Florida Department of Transportation

Bridge Inventory
2012 Annual Report

August 2012
State Maintenance Office
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Bridge Inventory - 2012 Annual Report

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Introduction

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

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

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

Number of Bridges

Currently there are 11,987 bridge-structures accounted for in the Florida DOT Bridge Management System. The FDOT has maintenance responsibility for 6,661 of the bridges, or 55.57%. County governments maintain 3,847 bridges (32.09%), city and towns maintain 1,204 bridges (10.04%), with the remaining 275 bridges (2.29%) maintained by others (see Figures 1 & 2).

The 6,661 bridges maintained by FDOT are divided by district and shown in Figures 3 & 4. District 2 has the most bridges, with 1,203 (18.06%), followed by District 5 (1019 bridges – 15.30%), District 1 (914 bridges – 13.72%), District 3 (792 bridges – 11.89%), District 4 (752 bridges - 11.29%), Turnpike District (699 bridges – 10.49%), District 7 (700 bridges – 10.51%), and District 6 (582 bridges – 8.74%). The number of bridges shown includes the 126 bridges maintained by the Dade County Expressway Authority (MDX) and 269 bridges maintained by the Orlando Orange County Expressway Authority (OOCEA).

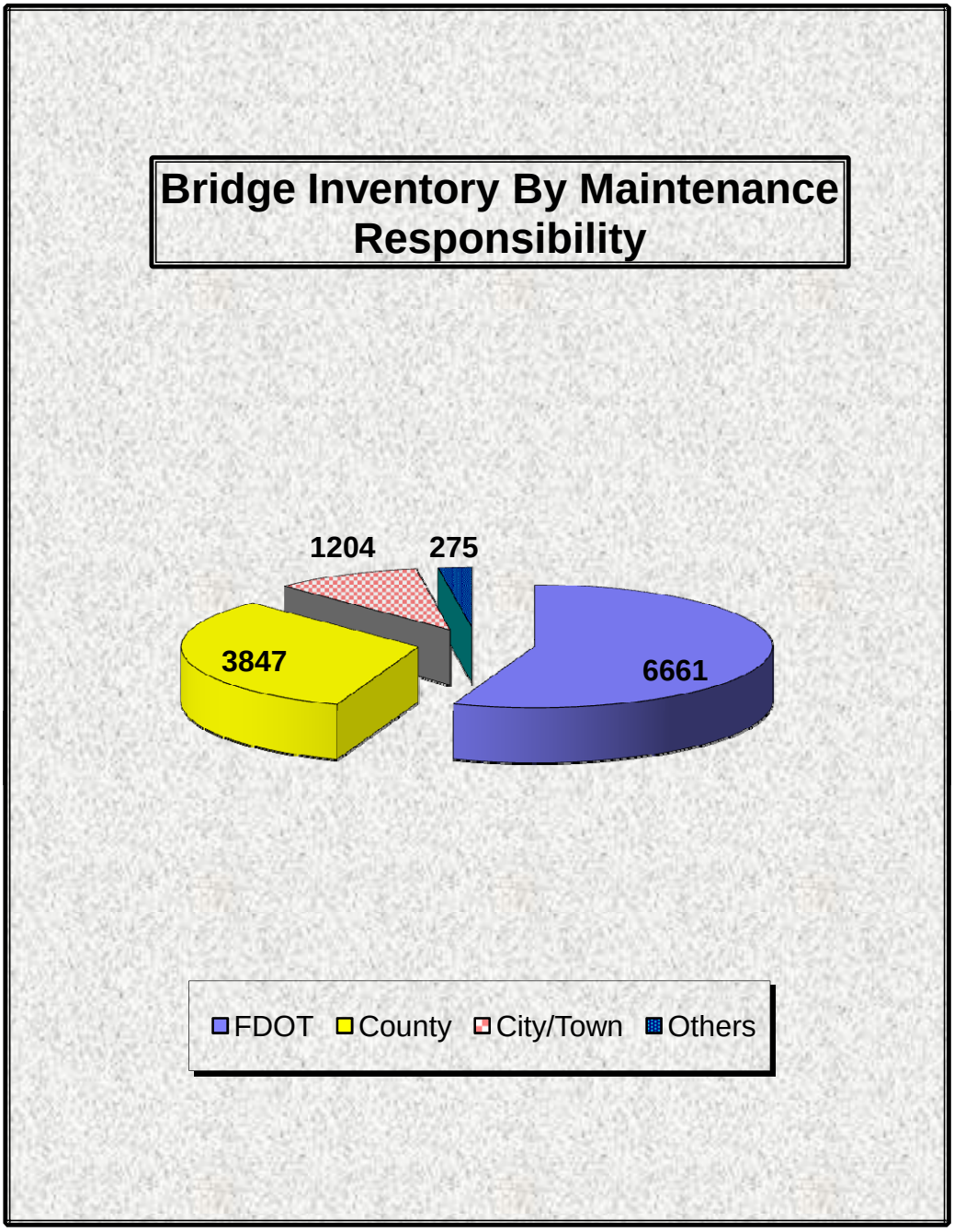

Figure 1

NOTE: The number of FDOT bridges includes 126 MDX bridges and 269 OOCEA bridges.

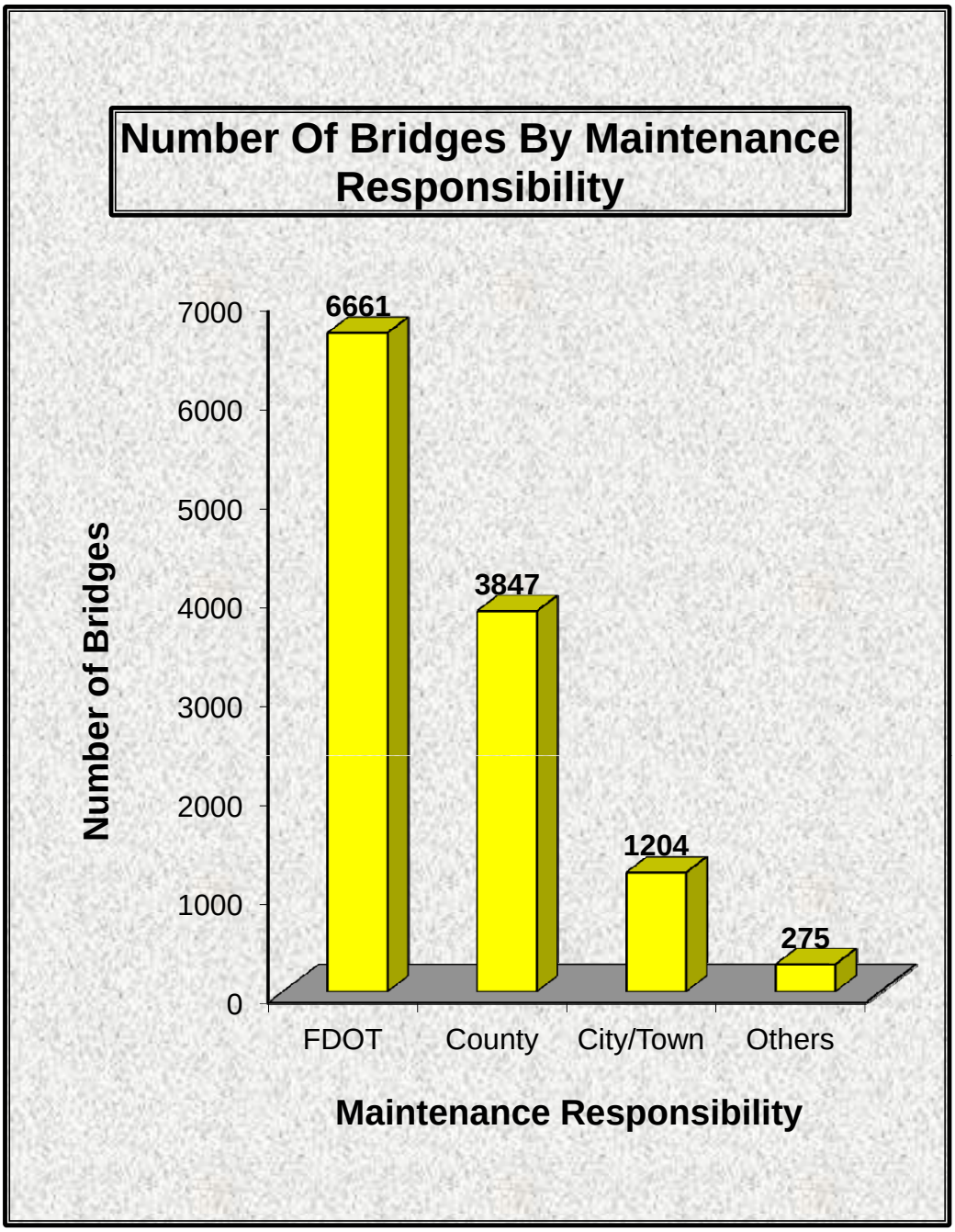

Figure 2

NOTE: The number of FDOT bridges includes 126 MDX bridges and 269 OOCEA bridges.

