 0 to 5,000 square foot range; 29.31% are in the 5,000 to 10,000 square foot range; and 27.74% 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 65.75% of their bridges under 5,000 square feet; with 17.77% between 5,000 and 10,000 square feet; 9.73% between 10,000 to 20,000 square feet; and only 6.74% over 20,000 square feet (see Figure 11). The results for the City/Town and Others groups are similar; with 73.28% of these bridges less than 5,000 square feet (see Figures 12 & 13).

FDOT Bridges by District

Tables 6 and 7 present the statewide data sorted by district. For example, 21.99% of the District 1 bridges are less than 5,000 square feet and only 16.11% of their bridges are over 20,000 square feet. In contrast, only 8.91% of District 4 bridges are less than 5,000 square feet, while 39.54% 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	8	424	105	77	1	0	2	617
1,000-2,500	166	753	338	48	10	4	8	1327
2,500-5,000	517	695	314	24	14	0	12	0
5,000-7,500	902	320	103	4	6	0	10	1345
7,500-10,000	844	186	55	2	7	0	10	1104
10,000-20,000	1867	277	66	4	5	0	20	2239
20,000-40,000	927	117	29	2	0	0	7	1082
40,000-80,000	406	42	17	0	0	0	6	471
80,000-160,000	187	21	6	1	2	0	1	218
>160,000	132	12	0	1	0	0	0	145
Total	5956	2847	1033	163	45	4	76	10124

Table 5

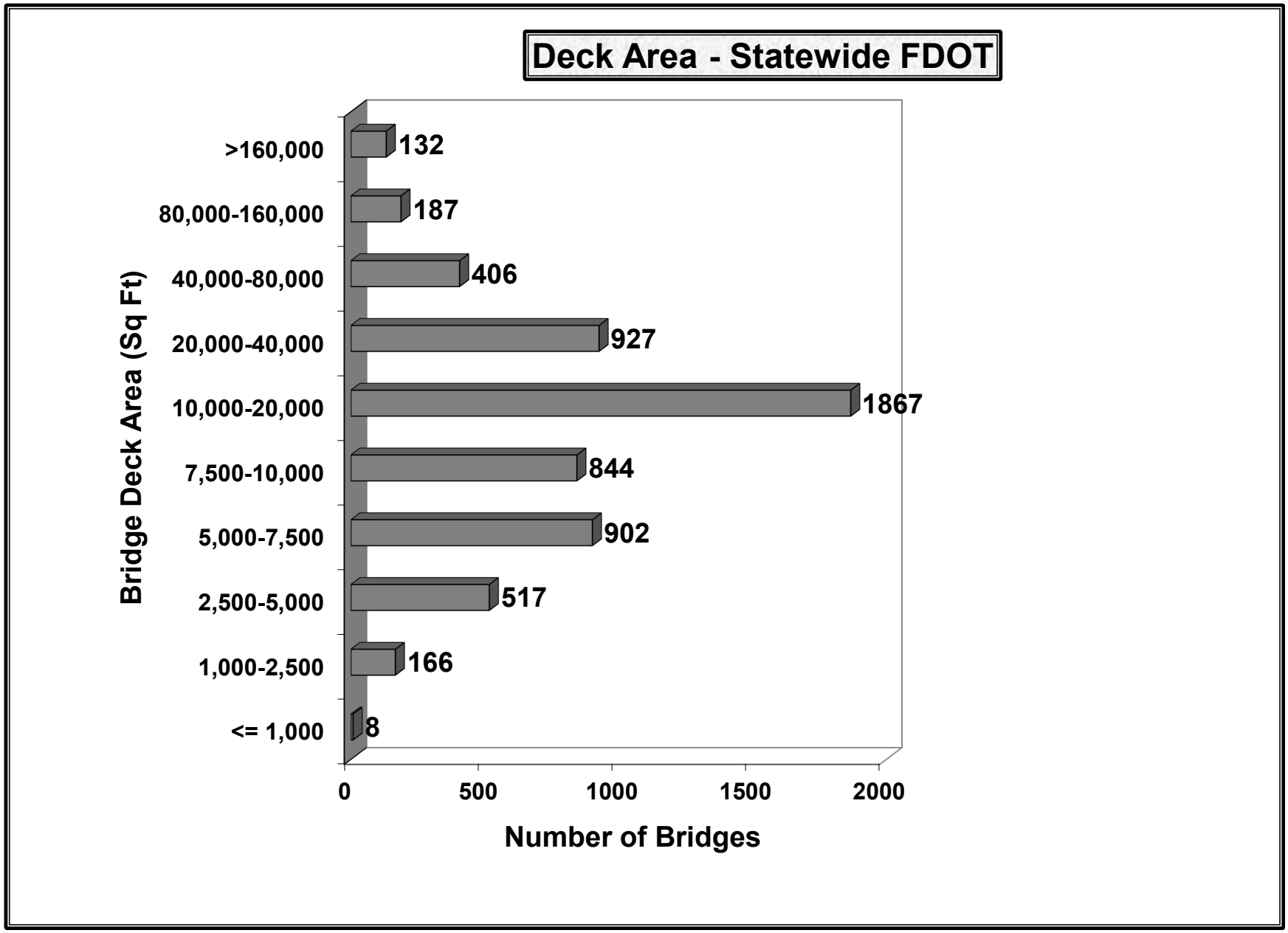
Deck Area - Statewide FDOT
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
132
187
406
927
1867
844
902
517
166
8
0
500
1000
1500
2000
Number of Bridges

Figure 10

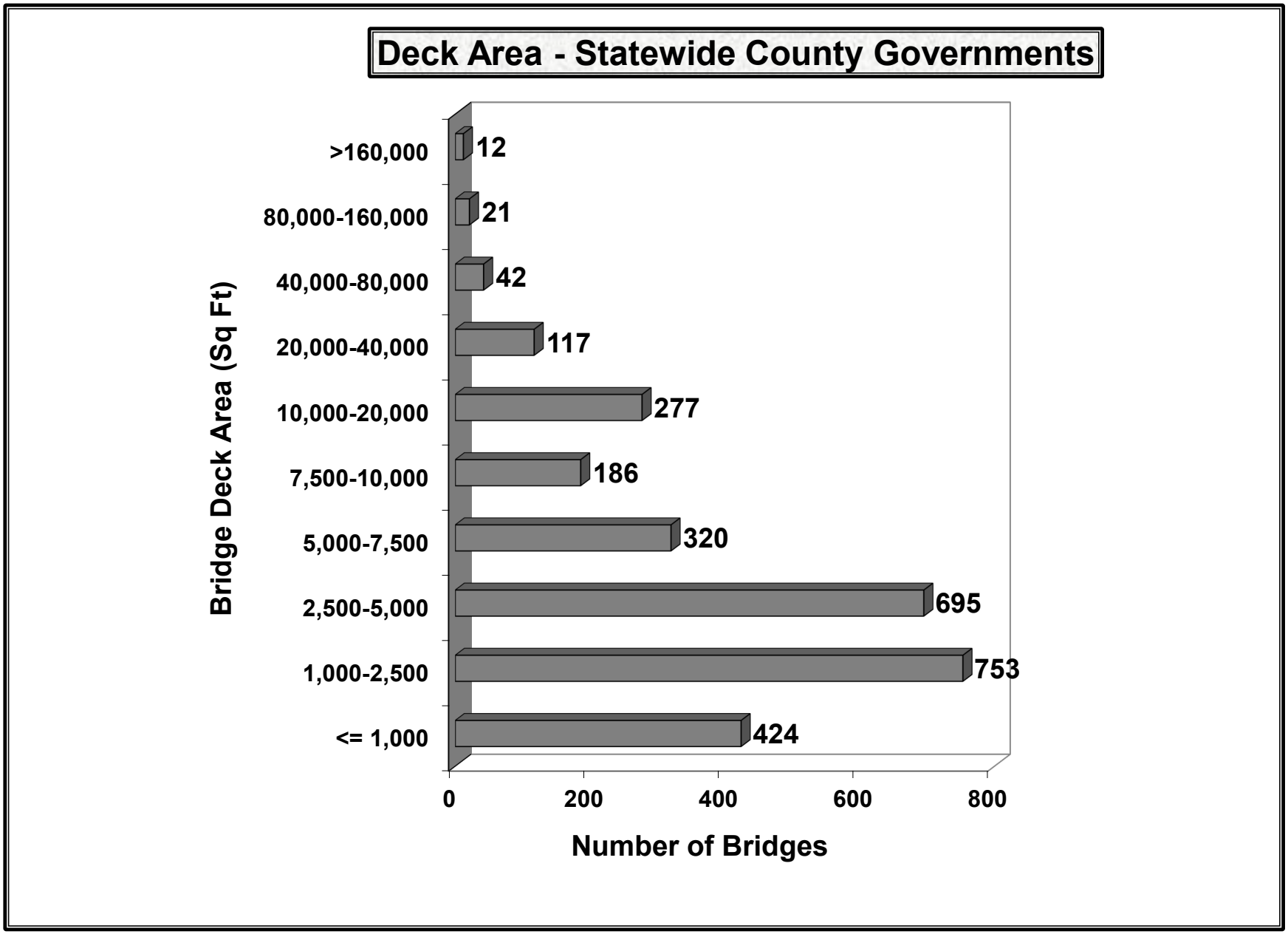
Deck Area - Statewide County Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
12
21
42
117
277
186
320
695
753
424
0
200
400
600
800
Number of Bridges

Figure 11

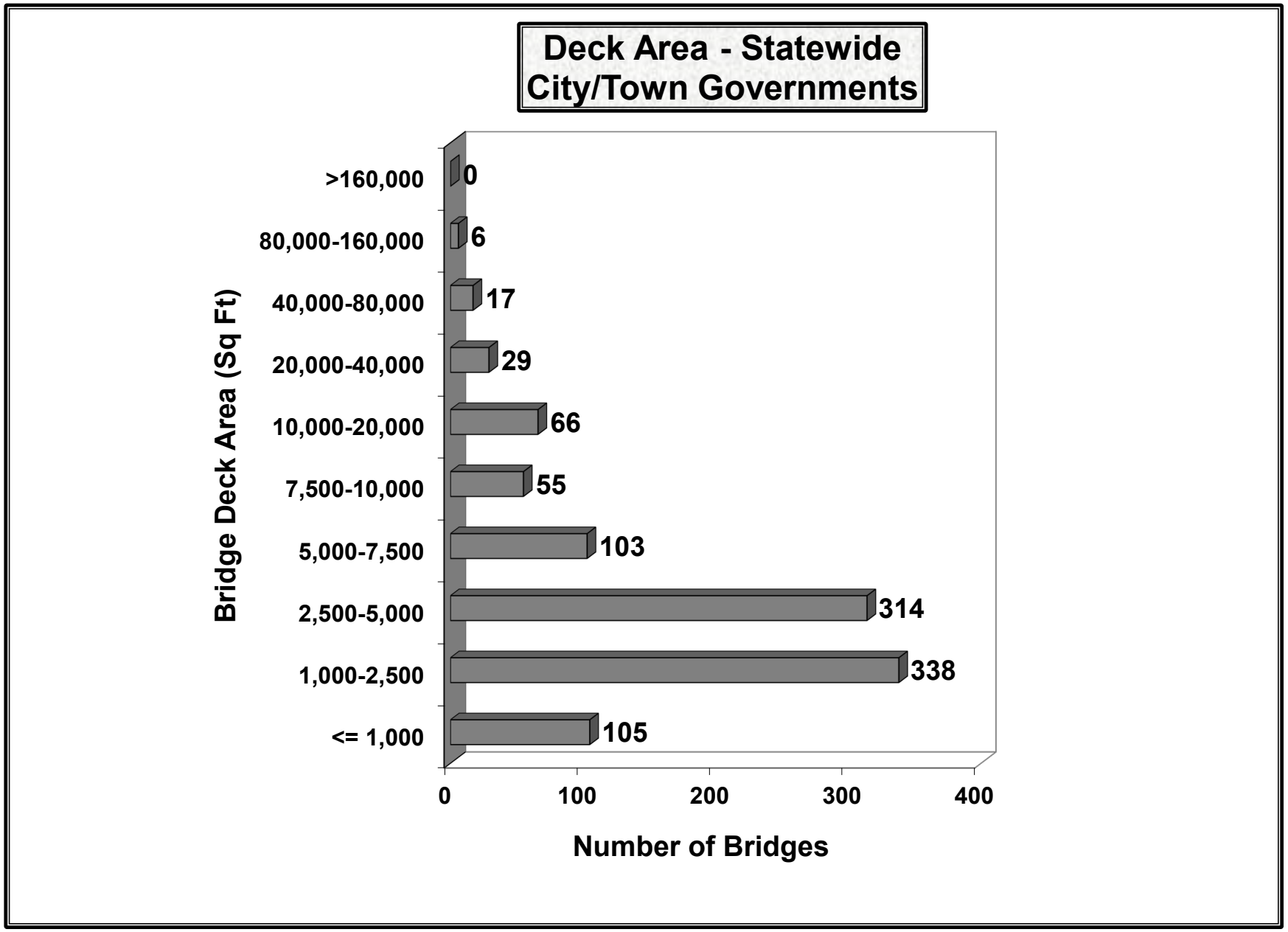
Deck Area - Statewide
City/Town Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
6
17
29
66
55
103
314
338
105
0
100
200
300
400
Number of Bridges