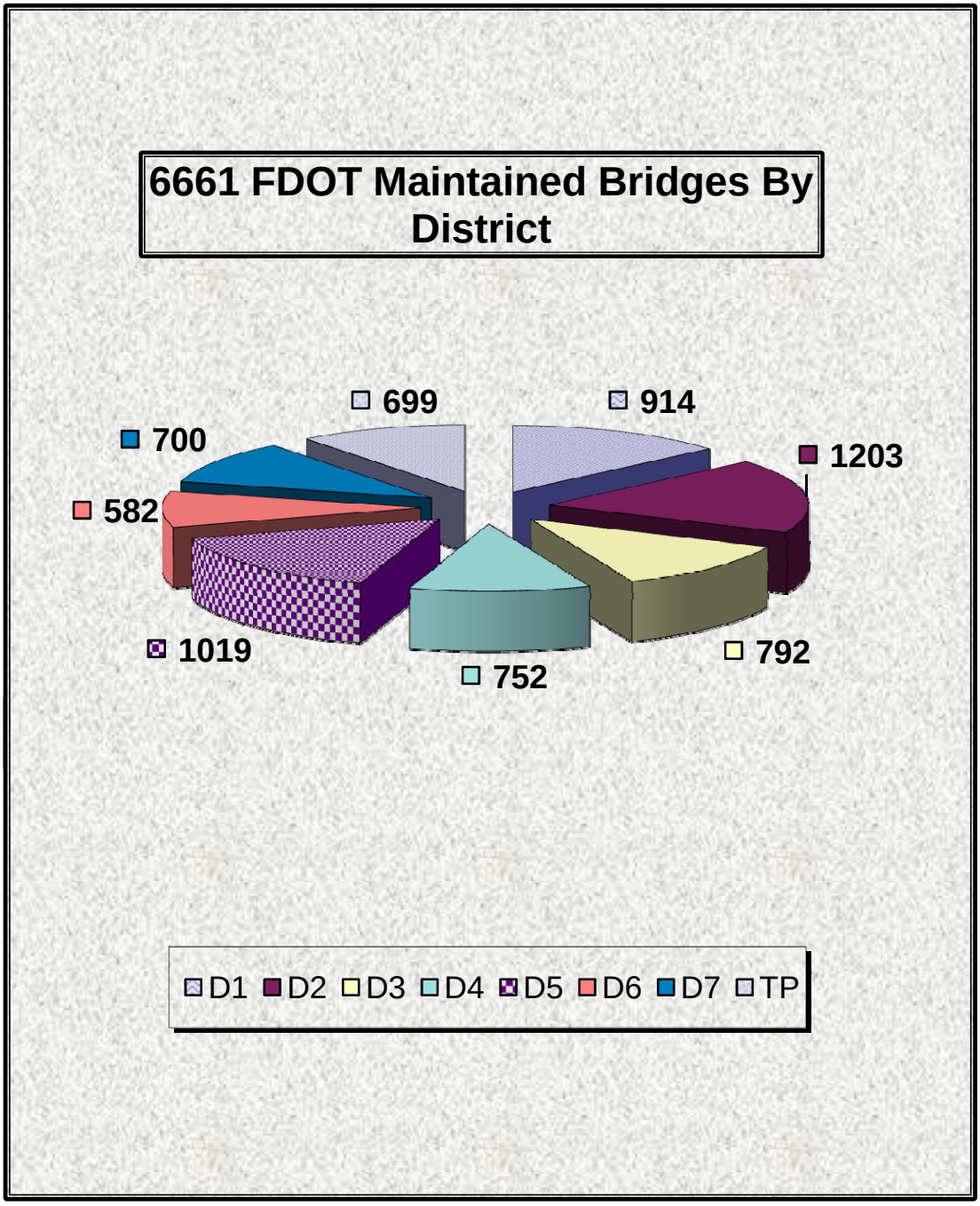

Figure 3

NOTE: The number of bridges includes 126 MDX bridges and 269 OOCEA bridges.

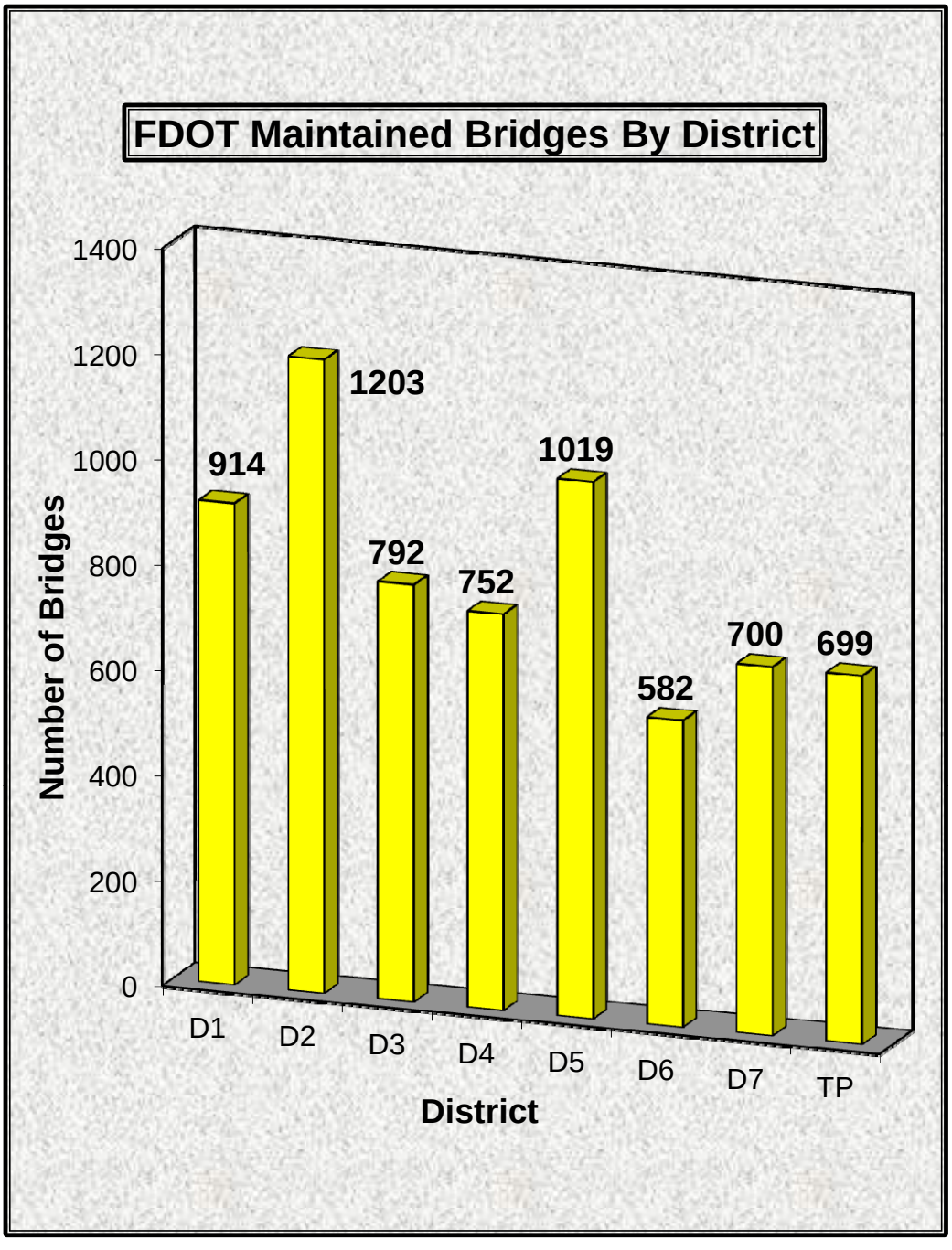

Figure 4

NOTE: The number of bridges includes 126 MDX bridges and 269 OOCEA bridges.

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Age of Bridges

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

For the 6,661 bridges maintained by FDOT, approximately 14.58% were constructed prior to 1960, about 41.96% were constructed in the 1960's and 1970's, with the remaining 43.46% having been built since 1980 (see Figure 5).

Similar results can be seen with the statewide bridge inventory of county government maintained bridges with 18.98% constructed prior to 1960, 35.61% constructed in the 1960's and 1970's, and 45.41% since 1980 (see Figure 6).

The city and town maintained bridges are very similar as well, with 18.69% constructed prior to 1960, 40.61% constructed in the 1960's and 1970's, and 40.70% since 1980 (see Figure 7).

An examination of the distribution of the decade of construction by FDOT District, for the 6,661 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 – 22.69%, District 1 – 24.07%, District 3 – 18.43%, District 5 – 9.52%, District 7 – 10.43%, District 4 – 6.78%, District 6 – 10.82%, and the Turnpike District – 6.87%. 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	161	101	46	0	0	4	0	312
1940s	220	140	24	2	0	0	0	386
1950s	590	489	155	11	0	0	0	1245
1960s	1517	847	210	22	8	0	0	2604
1970s	1278	523	279	7	12	0	6	2105
1980s	899	516	211	17	12	0	18	1673
1990s	904	658	145	41	10	0	23	1781
2000s	990	487	117	55	6	0	9	1664
2010s	102	86	17	4	8	0	0	217
Total	6661	3847	1204	159	56	4	56	11987

Table 1

NOTE: The number of bridges includes 126 MDX bridges and 269 OOCEA bridges.

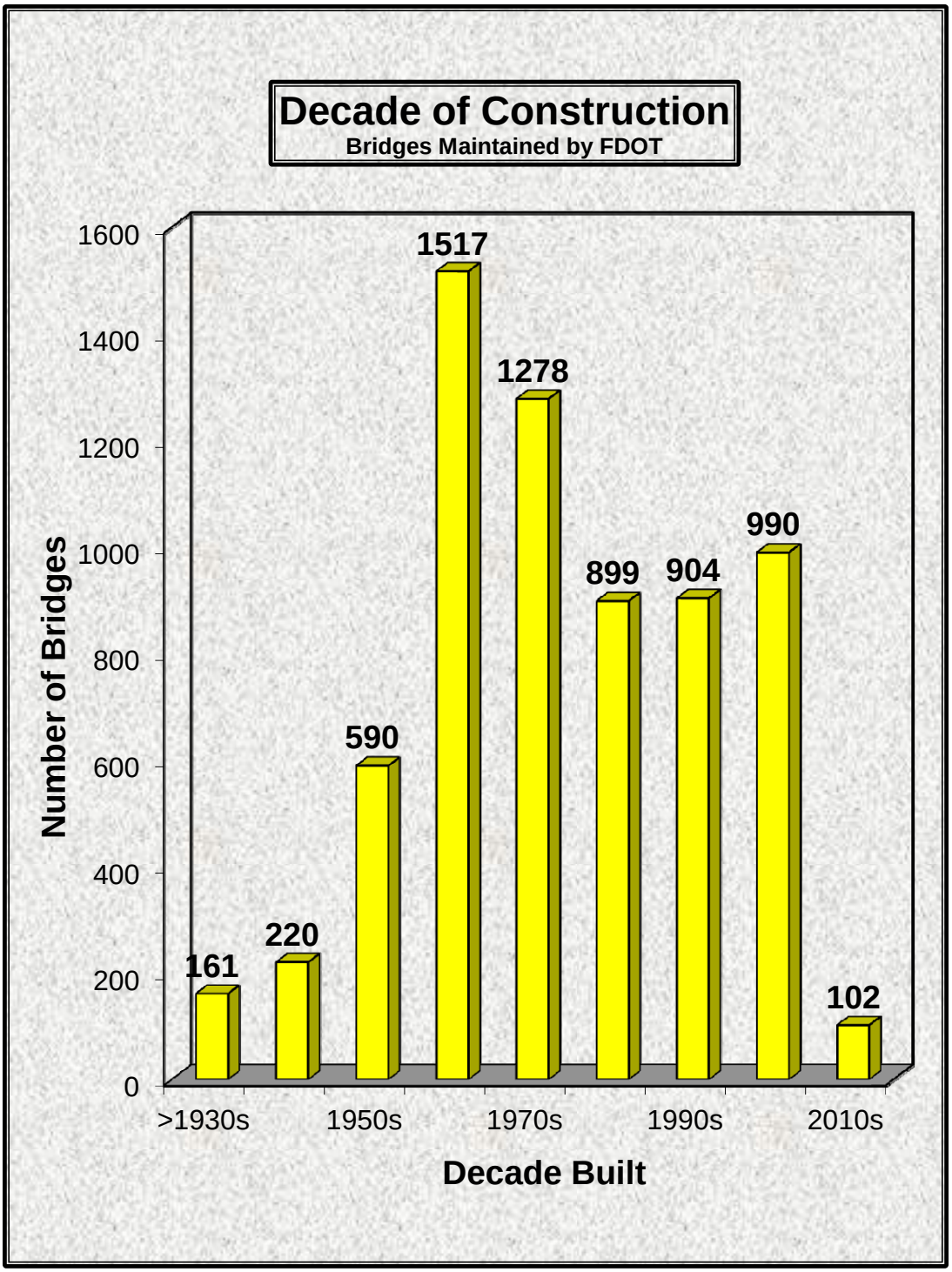

Figure 5

NOTE: The number of bridges includes 126 MDX bridges and 269 OOCEA bridges.

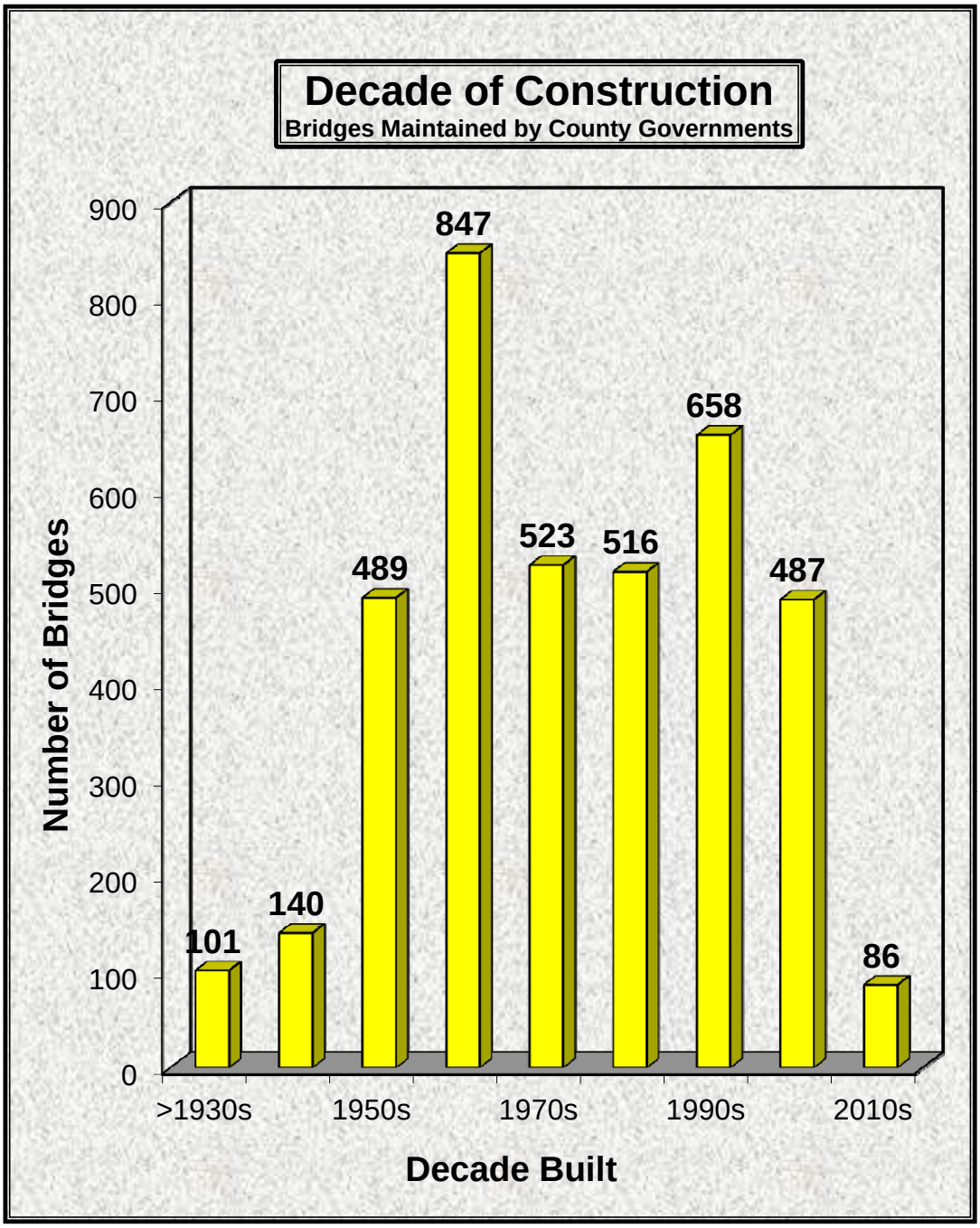
Decade of Construction
Bridges Maintained by County Governments
Number of Bridges
900
800
700
600
500
400
300
200
100
0
101
140
489
847
523
516
658
487
86
>1930s
1950s
1970s
1990s
2010s
Decade Built

Figure 6

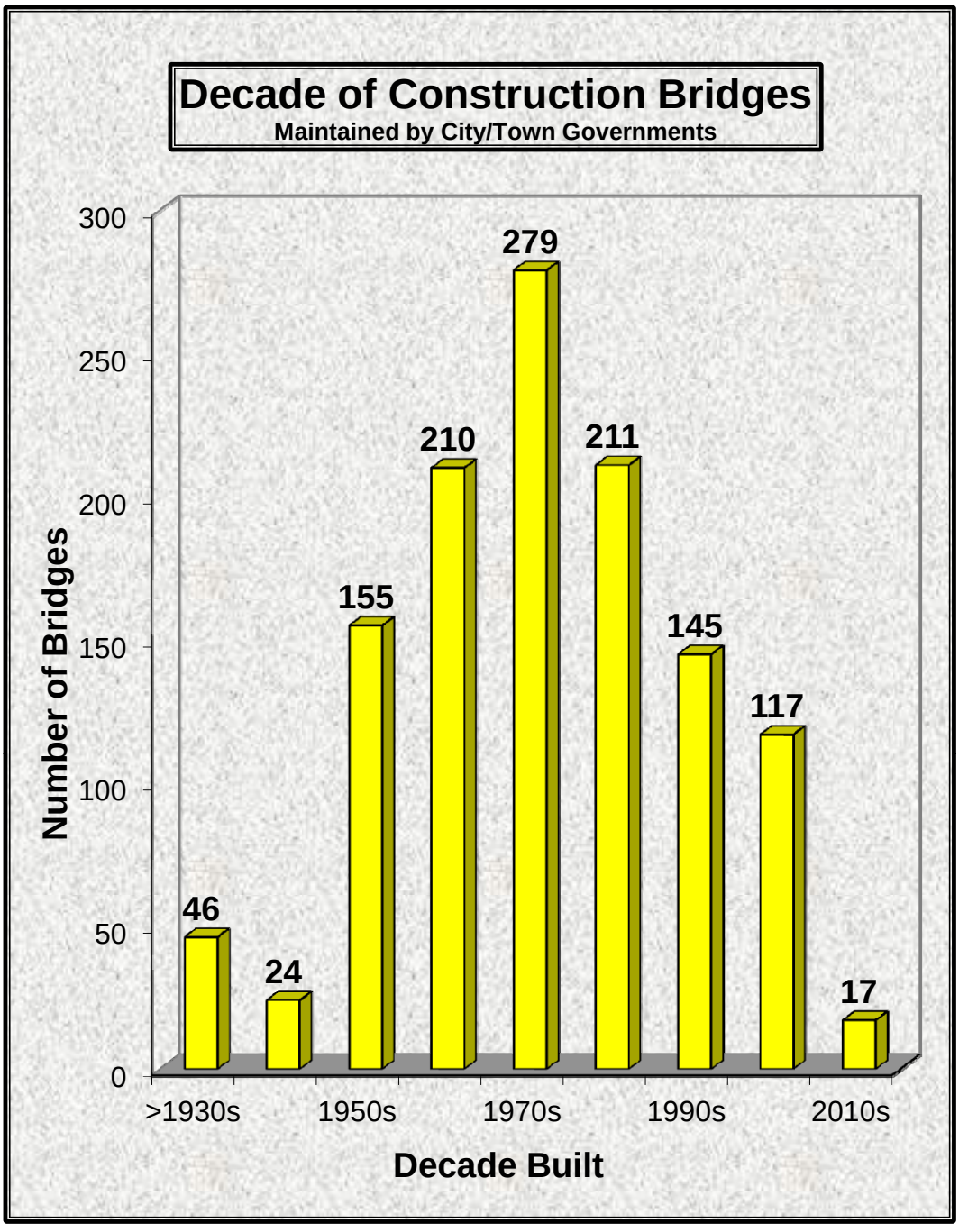
Decade of Construction Bridges
Maintained by City/Town Governments
Number of Bridges
300
250
200
150
100
50
0
46
24
155
210
279
211
145
117
17
>1930s
1950s
1970s
1990s
2010s
Decade Built