Figure 12

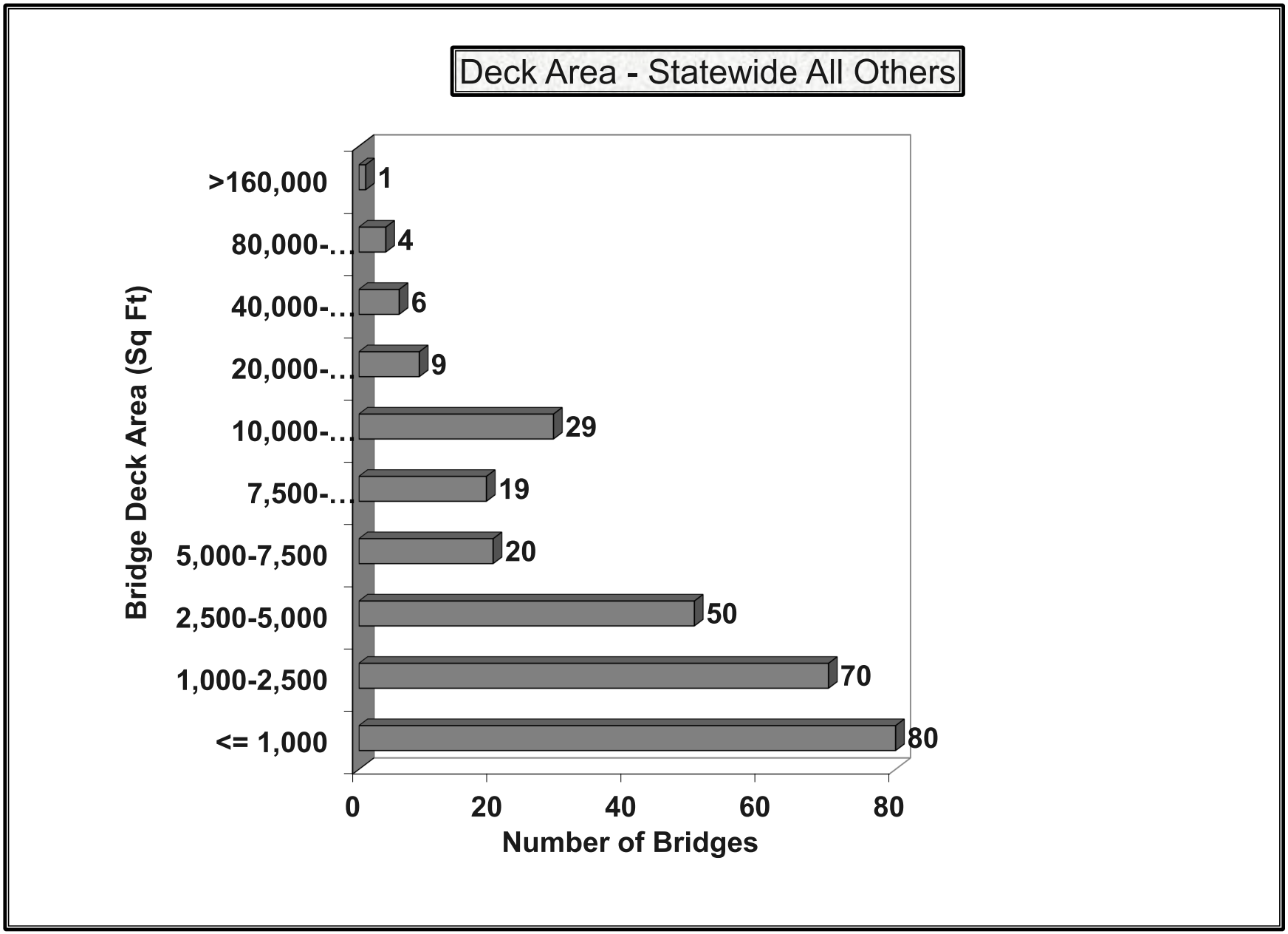
Deck Area - Statewide All Others
Bridge Deck Area (Sq Ft)
>160,000
80,000-...
40,000-...
20,000-...
10,000-...
7,500-...
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
1
4
6
9
29
19
20
50
70
80
0
20
40
60
80
Number of Bridges

Figure 13

Bridge Inventory By Deck Area (Districts 1 Thru 4)

	Maintenance Responsibility								Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
	District 1								District 3							
<= 1,000	4	88	23	0	0	0	0	115	0	200	6	61	1	0	0	268
1,000-2,500	76	193	59	10	6	0	0	344	10	223	11	27	0	0	0	271
2,500-5,000	77	177	76	6	12	0	0	348	53	141	13	7	0	0	0	214
5,000-7,500	146	55	26	2	4	0	0	233	99	60	2	0	0	0	0	161
7,500-10,000	93	37	11	0	0	0	0	141	99	26	1	2	0	0	0	128
10,000-20,000	203	52	8	2	1	0	0	266	187	28	3	0	0	0	0	218
20,000-40,000	62	20	0	2	0	0	0	84	77	15	1	0	0	0	0	93
40,000-80,000	30	5	0	0	0	0	0	35	32	3	2	0	0	0	0	37
80,000-160,000	10	7	0	0	0	0	0	17	23	3	0	0	2	0	0	28
>160,000	13	2	0	1	0	0	0	16	25	0	0	0	0	0	0	25
Total	714	636	203	23	23	0	0	1599	605	699	39	97	3	0	0	1443
	District 2								District 4							
<= 1,000	3	49	11	9	0	0	0	72	0	9	34	0	0	0	1	44
1,000-2,500	24	50	55	2	0	0	0	131	18	95	105	5	0	0	0	223
2,500-5,000	87	74	35	1	0	0	0	197	48	135	102	8	0	0	0	293
5,000-7,500	163	28	16	0	0	0	0	207	73	67	20	2	0	0	0	162
7,500-10,000	164	13	13	0	0	0	0	190	66	41	8	0	0	0	0	115
10,000-20,000	308	17	12	0	0	0	2	339	243	53	14	0	0	0	0	310
20,000-40,000	124	9	9	0	0	0	0	142	181	28	4	0	0	0	0	213
40,000-80,000	56	3	5	0	0	0	0	64	74	10	1	0	0	0	1	86
80,000-160,000	41	0	1	0	0	0	0	42	21	2	1	0	0	0	0	24
>160,000	21	1	0	0	0	0	0	22	17	2	0	0	0	0	0	19
Total	991	244	157	12	0	0	2	1406	741	442	289	15	0	0	2	1489

Table 6

Bridge Inventory By Deck Area (Districts 5 Thru 8)

	Maintenance Responsibility								Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
	District 5								District 7							
<= 1,000	0	21	11	7	0	0	1	40	1	42	16	0	0	0	0	59
1,000-2,500	12	53	40	2	2	0	8	117	16	68	38	0	2	0	0	124
2,500-5,000	96	59	27	2	1	0	12	197	23	51	25	0	0	0	0	99
5,000-7,500	153	33	19	0	0	0	10	215	67	42	10	0	0	0	0	119
7,500-10,000	158	24	11	0	0	0	10	203	85	29	4	0	7	0	0	125
10,000-20,000	314	56	18	1	2	0	18	409	207	43	6	0	1	0	0	257
20,000-40,000	149	19	5	0	0	0	7	180	127	15	6	0	0	0	0	148
40,000-80,000	55	7	5	0	0	0	5	72	69	9	2	0	0	0	0	80
80,000-160,000	36	2	2	0	0	0	1	41	24	3	2	1	0	0	0	30
>160,000	15	0	0	0	0	0	0	15	17	3	0	0	0	0	0	20
Total	988	274	138	12	5	0	72	1489	636	305	109	1	10	0	0	1061
	District 6								Turnpike							
<= 1,000	0	15	4	0	0	0	0	19	0	0	0	0	0	0	0	0
1,000-2,500	7	71	30	2	0	4	0	114	3	0	0	0	0	0	0	3
2,500-5,000	64	58	36	0	1	0	0	159	69	0	0	0	0	0	0	69
5,000-7,500	72	35	10	0	2	0	0	119	129	0	0	0	0	0	0	129
7,500-10,000	61	16	7	0	0	0	0	84	118	0	0	0	0	0	0	118
10,000-20,000	180	28	5	1	1	0	0	215	225	0	0	0	0	0	0	225
20,000-40,000	126	11	4	0	0	0	0	141	81	0	0	0	0	0	0	81
40,000-80,000	70	5	2	0	0	0	0	77	20	0	0	0	0	0	0	20
80,000-160,000	29	4	0	0	0	0	0	33	3	0	0	0	0	0	0	3
>160,000	20	4	0	0	0	0	0	24	4	0	0	0	0	0	0	4
Total	629	247	98	3	4	4	0	985	652	0	0	0	0	0	0	652

Table 7

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 14 shows, for each of the maintenance responsibility groups, the percentage of bridges in excellent, good, fair, and poor condition. Approximately 94.63% of the FDOT maintained bridges are in excellent or good condition. However, the number drops to 78.55% for County bridges, 81.86% for City/Town bridges, and 74.17% for Other Agency bridges.

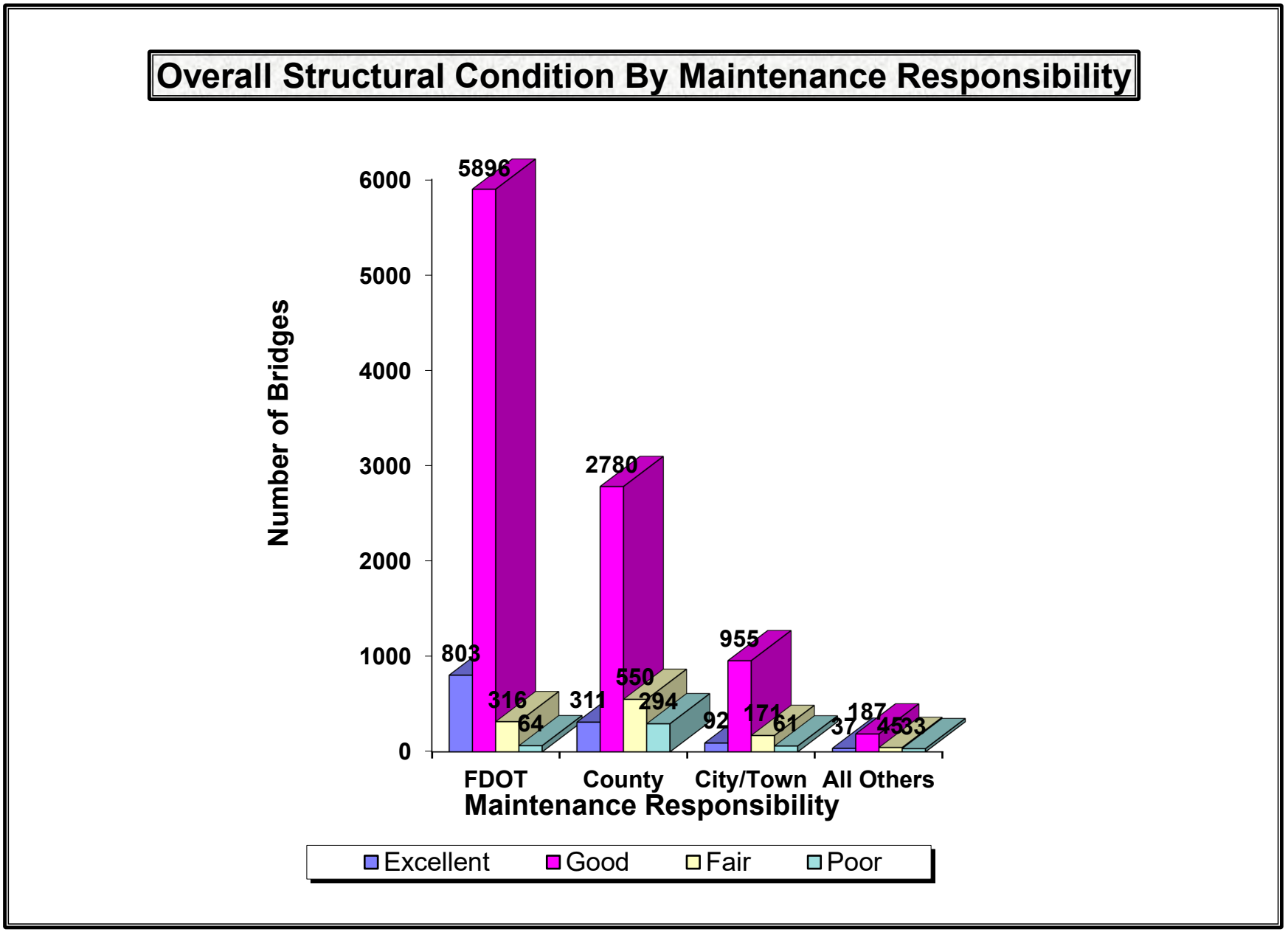
Overall Structural Condition By Maintenance Responsibility
Number of Bridges
6000
5000
4000
3000
2000
1000
0
5896
803
316
64
2780
311
550
294
955
92
171
61
187
37
45
33
FDOT
County
City/Town
All Others
Maintenance Responsibility
Excellent
Good
Fair
Poor

Figure 14

Overall Structural Condition																
	Maintenance Responsibility								Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
	District 1								District 5							
Excellent	47	64	11	3	1	0	0	126	262	52	12	2	3	0	13	344
Good	868	775	211	19	22	0	0	1895	850	306	148	9	4	0	53	1370
Fair	28	67	16	1	2	0	0	114	43	40	18	1	0	0	8	110
Poor	0	17	15	1	0	0	0	33	1	5	7	0	0	0	1	14
Total	943	923	253	24	25	0	0	2168	1156	403	185	12	7	0	75	1838
	District 2								District 6							
Excellent	94	42	18	1	0	0	1	156	162	18	8	1	4	0	0	193
Good	1090	315	163	5	0	0	1	1574	430	141	67	1	0	4	0	643
Fair	69	92	29	5	0	0	0	195	33	44	13	1	0	0	0	91
Poor	32	48	8	1	0	0	0	89	7	53	11	0	0	0	0	71
Total	1285	497	218	12	0	0	2	2014	632	256	99	3	4	4	0	998
	District 3								District 7							
Excellent	10	31	4	1	0	0	0	46	83	28	11	0	3	0	0	125
Good	730	530	40	47	0	0	1	1348	640	391	136	0	9	0	1	1177
Fair	78	231	7	22	3	0	0	341	19	19	21	0	0	0	0	59
Poor	14	155	2	29	0	0	0	200	1	8	5	1	0	0	0	15
Total	832	947	53	99	3	0	1	1935	743	446	173	1	12	0	1	1376
	District 4								Turnpike							
Excellent	66	76	28	4	0	0	0	174	79	0	0	0	0	0	0	79
Good	658	322	190	9	0	0	2	1181	630	0	0	0	0	0	0	630
Fair	39	57	67	2	0	0	0	165	7	0	0	0	0	0	0	7
Poor	9	8	13	0	0	0	0	30	0	0	0	0	0	0	0	0
Total	772	463	298	15	0	0	2	1550	716	0	0	0	0	0	0	716
									Statewide							
Excellent	803	311	92	12	11	0	14	1243								
Good	5896	2780	955	90	35	4	58	9818								
Fair	316	550	171	32	5	0	8	1082								
Poor	64	294	61	32	0	0	1	452								
Total	7079	3935	1279	166	51	4	81	12595								

NOTE: The number of FDOT bridges includes 156 MDX bridges and 352 CFX bridges.