Figure 7

Bridge Inventory by Decade (Districts 1 thru 4)								
	Maintenance Responsibility							
	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
District 1								
>1930s	25	11	7	0	0	0	0	43
1940s	61	25	3	1	0	0	0	90
1950s	134	104	13	4	0	0	0	255
1960s	117	225	38	7	6	0	0	393
1970s	158	138	87	0	3	0	0	386
1980s	178	138	48	1	5	0	0	370
1990s	137	135	26	6	8	0	0	312
2000s	97	98	19	0	0	0	0	214
2010s	7	26	4	0	0	0	0	37
Total	914	900	245	19	22	0	0	2100
District 2								
>1930s	62	18	6	0	0	0	0	86
1940s	62	53	3	0	0	0	0	118
1950s	149	123	36	7	0	0	0	315
1960s	423	100	38	1	0	0	0	562
1970s	193	41	29	3	0	0	1	267
1980s	44	46	25	1	0	0	0	116
1990s	100	49	19	3	0	0	0	171
2000s	148	51	36	3	0	0	1	239
2010s	22	5	2	0	0	0	0	29
Total	1203	486	194	18	0	0	2	1903
District 3								
>1930s	10	25	0	0	0	0	0	35
1940s	61	35	2	1	0	0	0	99
1950s	75	145	5	0	0	0	0	225
1960s	116	176	6	7	0	0	0	305
1970s	290	110	8	4	2	0	0	414
1980s	58	83	8	14	0	0	1	164
1990s	103	200	12	28	0	0	0	343
2000s	70	158	6	47	1	0	0	282
2010s	9	16	0	3	0	0	0	28
Total	792	948	47	104	3	0	1	1895
District 4								
>1930s	6	5	6	0	0	0	0	17
1940s	4	3	6	0	0	0	0	13
1950s	41	45	62	0	0	0	0	148
1960s	77	76	63	2	0	0	0	218
1970s	165	76	68	0	0	0	0	309
1980s	229	73	54	0	0	0	0	356
1990s	96	105	16	0	0	0	0	217
2000s	127	53	12	0	0	0	0	192
2010s	7	8	4	0	0	0	0	19
Total	752	444	291	2	0	0	0	1489

Table 2

Bridge Inventory by Decade (Districts 5 thru 8)								
	Maintenance Responsibility							
	FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
District 5								
>1930s	24	12	2	0	0	0	0	38
1940s	13	13	3	0	0	0	0	29
1950s	60	28	5	0	0	0	0	93
1960s	290	66	12	2	1	0	0	371
1970s	142	39	47	0	2	0	5	235
1980s	83	80	39	1	4	0	17	224
1990s	153	66	27	3	1	0	23	273
2000s	237	67	22	5	3	0	8	342
2010s	17	19	6	0	8	0	0	50
Total	1019	390	163	11	19	0	53	1655
District 6								
>1930s	5	20	9	0	0	4	0	38
1940s	9	7	4	0	0	0	0	20
1950s	49	25	14	0	0	0	0	88
1960s	237	97	16	3	1	0	0	354
1970s	79	32	16	0	0	0	0	127
1980s	65	26	17	0	0	0	0	108
1990s	49	14	10	1	0	0	0	74
2000s	73	22	8	0	0	0	0	103
2010s	16	5	0	1	0	0	0	22
Total	582	248	94	5	1	4	0	934
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	107	37	0	0	0	0	281
1970s	114	87	24	0	5	0	0	230
1980s	173	70	20	0	3	0	0	266
1990s	64	89	35	0	1	0	0	189
2000s	122	38	14	0	2	0	0	176
2010s	17	7	1	0	0	0	0	25
Total	700	431	170	0	11	0	0	1312
District 8								
>1930s	0	0	0	0	0	0	0	0
1940s	0	0	0	0	0	0	0	0
1950s	48	0	0	0	0	0	0	48
1960s	120	0	0	0	0	0	0	120
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	7	0	0	0	0	0	0	7
Total	699	0	0	0	0	0	0	699

Table 3

NOTE: The number of FDOT bridges includes 126 MDX bridges and 269 OOCEA bridges.

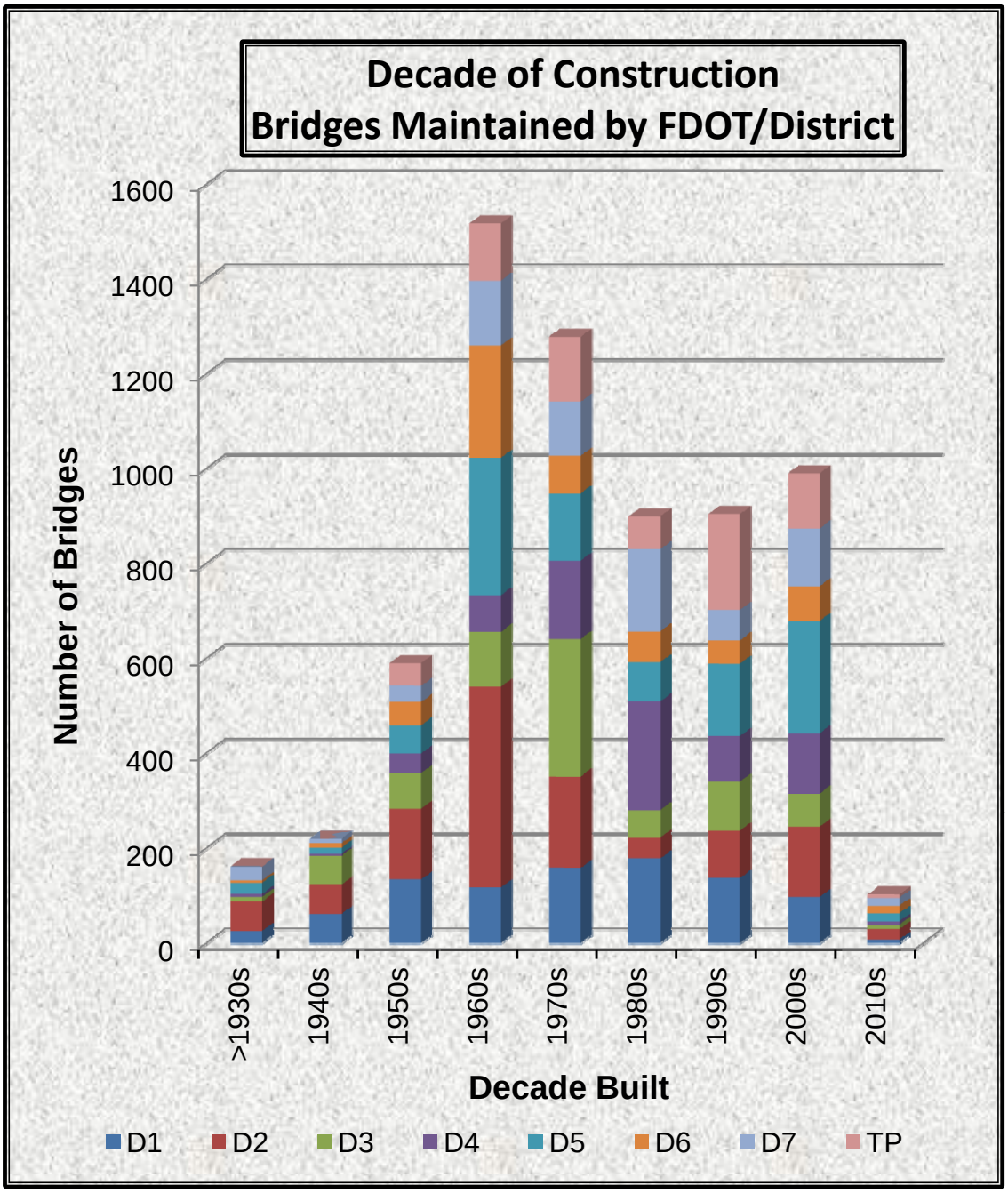
Decade of Construction
Bridges Maintained by FDOT/District
Number of Bridges
1600
1400
1200
1000
800
600
400
200
0
>1930s
1940s
1950s
1960s
1970s
1980s
1990s
2000s
2010s
Decade Built
D1
D2
D3
D4
D5
D6
D7
TP

Figure 8

Types of Bridge Superstructures

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

Slabs

These would include both Reinforced Concrete Slabs and Prestressed Concrete Slabs. These superstructure types are characterized by having a generally constant, rectangular cross-section using concrete as the main building component.
Slab bridges maintained by the state represent 16.60% of the total inventory. Similarly, slab bridges maintained by counties are 35.40%, and by cities and towns are 54.98%.

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 61.99% of the state maintained inventory, 34.75% of the county bridges, and 25.58% of the city/town bridges.

Trusses

The members of a truss work in either tension or compression. Bending is assumed not to occur in this type of bridge superstructure. The external loads from the deck and traffic are applied only at the joints of a truss.
At present 0.05% of the state maintained bridges use truss superstructures. Likewise, 0.36% 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 16.56% of the state maintained bridges. County inventories include 26.90% culverts, and city/towns include 16.61% 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 1.40% of the total state bridge inventory. County inventories include 1.07% 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	781	649	219	12	9	0	0	1670
PSC Slab	325	713	443	11	17	4	6	1519
RC Beam	102	131	80	1	0	0	1	315
PSC Beam	3372	651	182	16	11	0	46	4278
Steel Beam	654	146	25	30	6	0	1	862
Timber Beam	1	409	21	38	0	0	0	469
RC Box	6	1	0	0	0	0	0	7
PSC Box	96	3	0	0	0	0	0	99
Steel Box	114	8	4	0	0	0	0	126
Truss	3	14	1	39	0	0	0	57
Movable	93	41	7	1	1	0	0	143
Culvert	1103	1035	200	3	11	0	2	2354
Other	11	46	22	8	1	0	0	88
Total	6661	3847	1204	159	56	4	56	11987

Table 4

NOTE: The number of FDOT bridges includes 126 MDX bridges and 269 OOCEA bridges.

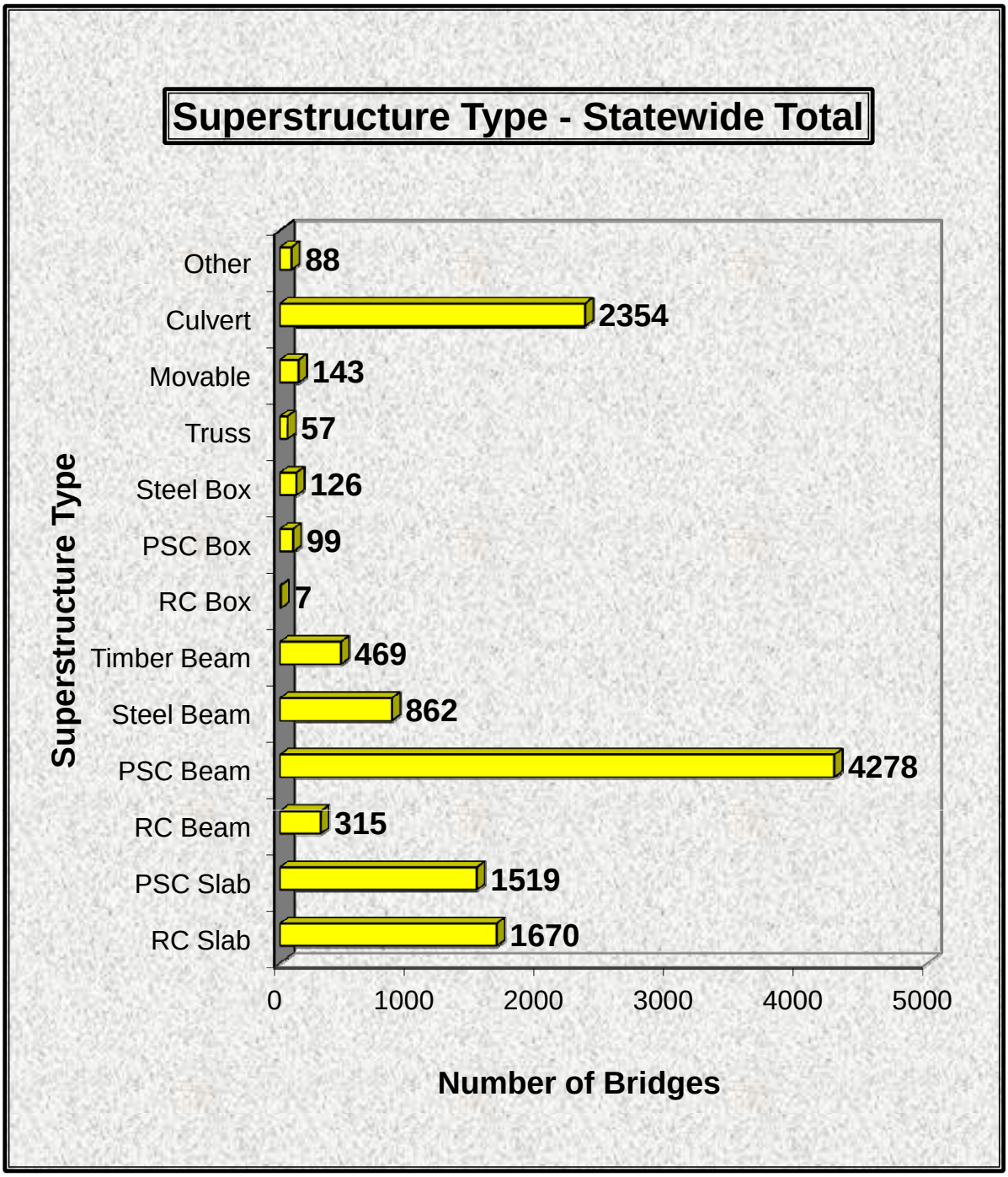
Superstructure Type - Statewide Total
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
88
2354
143
57
126
99
7
469
862
4278
315
1519
1670
0
1000
2000
3000
4000
5000
Number of Bridges

Figure 9

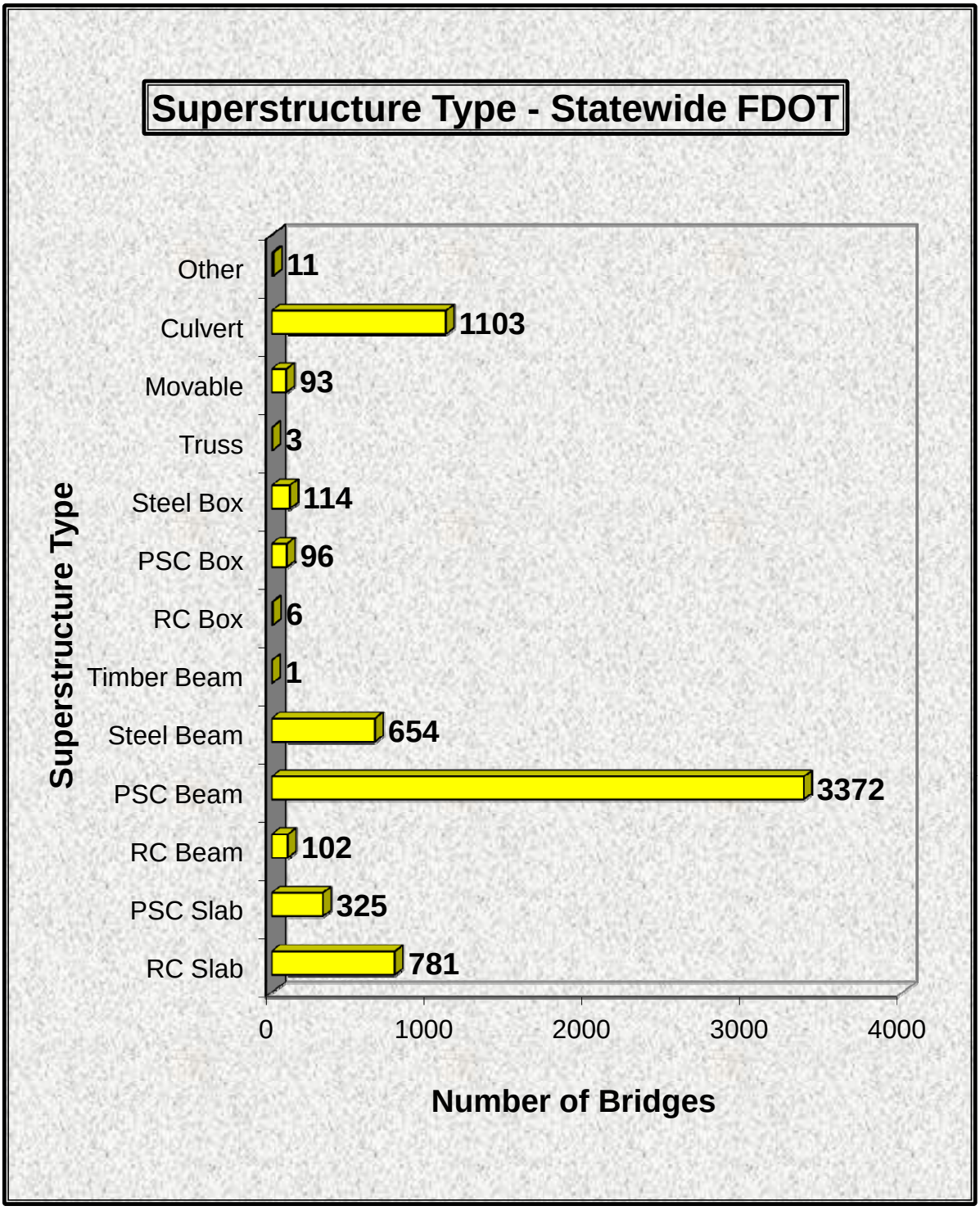
Superstructure Type - Statewide FDOT
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
11
1103
93
3
114
96
6
1
654
3372
102
325
781
0
1000
2000
3000
4000
Number of Bridges