Table 8

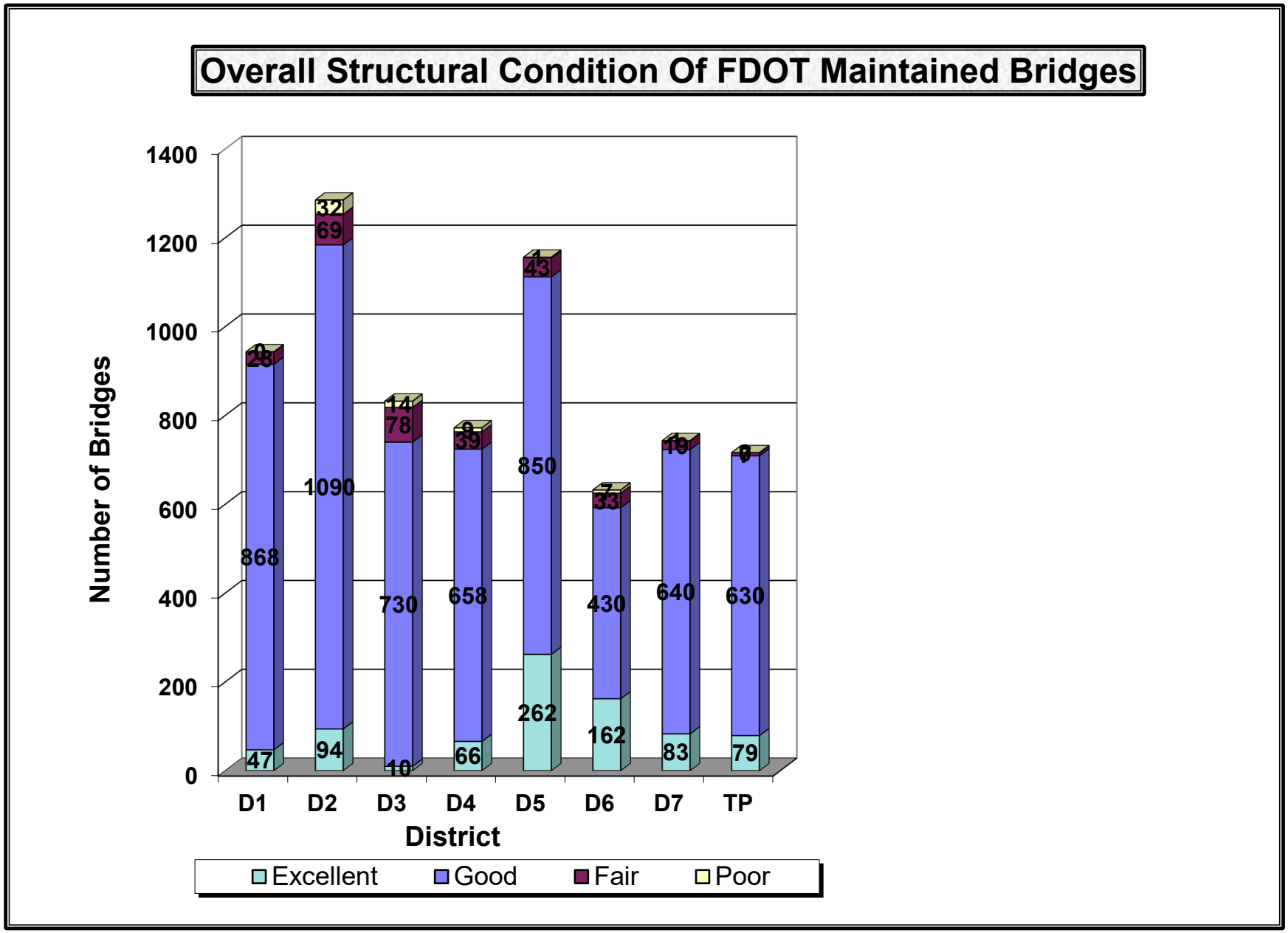
Overall Structural Condition Of FDOT Maintained Bridges
Number of Bridges
1400
1200
1000
800
600
400
200
0
D1
D2
D3
D4
D5
D6
D7
TP
District
868
28
47
1090
69
32
94
730
78
14
10
658
39
9
66
850
43
1
262
430
33
7
162
640
19
1
83
630
0
79
Excellent
Good
Fair
Poor

Figure 15

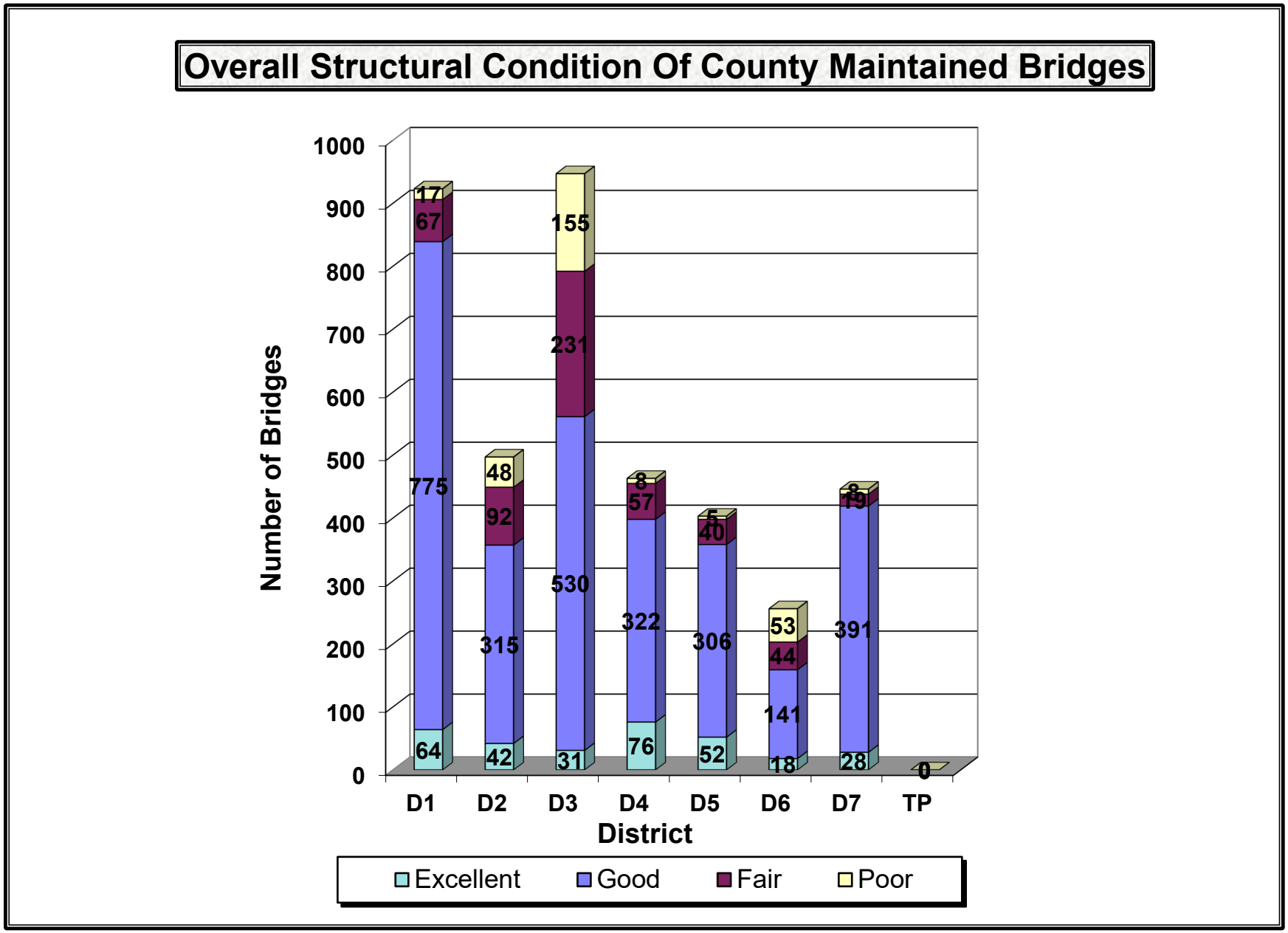
Overall Structural Condition Of County Maintained Bridges
Number of Bridges
1000
900
800
700
600
500
400
300
200
100
0
D1
D2
D3
D4
D5
D6
D7
TP
District
775
64
67
17
315
42
92
48
530
31
231
155
322
76
57
8
306
52
40
5
141
18
44
53
391
28
19
8
0
Excellent
Good
Fair
Poor

Figure 16

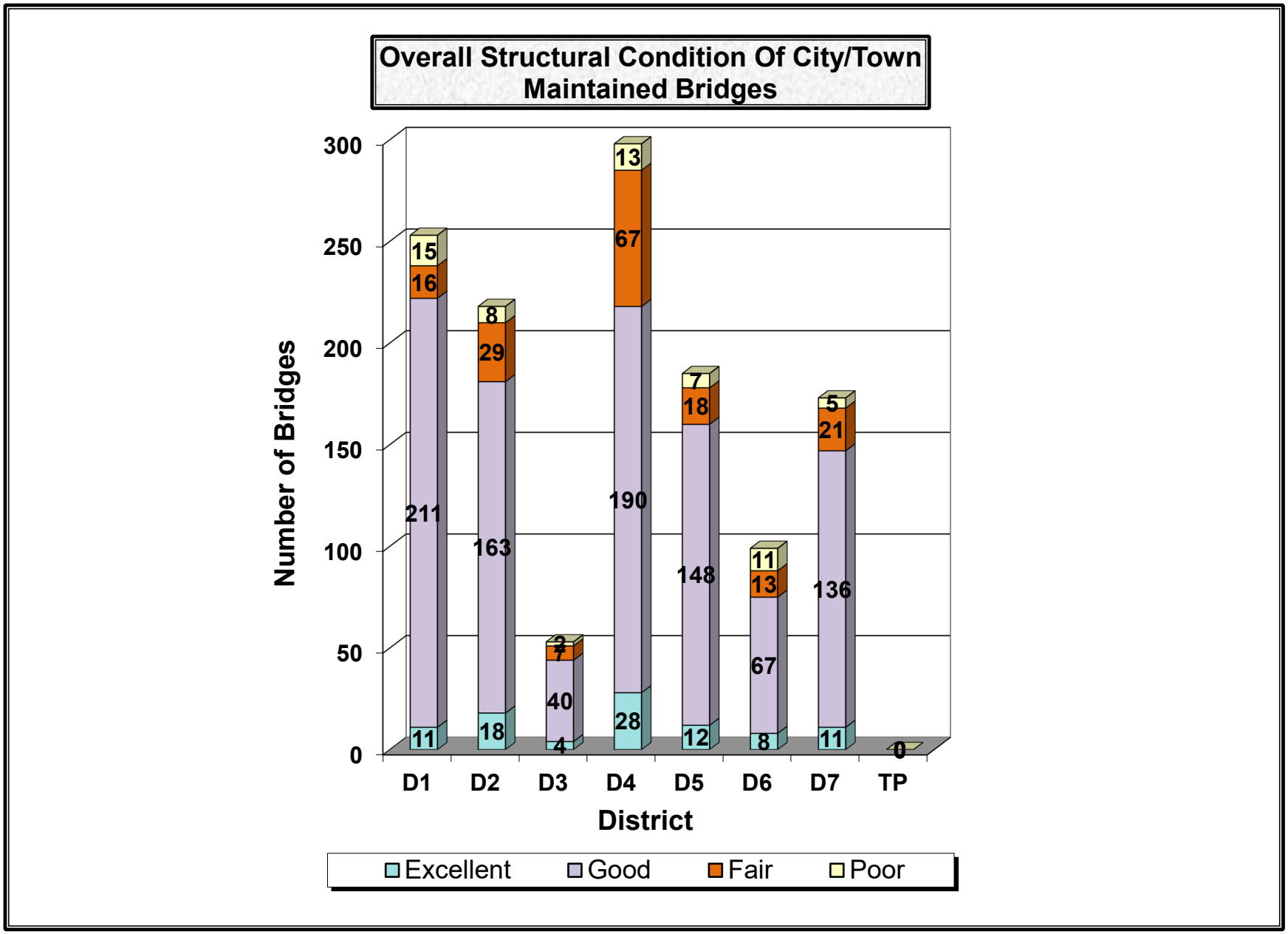
Overall Structural Condition Of City/Town Maintained Bridges
Number of Bridges
300
250
200
150
100
50
0
15
16
211
11
8
29
163
18
2
7
40
4
13
67
190
28
7
18
148
12
11
13
67
8
5
21
136
11
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor

Figure 17

FHWA Bridge Performance Measures

In compliance with the Federal Highway Administration (FHWA) mandate for all states, the FDOT created and implemented a Transportation Asset Management Plan. Part of the Plan is to identify the statewide average condition of all bridges on the National Highway System. This condition is divided into three groups called "Good", "Fair", and "Poor". The conditions use the National Bridge Inventory (NBI) rating system. The condition group, Good, is defined as bridges with an overall NBI condition rating of 7, 8, or 9. The condition group, Fair, is defined as bridges with an overall NBI condition rating of 5, or 6. The condition group, Poor, is defined as bridges with an overall NBI condition rating of 4 or less.

The performance measures required for identifying in the TAMP are: 1) the percentage of bridges on the NHS, measured by total deck area, with an overall condition rating of Good (as defined above); 2) the percentage of bridges on the NHS, measured by total deck area, with an overall condition rating of Poor (as defined above).

Table 9 shows the results of these measures. The percentage of bridges on the NHS rated as "Good" is 67.16%. The percentage of bridges on the NHS rated as "Poor" is 1.42%.

The statistical quantities for each district and the Turnpike are also listed.

FHWA Performance Measures									
	District 1	District 2	District 3	District 4	District 5	District 6	District 7	Turnpike	Statewide Total
Total Bridge Deck Area on the National Highway System (NHS)	11,724,791	20,891,576	13,255,697	16,668,282	18,376,840	20,023,478	23,310,306	9,176,347	133,427,317
Bridges on the NHS with an Overall Bridge Condition NBI Rating >= 7 (Measured by Square Feet of Deck Area)	8,473,611	10,922,914	5,275,598	12,405,140	13,018,838	11,341,883	18,514,290	7,126,337	87,078,611
Bridges on the NHS with an Overall Bridge Condition NBI Rating <= 4 (Measured by Square Feet of Deck Area)	0	224,440	289,640	362,476	6,152	13,315	0	0	896,023
Percent of NHS Bridges with Overall Bridge Condition NBI Rating >= 7	72.27%	52.28%	39.80%	74.42%	70.84%	56.64%	79.43%	77.66%	65.26%
Percent of NHS Bridges with Overall Bridge Condition NBI Rating <= 4	0.00%	1.07%	2.19%	2.17%	0.03%	0.07%	0.00%	0.00%	0.67%

Table 9

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 465 structurally deficient bridges in Florida, with over 64.52% having county maintenance responsibility. Sixty-eight (14.62%) of the structurally deficient bridges are maintained by FDOT (see Figure 20). Refer to Figure 21 for a presentation of structurally deficient bridges, by district, for each of the maintenance responsibility groups. Over 68.67% of the County Government maintained structurally deficient bridges are concentrated within District 2 and 3. Over 65.08% of the City/Town maintained structurally deficient bridges are concentrated within Districts 1, 4, and 6.

NOTE: The term Structurally Deficient is no longer officially recognized by the FHWA..

Structurally Deficient Bridges (SD) Bridges								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Local	Federal	Others	Total
Statewide	68	300	63	32	0	0	2	465
District 1	0	18	15	1	0	0	0	34
District 2	32	49	8	1	0	0	0	90
District 3	15	157	2	29	0	0	0	203
District 4	10	8	13	0	0	0	1	32
District 5	1	5	7	0	0	0	1	14
District 6	9	55	13	0	0	0	0	77
District 7	1	8	5	1	0	0	0	15
Turnpike	0	0	0	0	0	0	0	0

Table 10

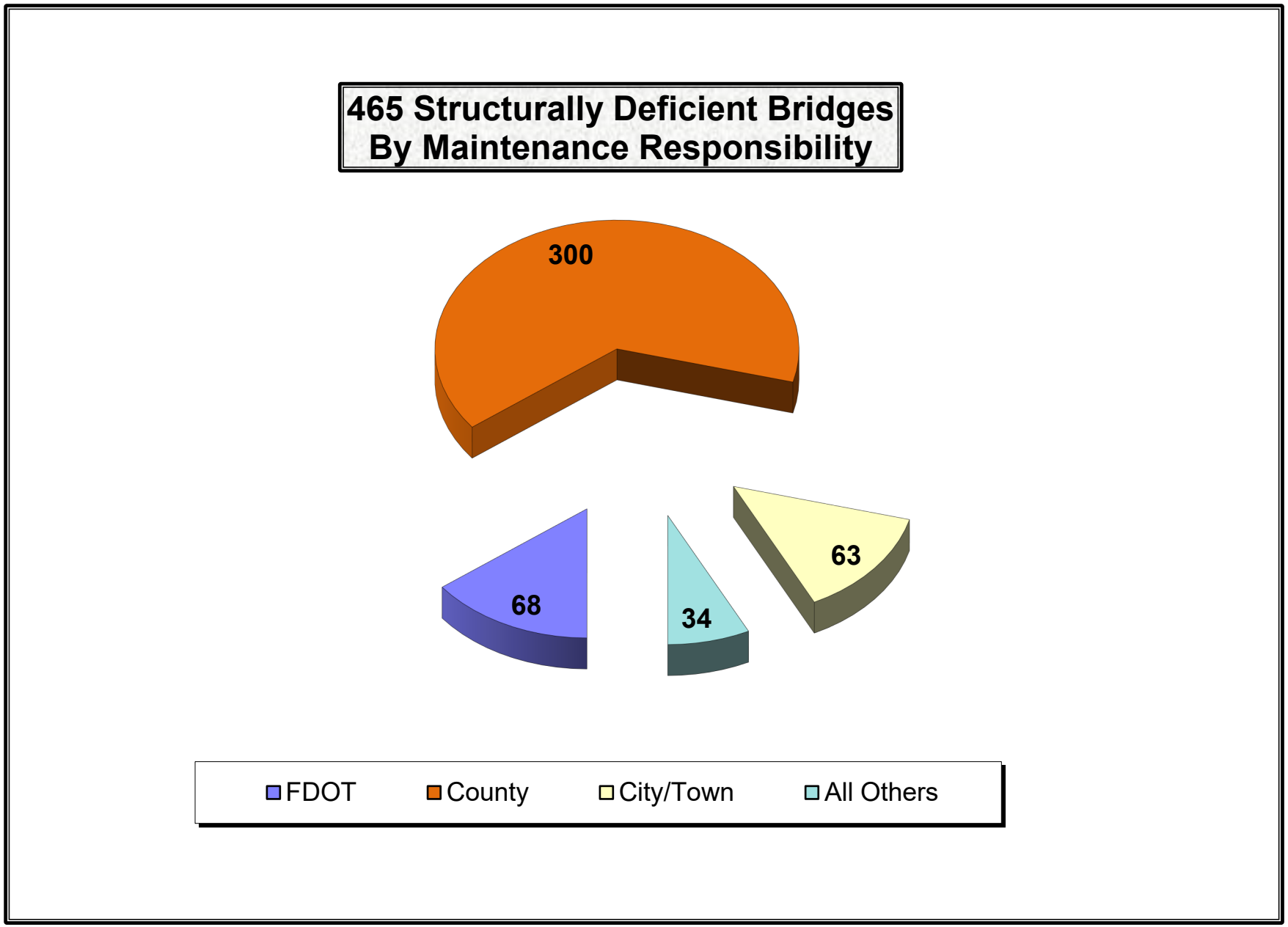
465 Structurally Deficient Bridges
By Maintenance Responsibility
300
68
34
63
FDOT
County
City/Town
All Others

Figure 18

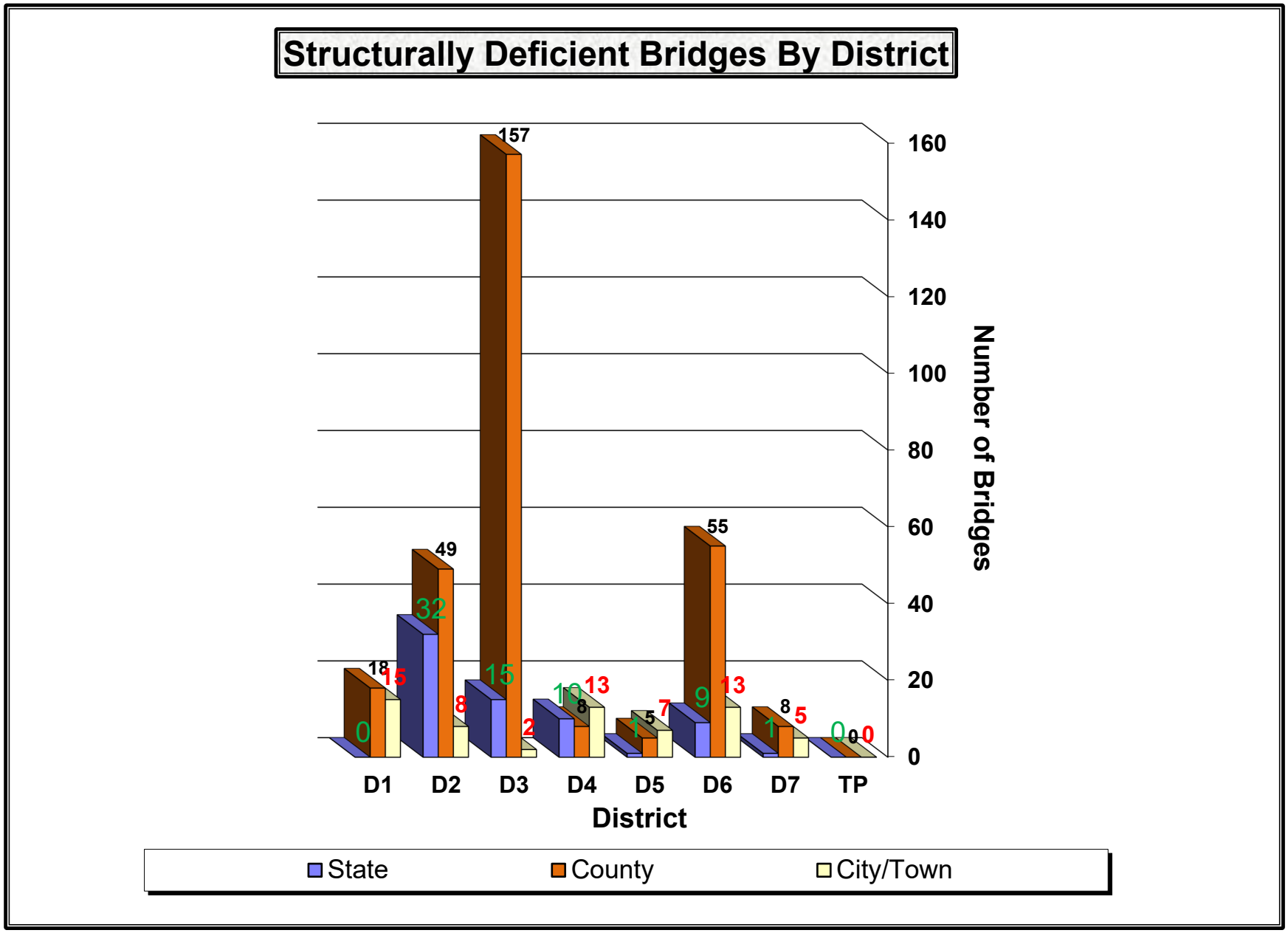
Structurally Deficient Bridges By District
160
140
120
100
80
60
40
20
0
Number of Bridges
157
49
32
18
15
0
8
15
2
10
13
8
5
7
55
9
13
8
1
5
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
State
County
City/Town

Figure 19

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 11 presents the number of posted and closed bridges by maintenance responsibility group, for each of the districts. There are currently 637 posted or closed bridges in Florida, with County Governments having maintenance responsibility for over 74.25% of the total. City and Town Governments are responsible for the maintenance of over 18.05% of the total, while the FDOT is responsible for only 11 of the 637 bridges (1.73%). The number of posted County bridges (473 bridges) is much greater than the number of structurally deficient County bridges (300), which indicated that the majority of County bridge posting restrictions are caused by obsolete design, rather than advanced structural deterioration.

Of the 11 posted or closed bridges maintained by the FDOT, Districts 4, 7, and Turnpike had none. Three Hundred and Thirty-Six (71.04%) of the posted or closed bridges maintained by County Governments are concentrated within Districts 2 and 3. Sixty-three (54.78%) of the posted or closed bridges maintained by City/Town Governments are concentrated within Districts 2 and 4. Statewide, 64.21% of all posted or closed bridges are within the boundaries of Districts 2 and 3.