Figure 10

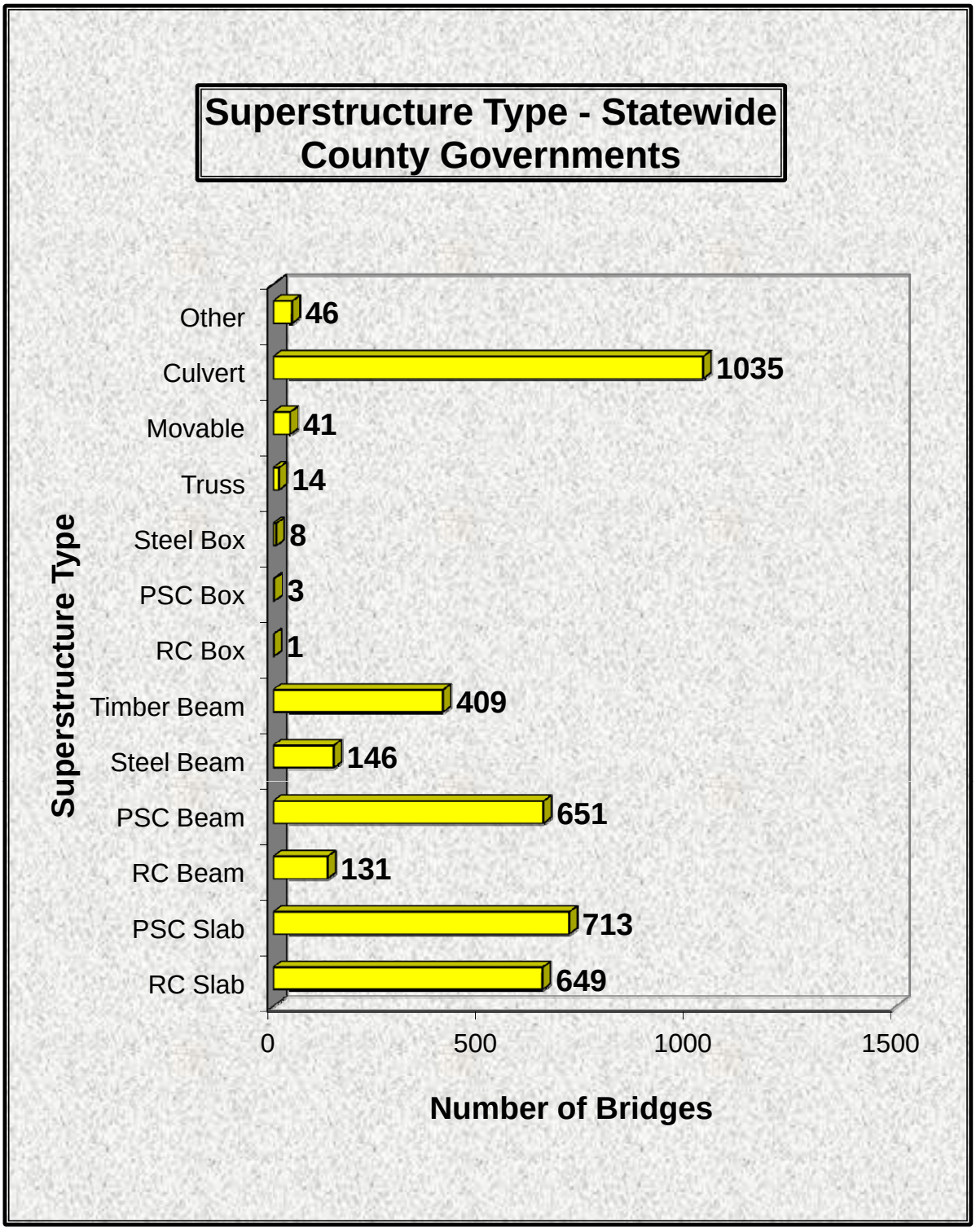
Superstructure Type - Statewide
County Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
46
1035
41
14
8
3
1
409
146
651
131
713
649
0
500
1000
1500
Number of Bridges

Figure 11

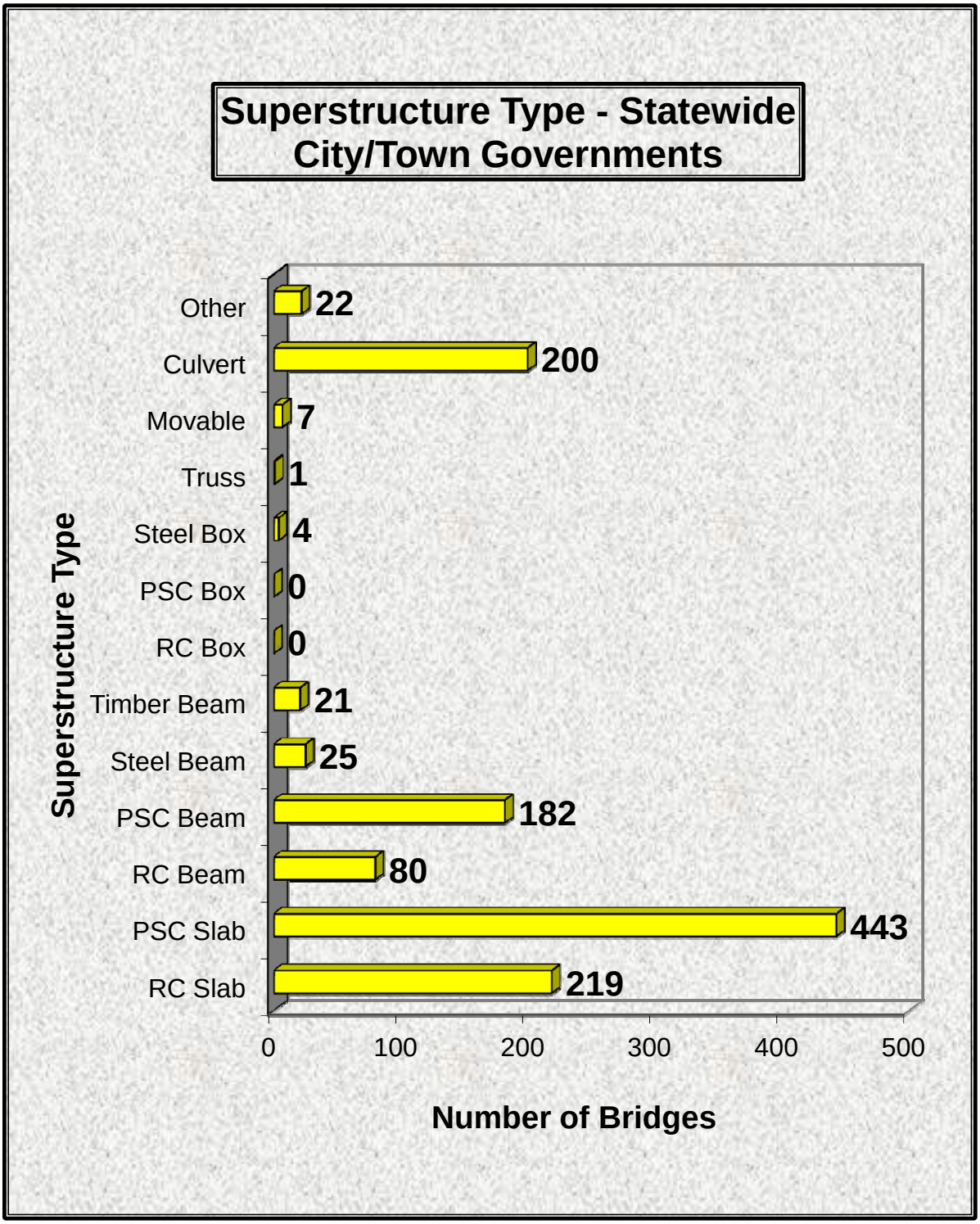
Superstructure Type - Statewide
City/Town Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
22
200
7
1
4
0
0
21
25
182
80
443
219
0
100
200
300
400
500
Number of Bridges

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 5,550 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 1,631 bridges, 29.39% of the total. 15.26% of the FDOT bridges fall into the 0 to 5,000 square foot range; 32.31% are in the 5,000 to 10,000 square foot range; and 23.05% of the bridges have deck areas greater than 20,000 square feet.

County and City/Town Bridges

As one might expect, bridges maintained by county governments are generally smaller than those maintained by FDOT. The statewide county maintenance responsibility group has 71.07% of their bridges under 5,000 square feet; with 16.23% between 5,000 and 10,000 square feet; 7.28% between 10,000 to 20,000 square feet; and only 5.42% over 20,000 square feet (see Figure 14). The results for the City/Town group are similar; with 77.33% of these bridges less than 5,000 square feet (see Figure 15 & 16).