Posted and Closed Bridges																
	Maintenance Responsibility								Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
	District 1								District 5							
Posted	0	69	13	0	0	0	0	82	1	14	18	6	2	0	0	41
Closed	0	2	2	0	0	0	0	4	0	1	0	0	0	0	0	1
Total	0	71	15	0	0	0	0	86	1	15	18	6	2	0	0	42
	District 2								District 6							
Posted	3	90	31	7	0	0	0	131	0	20	7	0	0	0	0	27
Closed	0	4	3	0	0	0	0	7	3	5	2	0	0	0	0	10
Total	3	94	34	7	0	0	0	138	3	25	9	0	0	0	0	37
	District 3								District 7							
Posted	0	231	5	13	0	0	0	249	0	6	5	0	0	0	0	11
Closed	3	11	0	7	1	0	0	22	0	1	0	0	0	0	0	1
Total	3	242	5	20	1	0	0	271	0	7	5	0	0	0	0	12
	District 4								Turnpike							
Posted	1	18	29	1	0	0	0	49	0	0	0	0	0	0	0	0
Closed	0	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0
Total	1	19	29	1	0	0	1	51	0	0	0	0	0	0	0	0
									Statewide							
Posted									5	448	108	27	2	0	0	590
Closed									6	25	7	7	1	0	1	47
Total									11	473	115	34	3	0	1	637

Table 11

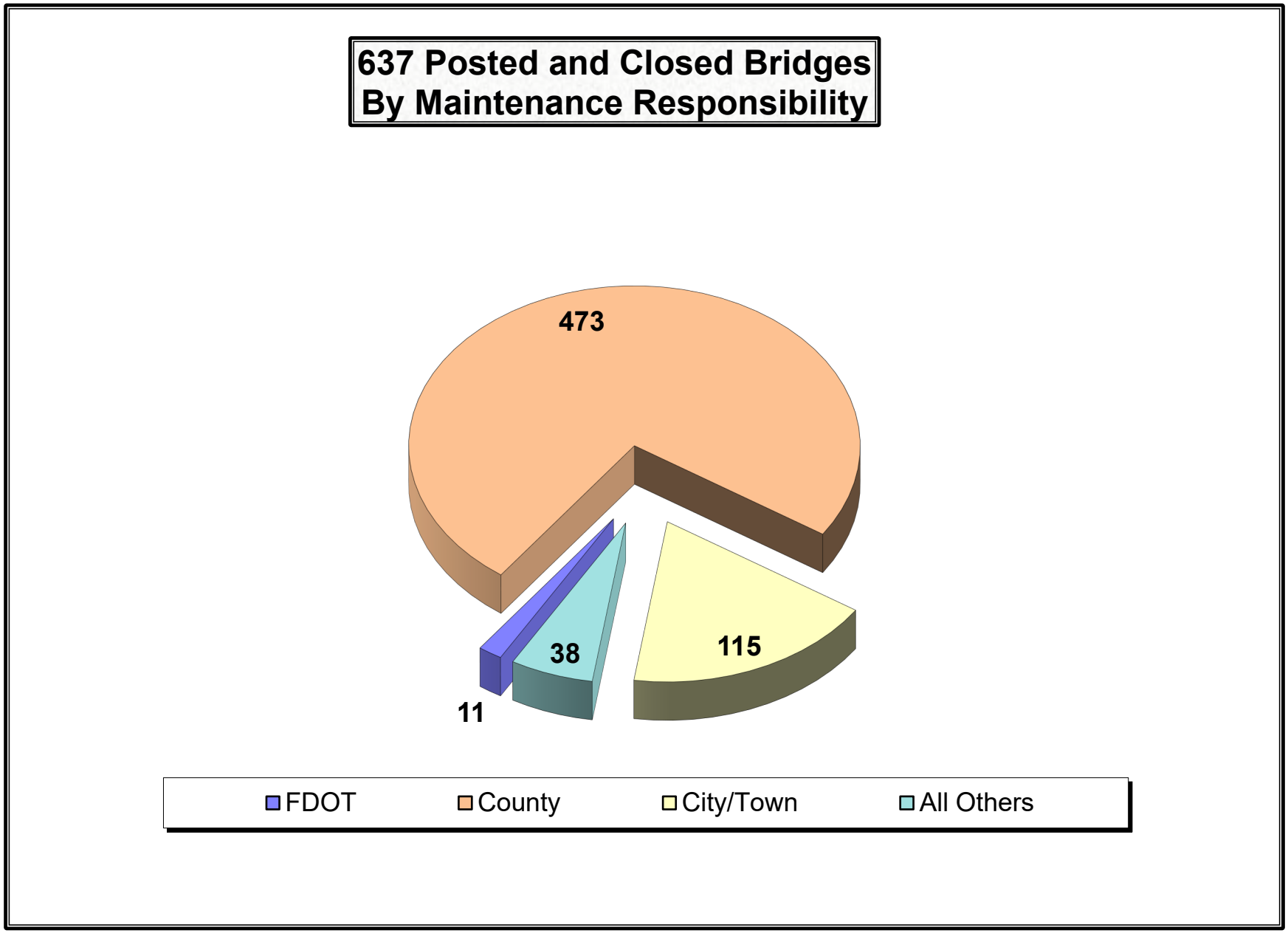
637 Posted and Closed Bridges
By Maintenance Responsibility
473
38
115
11
FDOT
County
City/Town
All Others

Figure 20

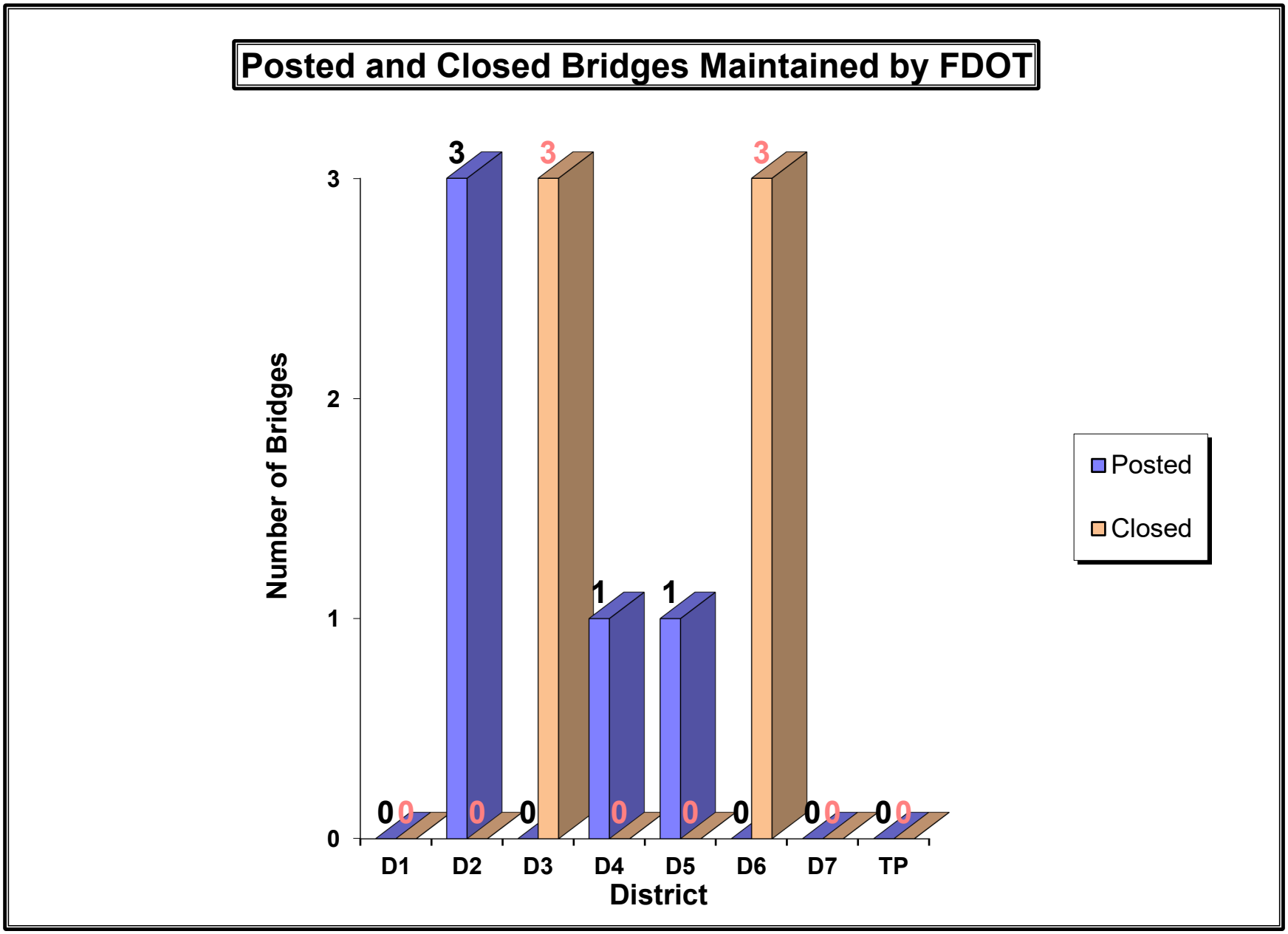
Posted and Closed Bridges Maintained by FDOT
Number of Bridges
0
1
2
3
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed
0 0
3
0
3
1
1
0
3
0 0
0 0

Figure 21

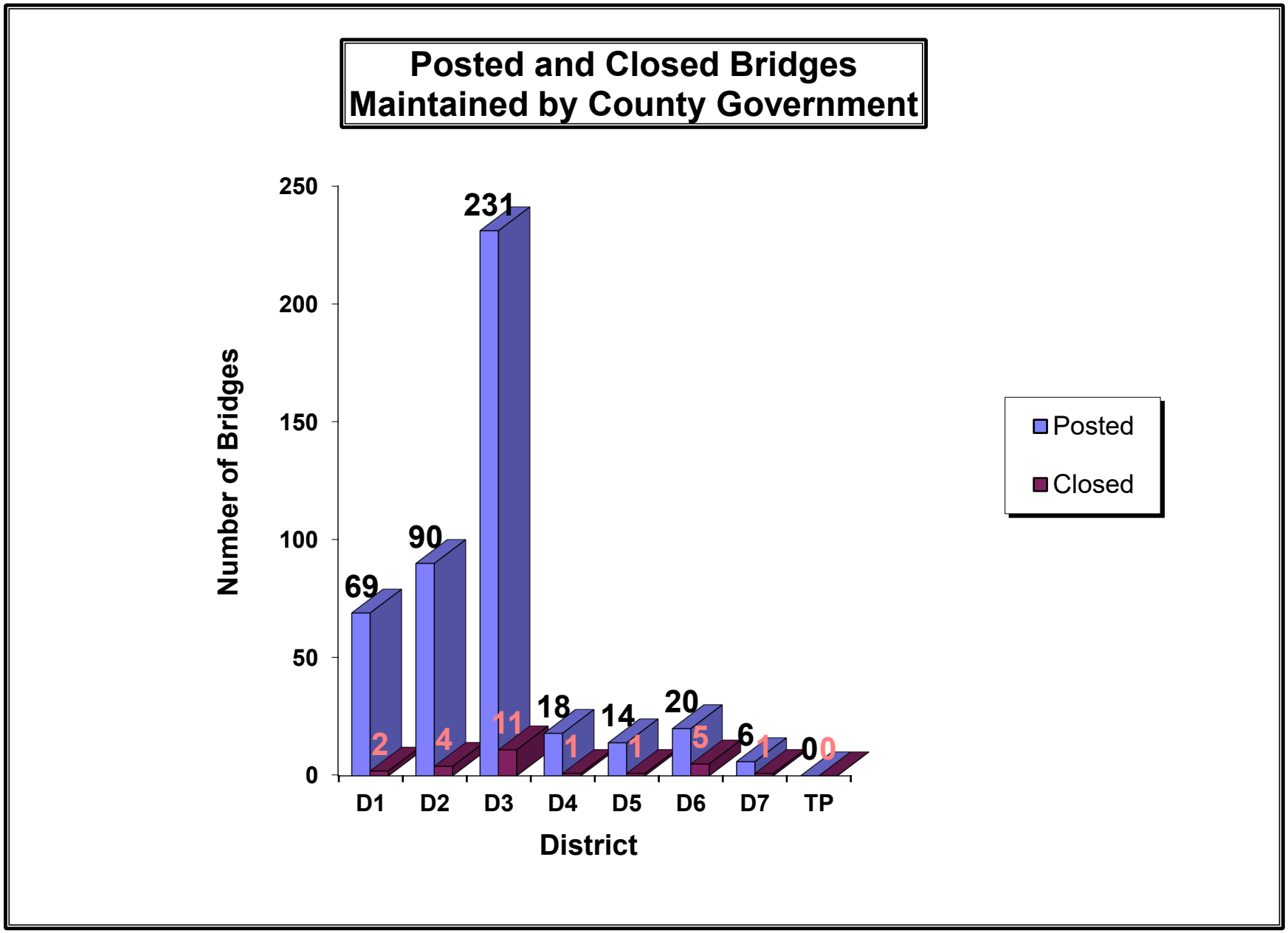
Posted and Closed Bridges
Maintained by County Government
Number of Bridges
250
200
150
100
50
0
69
2
90
4
231
11
18
1
14
1
20
5
6
1
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 22

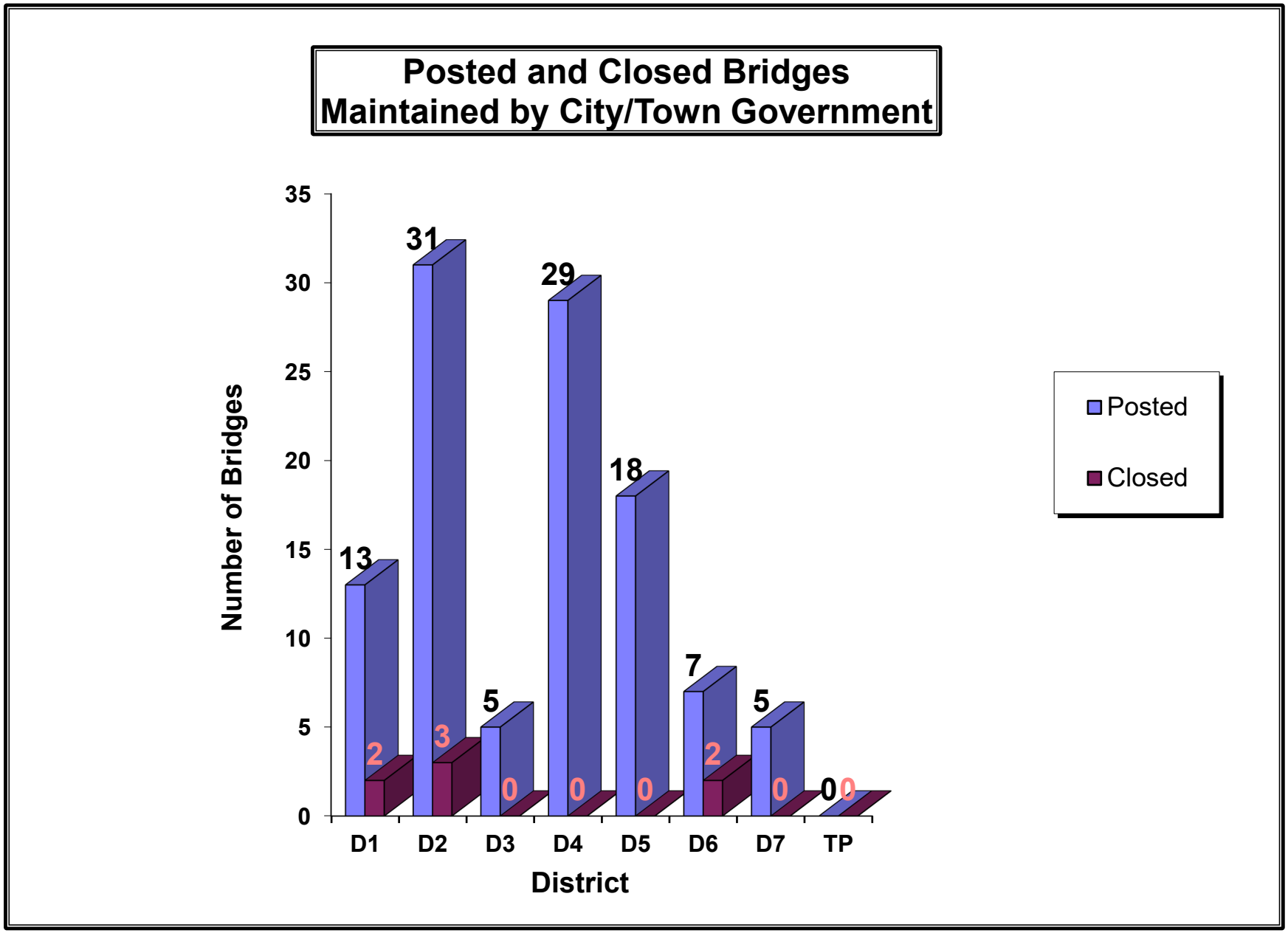
Posted and Closed Bridges
Maintained by City/Town Government
Number of Bridges
35
30
25
20
15
10
5
0
13
2
31
3
5
0
29
0
18
0
7
2
5
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 23

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).

NOTE: The term Functionally Obsolete is no longer officially recognized by the FHWA.

There are currently 1,723 functionally obsolete bridges in Florida, about 13.68% of the total. The FDOT has maintenance responsibility for over 43.64% of all functionally obsolete bridges (see Figure 26). Refer to Figure 27 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	752	587	299	55	12	0	18	1723
District 1	65	148	83	6	4	0	0	306
District 2	204	55	28	7	0	0	1	295
District 3	41	106	8	30	1	0	1	187
District 4	50	86	73	4	0	0	0	213
District 5	106	46	47	7	0	0	15	221
District 6	148	69	22	1	0	0	0	240
District 7	73	77	38	0	7	0	1	196
Turnpike	65	0	0	0	0	0	0	65

Table 12

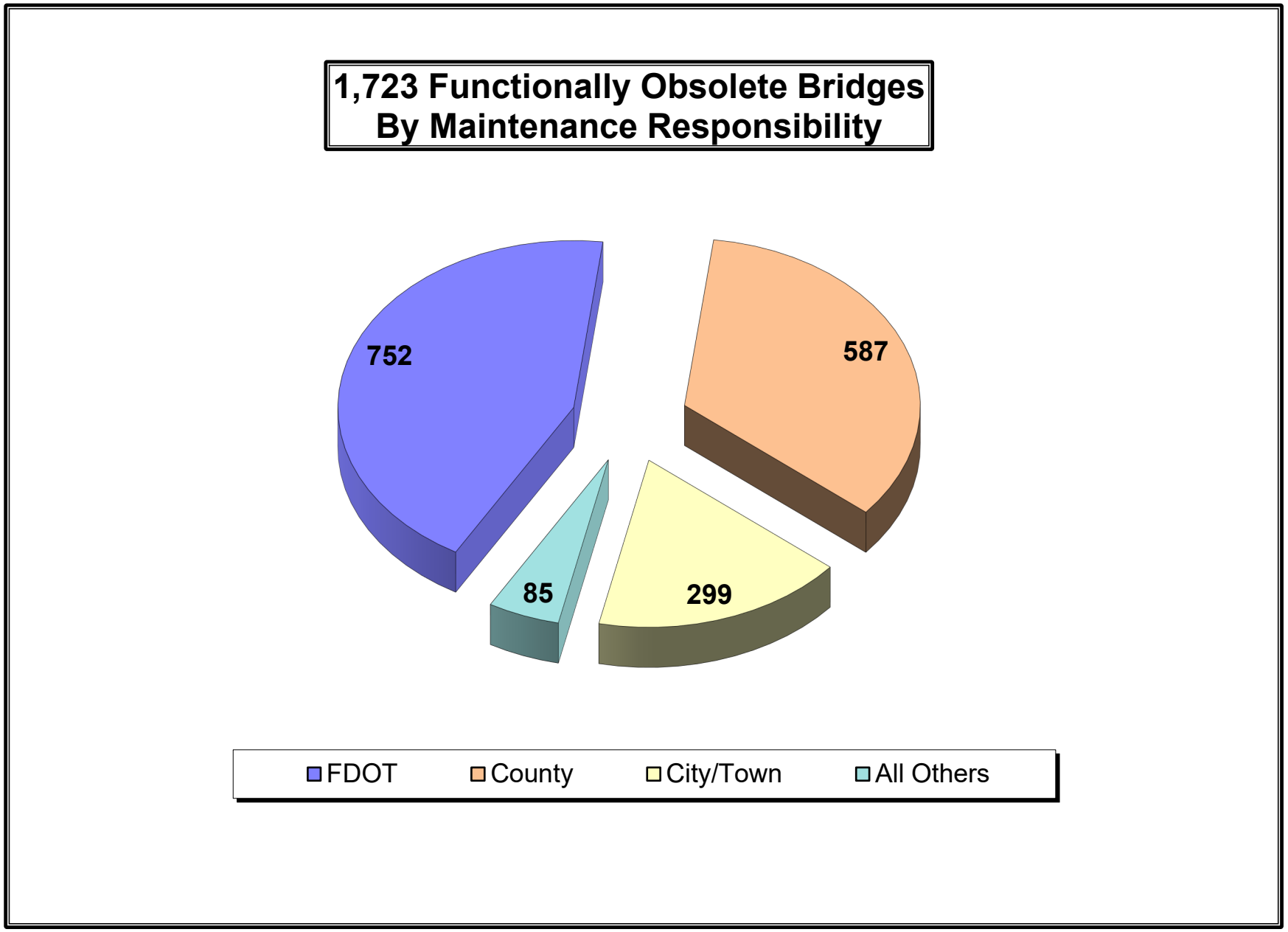
1,723 Functionally Obsolete Bridges
By Maintenance Responsibility
752
587
85
299
FDOT
County
City/Town
All Others

Figure 24

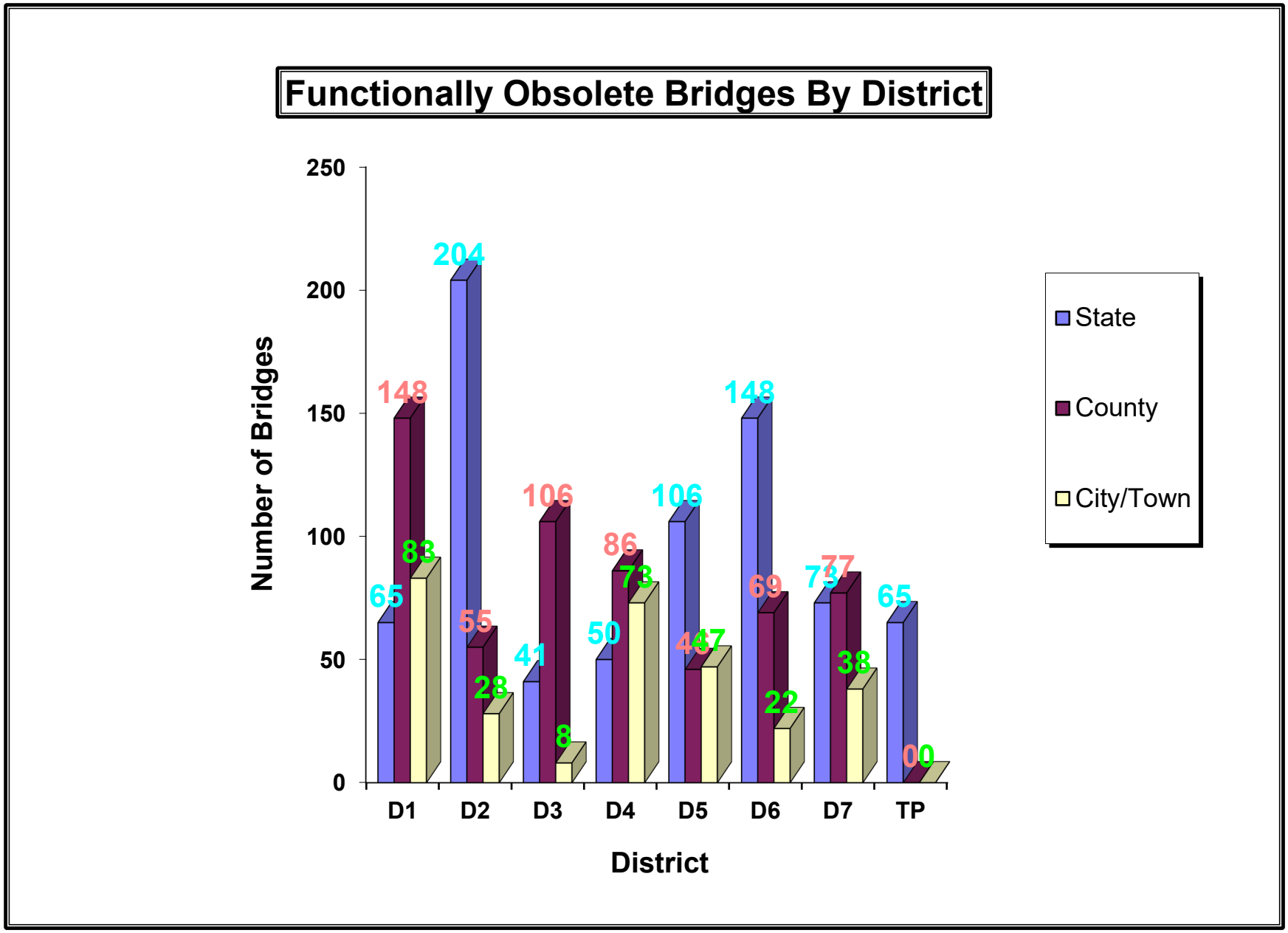
Functionally Obsolete Bridges By District
Number of Bridges
250
200
150
100
50
0
D1
D2
D3
D4
D5
D6
D7
TP
District
State
County
City/Town
65
148
83
204
55
28
41
106
8
50
86
73
106
47
148
69
22
73
77
38
65
0

Figure 25

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 BrM. The BrM 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 BrM. Each of these combinations were 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	49,111	233,584	504,656	707,223	626,361	695,277	1,668,983	1,119,531	492,894	6,097,621
P/C Slab	39,593	0	70,321	835,776	693,427	708,786	350,790	23,259	88,146	2,810,097
R/C Beam	218,164	186,775	487,533	0	0	0	11,260	31,399	295,521	1,230,652
P/C Beam	21,054	0	3,182,804	11,174,514	16,368,909	15,452,967	12,644,345	15,483,804	11,498,930	85,827,327
Steel Beam	452,369	183,138	1,896,992	3,632,935	7,663,110	2,857,827	3,223,007	3,638,222	1,504,871	25,052,471
Timber Beam	0	0	0	986	0	0	0	0	0	986
R/C Box	0	0	0	14,294	51,600	0	0	0	0	65,894
P/C Box	0	0	0	0	0	0	0	294,323	24,075	318,398
Steel Box	0	0	0	0	94,340	1,336,804	1,529,161	1,323,346	940,905	5,224,556
Truss	223,224	0	428,255	250,860	0	0	0	0	0	902,340
Movable	163,176	83,019	654,954	544,007	659,422	371,782	473,157	564,073	236,253	3,749,843
Culvert	89,014	124,544	322,514	621,806	361,239	148,052	164,698	187,632	116,777	2,136,276
Other	13,937	20,048	133,130	0	0	6,704,355	2,918,134	4,696,822	1,162,134	15,648,560
Total	1,269,643	831,108	7,681,158	17,782,401	26,518,407	28,275,850	23,141,100	27,362,413	16,360,506	149,222,586

Table 13

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	5,893	28,306	61,174	93,576	90,034	100,939	246,152	160,804	66,575	853,452
P/C Slab	5,939	0	10,548	125,366	104,014	106,318	52,619	3,489	13,222	421,515
R/C Beam	20,726	17,744	46,316	0	0	0	1,070	2,983	28,811	117,648
P/C Beam	2,211	0	334,194	1,175,153	1,722,816	1,630,272	1,382,753	1,670,613	1,215,343	9,133,355
Steel Beam	50,342	21,744	222,551	452,563	915,775	361,690	405,109	453,214	189,183	3,072,171
Timber Beam	0	0	0	94	0	0	0	0	0	94
R/C Box	0	0	0	2,144	7,740	0	0	0	0	9,884
P/C Box	0	0	0	0	0	0	22,847	42,677	3,491	69,015
Steel Box	0	0	0	0	14,151	200,521	229,374	198,502	141,136	783,683
Truss	39,064	0	74,945	43,901	0	0	0	0	0	157,909
Movable	60,240	22,388	222,649	220,423	164,865	120,854	153,989	177,399	65,155	1,207,962
Culvert	8,456	11,832	30,639	59,072	34,318	14,065	15,646	17,825	11,094	202,946
Other	2,091	3,007	19,970	0	0	1,005,653	437,720	704,523	174,320	2,347,284
Total	194,962	105,020	1,022,986	2,172,290	3,053,712	3,540,312	2,947,278	3,432,029	1,908,329	18,376,918