FDOT Bridges by District

Tables 6 and 7 present the statewide data sorted by FDOT District. Figure 17 allows graphic comparison between the FDOT Districts for the FDOT maintained bridges. For example, 31.69% of the District 1 bridges are less than 5,000 square feet and only 14.47% of their bridges are over 20,000 square feet. In contrast, only 13.88% of District 4 bridges are less than 5,000 square feet, while 32.54% 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	24	549	131	97	3	0	0	804
1,000-2,500	181	778	361	34	12	4	6	1376
2,500-5,000	642	665	279	12	10	0	9	0
5,000-7,500	934	289	89	4	8	0	12	1336
7,500-10,000	859	166	39	1	5	0	8	1078
10,000-20,000	1631	204	58	6	1	0	14	1914
20,000-40,000	705	91	22	0	0	0	2	820
40,000-80,000	306	39	13	1	3	0	3	365
80,000-160,000	155	15	5	1	3	0	0	179
>160,000	113	7	0	0	0	0	0	120
Total	5550	2803	997	156	45	4	54	9609

Table 5

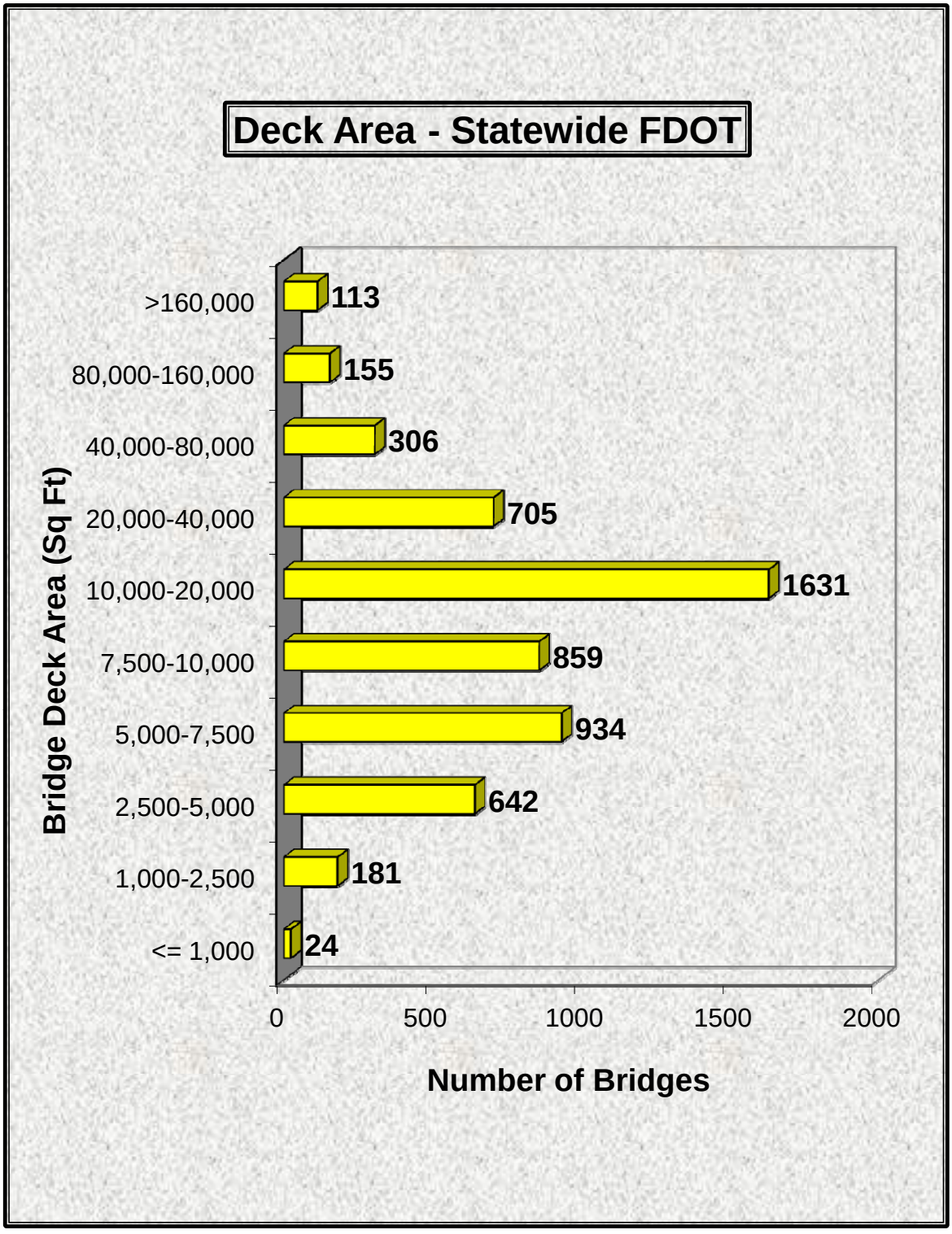
Deck Area - Statewide FDOT
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
113
155
306
705
1631
859
934
642
181
24
0
500
1000
1500
2000
Number of Bridges

Figure 13

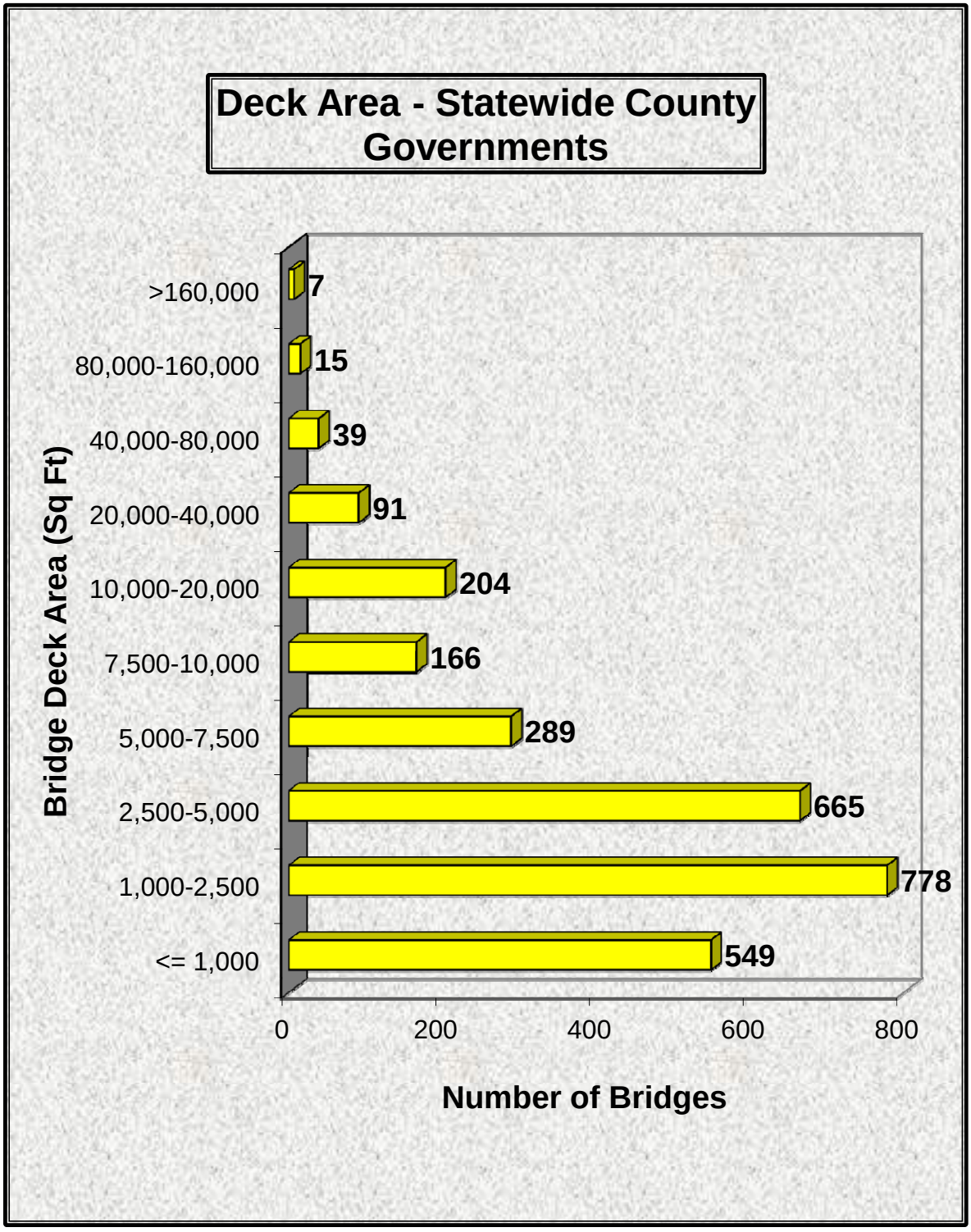
Deck Area - Statewide County Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
7
15
39
91
204
166
289
665
778
549
0
200
400
600
800
Number of Bridges