Table 14

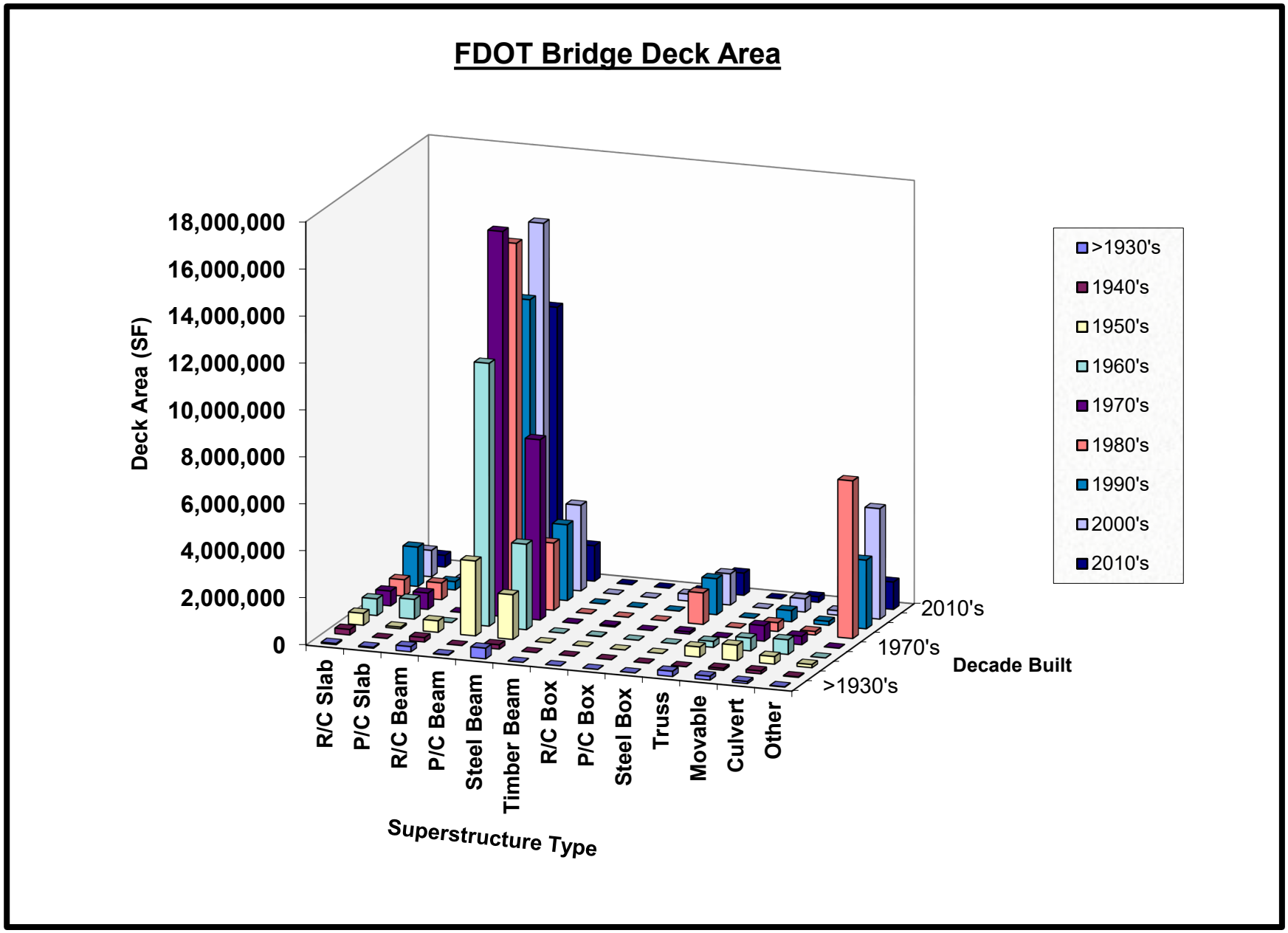
FDOT Bridge Deck Area
Deck Area (SF)
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Superstructure Type
2010's
1970's
>1930's
Decade Built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

Figure 26

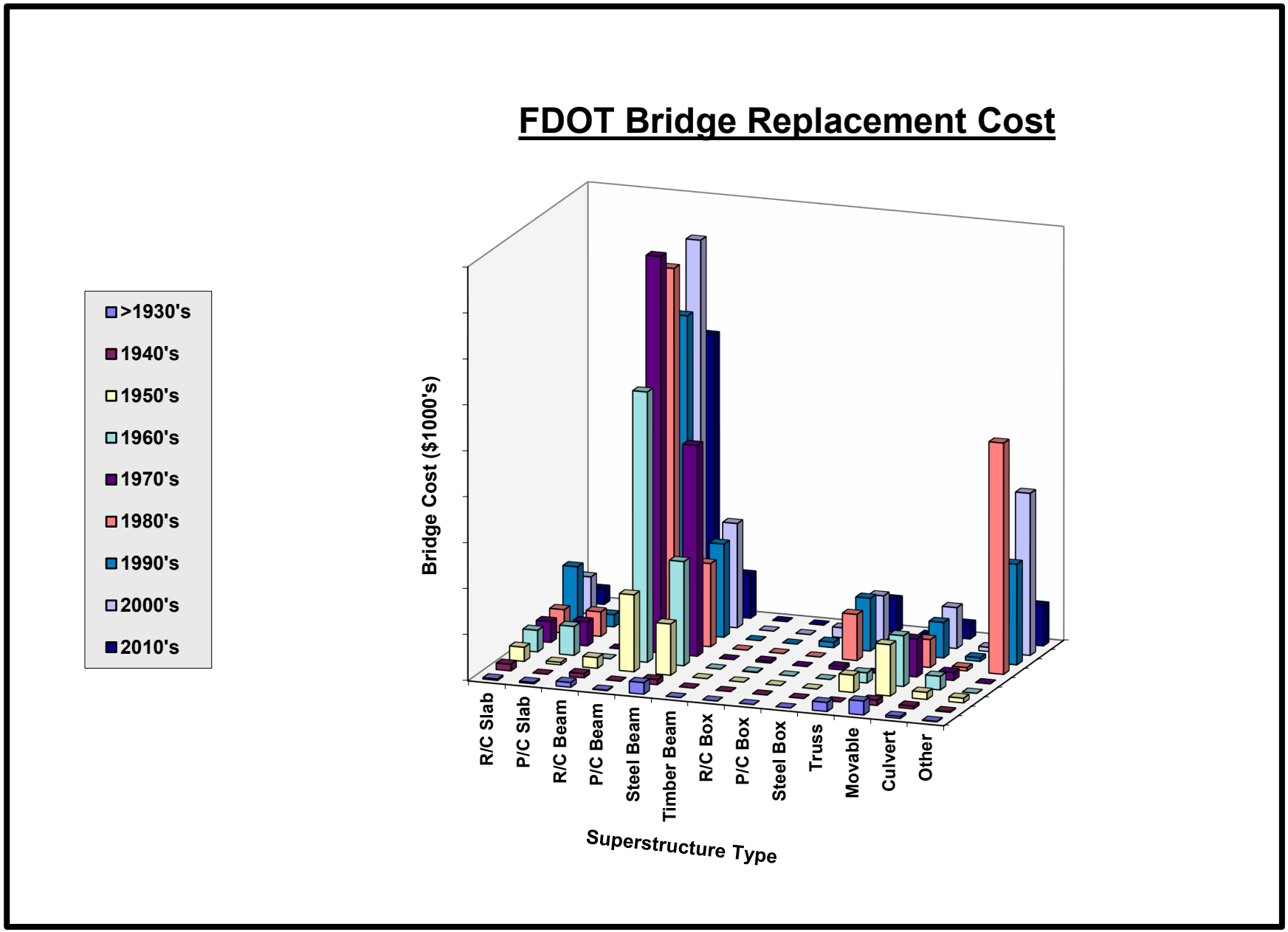
FDOT Bridge Replacement Cost
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Bridge Cost ($1000's)
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Superstructure Type

Figure 27

FDOT Bridge Deck Area (Square Feet)									
	District								
	D1	D2	D3	D4	D5	D6	D7	Turnpike	Total
>1930's	57,798	343,707	288,979	92,308	75,010	258,464	153,377	0	1,269,643
1940's	166,742	334,739	165,977	18,231	20,248	98,057	27,114	0	831,108
1950's	878,869	1,807,351	732,647	421,620	388,593	1,496,850	1,358,036	597,192	7,681,158
1960's	1,144,347	5,311,577	1,095,242	1,091,053	2,448,569	4,021,572	1,934,433	735,607	17,782,401
1970's	2,495,533	6,038,817	4,349,136	4,227,587	1,382,829	2,116,673	3,847,044	2,060,788	26,518,407
1980's	3,705,897	2,427,726	2,593,550	6,797,612	1,099,031	4,754,462	5,854,213	1,043,359	28,275,850
1990's	1,872,971	2,708,191	5,287,560	3,201,410	2,338,124	1,518,442	3,287,262	2,927,140	23,141,100
2000's	2,934,733	5,338,699	4,884,453	3,619,421	3,292,575	1,347,235	4,142,836	1,802,460	27,362,413
2010's	770,468	3,091,621	1,908,251	0	3,977,634	1,436,085	2,921,727	716,165	14,821,951
Total	14,027,358	27,402,426	21,305,795	19,469,243	15,022,614	17,047,841	23,526,042	9,882,711	147,684,030

Table 15

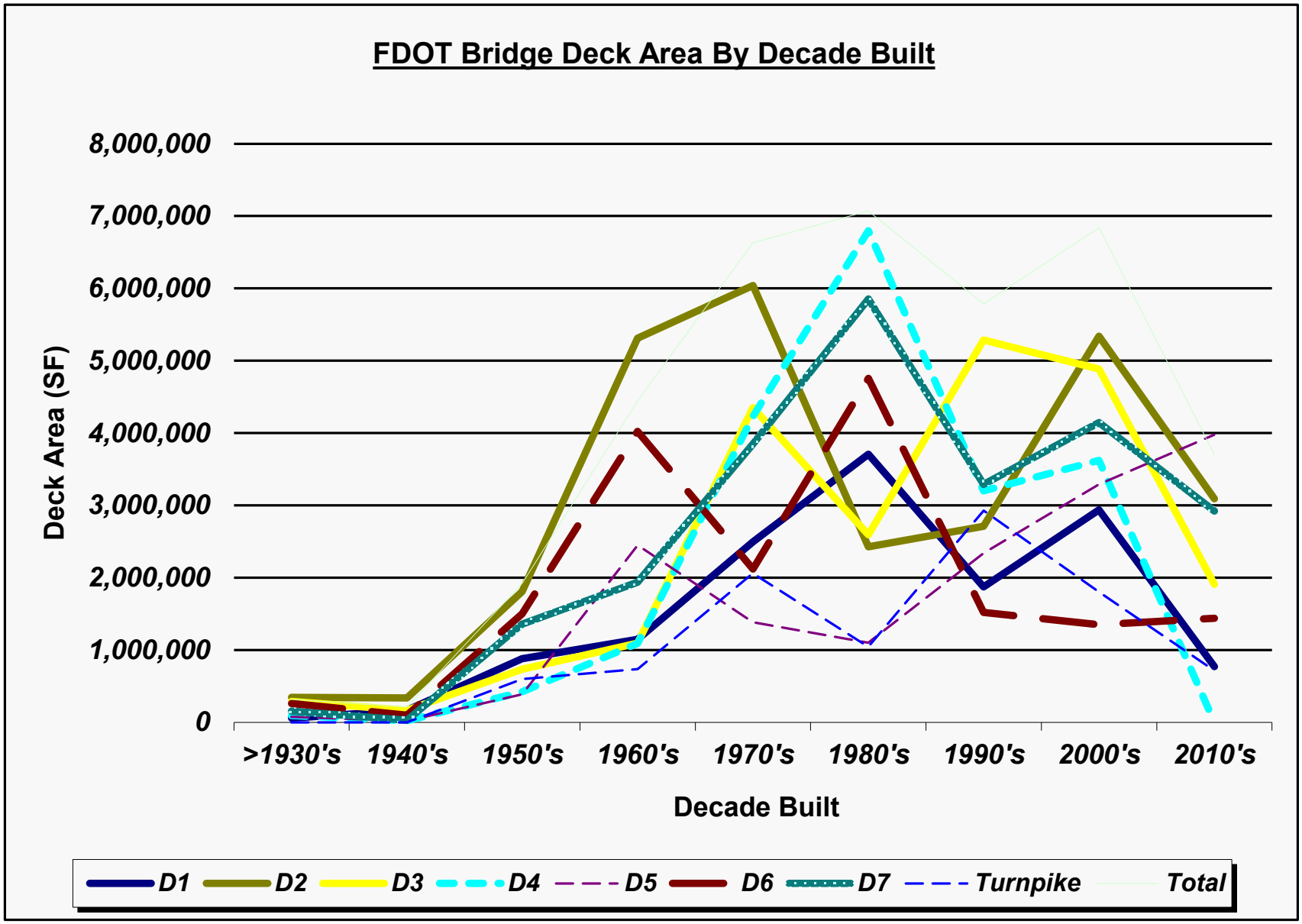
FDOT Bridge Deck Area By Decade Built
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Deck Area (SF)
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
Turnpike
Total

Figure 28

FDOT Bridge Replacement Cost ($1000's)									
	District								
	D1	D2	D3	D4	D5	D6	D7	Turnpike	Total
>1930's	5,753	53,623	46,363	9,953	8,412	28,491	42,366	0	194,962
1940's	26,265	42,860	18,518	1,732	2,055	10,805	2,786	0	105,020
1950's	117,090	229,211	78,686	151,676	48,072	181,809	151,421	65,020	1,022,986
1960's	155,772	614,335	120,564	208,986	283,956	474,353	229,607	84,718	2,172,290
1970's	295,869	684,199	502,434	490,406	163,292	273,428	426,437	217,648	3,053,712
1980's	429,068	313,520	325,537	833,647	135,539	653,638	735,865	113,497	3,540,312
1990's	235,289	336,753	681,100	447,080	294,984	225,568	404,516	321,988	2,947,278
2000's	373,209	619,065	585,888	516,526	388,331	172,291	574,036	202,684	3,432,029
2010's	86,742	342,256	210,829	0	443,829	174,866	373,144	81,205	1,712,870
Total	1,725,056	3,235,822	2,569,918	2,660,005	1,768,470	2,195,249	2,940,179	1,086,759	18,181,459

Table 16

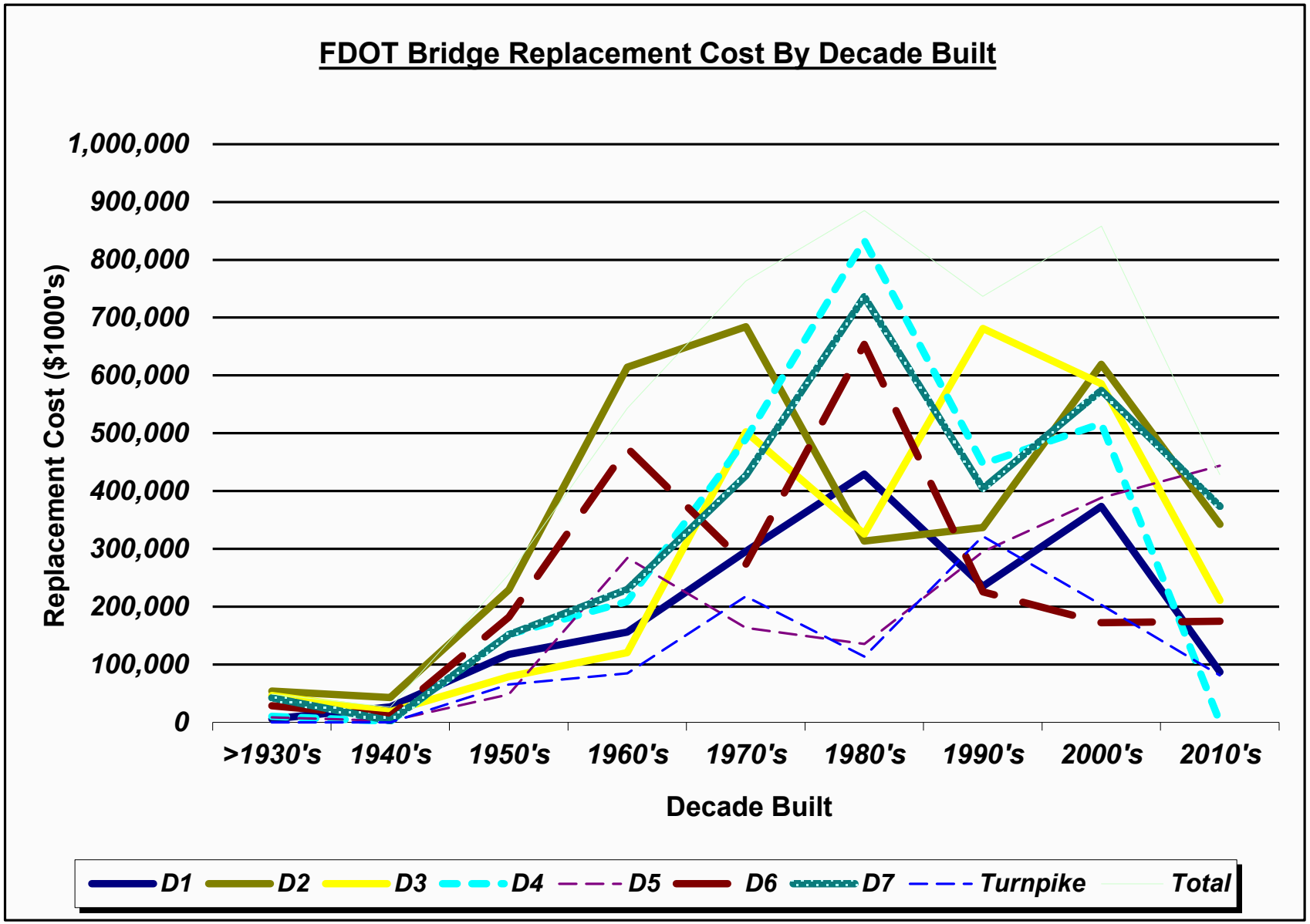
FDOT Bridge Replacement Cost By Decade Built
Replacement Cost ($1000's)
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
Turnpike
Total

Figure 29

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	10,285,486	3,378,682	1,304,639	387,190
2	17,697,368	9,312,482	2,114,302	1,085,742
3	17,491,157	3,611,536	2,114,165	439,084
4	10,388,454	10,595,143	1,598,714	1,255,026
5	8,604,622	7,465,952	1,062,078	838,331
6	10,817,971	6,243,424	1,486,810	709,795
7	13,637,216	9,786,512	1,756,863	1,177,096
Turnpike	3,718,787	6,158,997	409,294	685,025
Total	92,641,059	56,552,728	11,846,866	6,577,288

Table 17

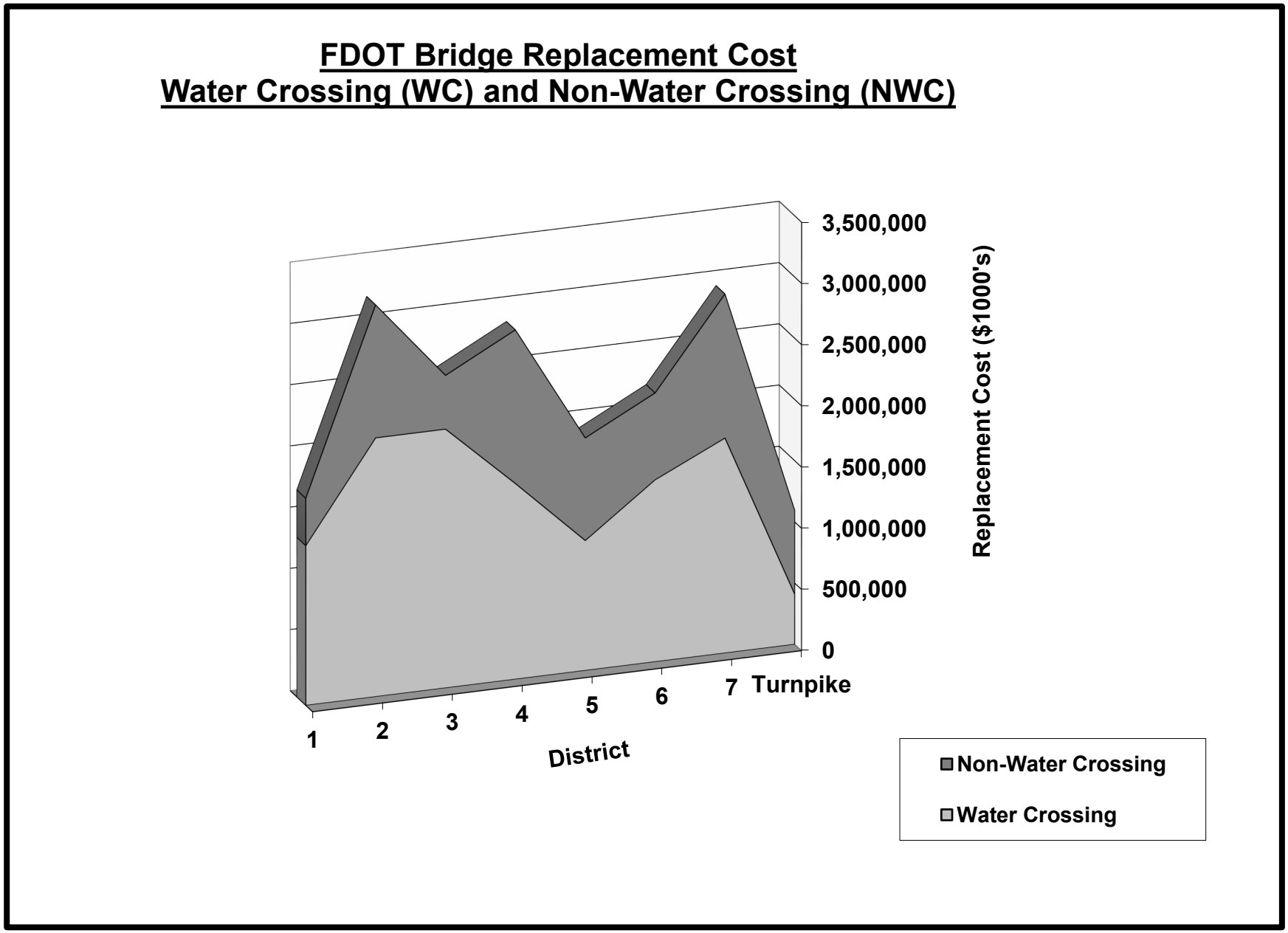
FDOT Bridge Replacement Cost
Water Crossing (WC) and Non-Water Crossing (NWC)
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Replacement Cost ($1000's)
1
2
3
4
5
6
7 Turnpike
District
Non-Water Crossing
Water Crossing

Figure 30

Ancillary Structures

Table 18 on the following page lists the ancillary structure inventories with the designated ownership of the state, counties, towns, and cities in Florida. The list is further divided by District, Turnpike Enterprise, the Central Florida Expressway Authority (CFX), and the Miami-Dade Expressway Authority. (MDX).

The sign structures are considered Overhead Sign Structures, where the structure extends partially or completely over the travel lanes.

The High Mast Light Pole Structures include both galvanized steel and weathering steel designs.

Table 18 — Ancillary Structures

	District	1	2	3	4	5	6	7	Total	Turnpike	CFX	MDX
State	Sign-Monotube-Span	0	0	0	0	0	3	108	111	14	7	43
	Sign-Monotube-Cantilever	0	1	0	1	21	8	112	143	10	1	23
	Cantilever Sign Structure	366	739	160	1110	618	367	543	3903	594	375	78
	Span Sign Structure	116	380	57	333	236	289	259	1670	458	254	59
	Butterfly Sign Structure	1	17	2	73	3	32	22	150	3	24	2
	Cable Sign Structure	0	5	19	28	64	16	0	132	2	2	0
	High Mast Light Pole	590	997	516	745	371	165	798	4182	374	22	79
	Traffic Signal Mast Arm	10	10	11	1	36	8	12	88	0	48	0
County	Sign-Monotube-Span	0	0	0	0	0	0	0	0	0	0	0
	Sign-Monotube-Cantilever	0	0	0	0	17	1	0	18	0	0	0
	Cantilever Sign Structure	0	9	1	6	6	1	0	23	0	0	0
	Span Sign Structure	4	0	0	8	0	0	0	12	0	0	0
	Butterfly Sign Structure	0	0	0	1	0	0	0	1	0	0	0
	Cable Sign Structure	0	6	0	8	0	0	0	14	0	0	0
	High Mast Light Pole	0	0	0	0	2	3	0	5	0	0	0
	Traffic Signal Mast Arm	440	160	262	1158	334	1410	351	4115	0	0	0
Town	Sign-Monotube-Span	0	0	0	0	0	0	0	0	0	0	0
	Sign-Monotube-Cantilever	0	0	0	0	0	0	0	0	0	0	0
	Cantilever Sign Structure	0	0	0	0	0	0	0	0	0	0	0
	Span Sign Structure	0	0	0	0	0	0	0	0	0	0	0
	Butterfly Sign Structure	0	0	0	0	0	0	0	0	0	0	0
	Cable Sign Structure	0	0	0	0	0	0	0	0	0	0	0
	High Mast Light Pole	0	0	0	0	0	0	0	0	0	0	0
	Traffic Signal Mast Arm	4	0	0	26	0	0	0	30	0	0	0
City	Sign-Monotube-Span	0	0	0	0	0	0	1	1	0	0	0
	Sign-Monotube-Cantilever	0	0	0	0	0	0	0	0	0	0	0
	Cantilever Sign Structure	0	45	1	0	0	0	0	46	0	0	0
	Span Sign Structure	1	0	0	0	0	0	0	1	0	0	0
	Butterfly Sign Structure	0	0	0	0	0	0	0	0	0	0	0
	Cable Sign Structure	0	32	0	0	0	0	0	32	0	0	0
	High Mast Light Pole	0	0	0	1	0	0	0	1	0	0	0
	Traffic Signal Mast Arm	298	722	340	67	447	18	350	2242	0	0	0

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 12,595 bridges accounted for in Florida. The FDOT has maintenance responsibility for 7,079 of the bridges, or 56.20%. County governments maintain 3,935 bridges (31.24%), city and towns maintain 1,279 bridges (10.15%), with the remaining 302 bridges (2.40%) maintained by others. 13.93% of all bridges currently in service in Florida were constructed prior to 1960; 34.14% were constructed in the 1960's and 1970's, while the remaining 51.93% 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 (34.14% 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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