Figure 14

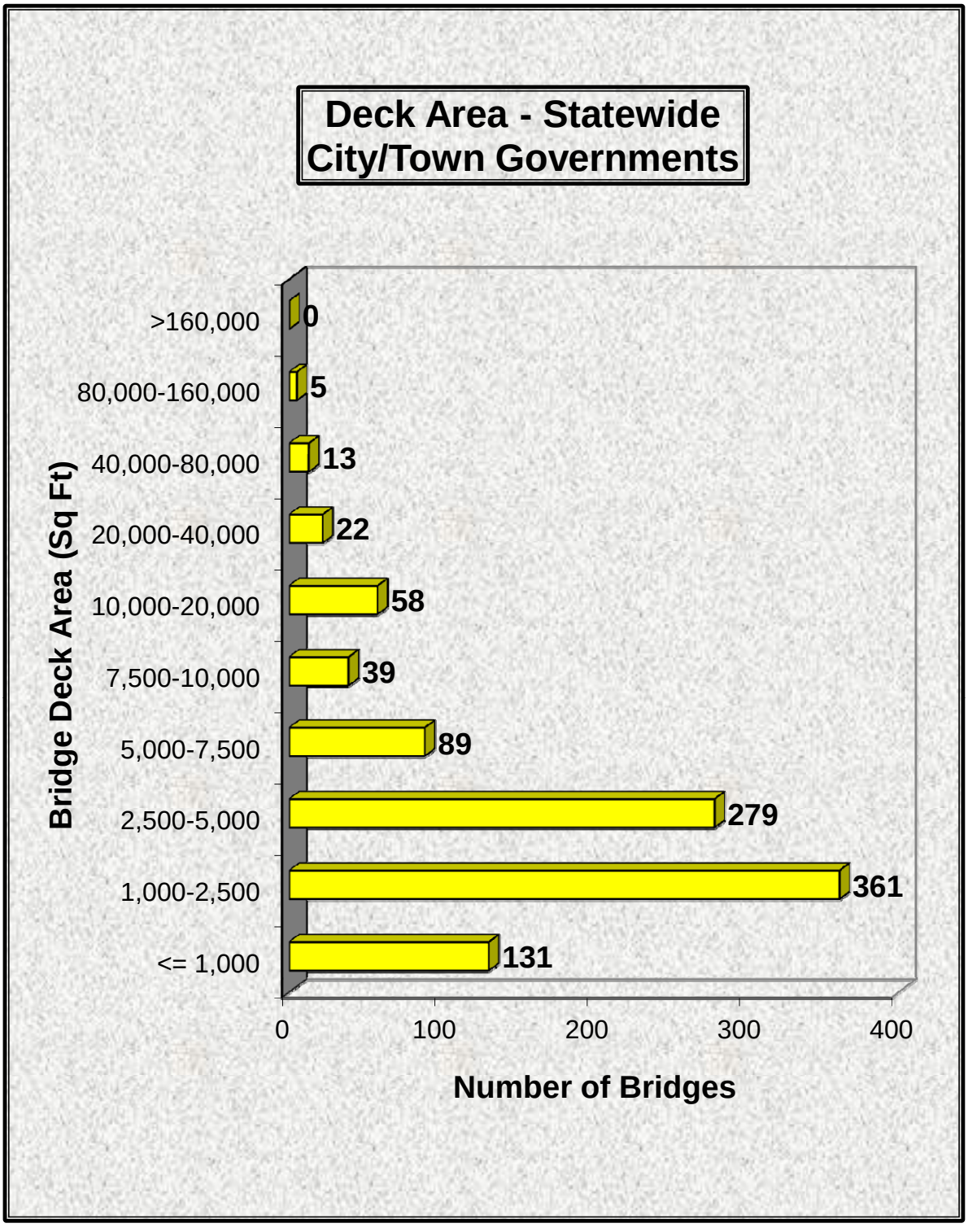
Deck Area - Statewide
City/Town Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
5
13
22
58
39
89
279
361
131
0
100
200
300
400
Number of Bridges

Figure 15

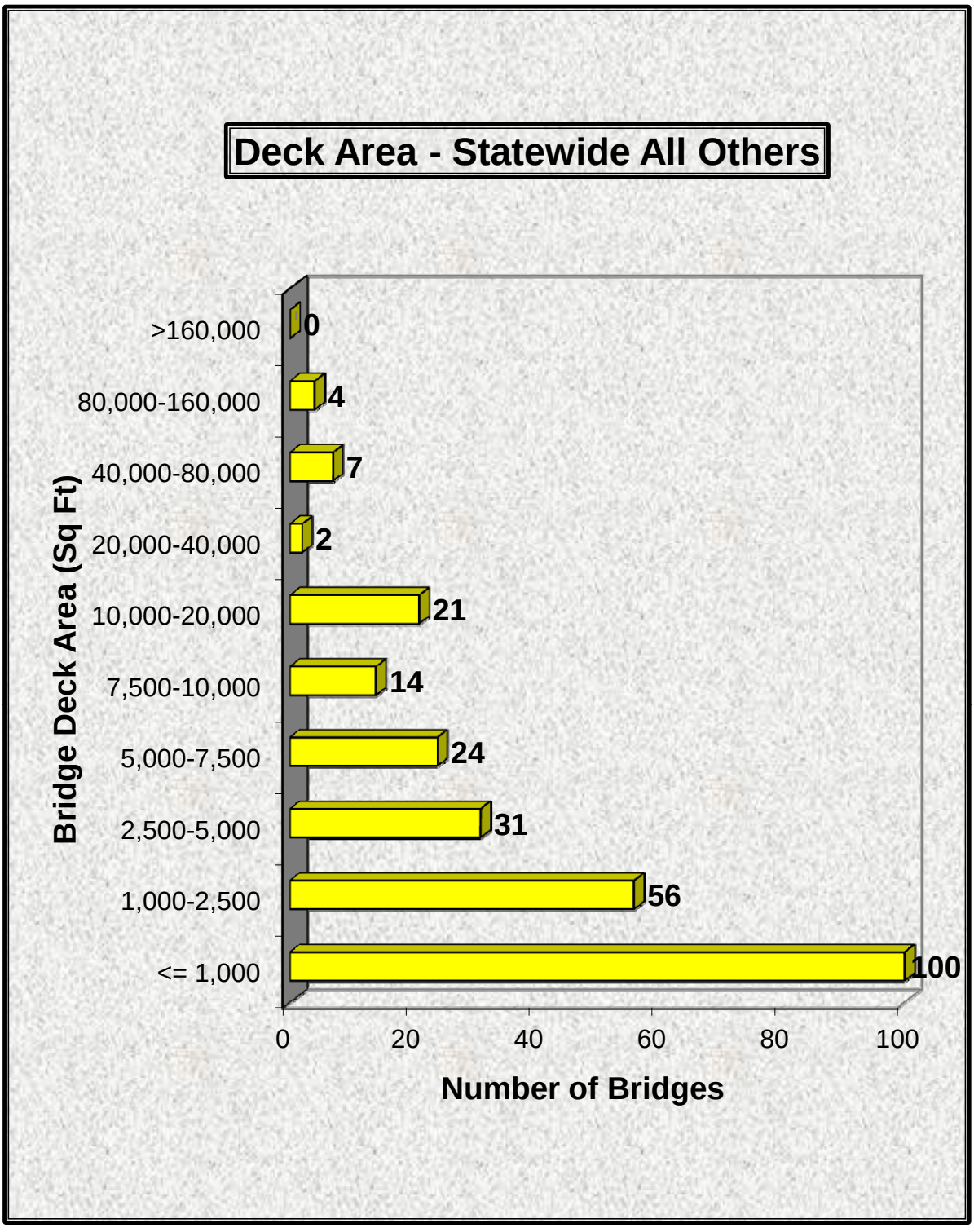
Deck Area - Statewide All Others
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
4
7
2
21
14
24
31
56
100
0
20
40
60
80
100
Number of Bridges

Figure 16

Bridge Inventory By Deck Area (District)

	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
District 1								
<= 1,000	8	115	28	5	0	0	0	156
1,000-2,500	77	205	62	3	10	0	0	357
2,500-5,000	134	170	75	5	8	0	0	392
5,000-7,500	113	51	26	2	3	0	0	195
7,500-10,000	98	32	4	0	0	0	0	134
10,000-20,000	161	31	7	3	0	0	0	202
20,000-40,000	55	17	0	0	0	0	0	72
40,000-80,000	22	6	0	0	0	0	0	28
80,000-160,000	11	5	0	0	0	0	0	16
>160,000	12	1	0	0	0	0	0	13
Total	691	633	202	18	21	0	0	1565
District 2								
<= 1,000	5	60	12	13	0	0	0	90
1,000-2,500	26	62	60	2	0	0	0	150
2,500-5,000	93	64	27	1	0	0	0	185
5,000-7,500	166	25	13	0	0	0	0	204
7,500-10,000	164	11	14	0	0	0	0	189
10,000-20,000	267	11	9	0	0	0	2	289
20,000-40,000	92	5	6	0	0	0	0	103
40,000-80,000	44	2	3	1	0	0	0	50
80,000-160,000	35	0	0	1	0	0	0	36
>160,000	20	1	0	0	0	0	0	21
Total	912	241	144	18	0	0	2	1317
District 3								
<= 1,000	4	266	8	74	1	0	0	353
1,000-2,500	10	207	10	24	0	0	0	251
2,500-5,000	59	122	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	148	25	2	0	0	0	0	175
20,000-40,000	61	11	1	0	0	0	0	73
40,000-80,000	29	3	2	0	0	0	0	34
80,000-160,000	19	3	1	0	2	0	0	25
>160,000	23	0	0	0	0	0	0	23
Total	559	712	36	104	3	0	0	1414
District 4								
<= 1,000	0	19	49	0	0	0	0	68
1,000-2,500	22	106	114	0	0	0	0	242
2,500-5,000	77	135	88	1	0	0	0	301
5,000-7,500	72	64	13	1	0	0	0	150
7,500-10,000	56	23	6	0	0	0	0	85
10,000-20,000	254	47	12	0	0	0	0	313
20,000-40,000	137	23	1	0	0	0	0	161
40,000-80,000	59	5	0	0	0	0	0	64
80,000-160,000	21	1	1	0	0	0	0	23
>160,000	15	0	0	0	0	0	0	15
Total	713	423	284	2	0	0	0	1422

Table 6

Bridge Inventory By Deck Area (District)

	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
District 5								
<= 1,000	1	23	12	3	2	0	0	41
1,000-2,500	16	53	40	4	1	0	6	120
2,500-5,000	88	64	28	0	2	0	9	191
5,000-7,500	184	27	17	1	1	0	12	242
7,500-10,000	159	33	8	0	2	0	8	210
10,000-20,000	240	33	19	1	0	0	12	305
20,000-40,000	97	14	2	0	0	0	2	115
40,000-80,000	35	7	4	0	2	0	3	51
80,000-160,000	22	1	2	0	1	0	0	26
>160,000	13	0	0	0	0	0	0	13
Total	855	255	132	9	11	0	52	1314
District 6								
<= 1,000	1	21	4	2	0	0	0	28
1,000-2,500	13	69	33	1	0	4	0	120
2,500-5,000	64	62	31	0	0	0	0	157
5,000-7,500	65	32	9	0	0	0	0	106
7,500-10,000	60	16	4	0	0	0	0	80
10,000-20,000	169	17	4	2	0	0	0	192
20,000-40,000	119	9	5	0	0	0	0	133
40,000-80,000	47	6	2	0	1	0	0	56
80,000-160,000	26	4	0	0	0	0	0	30
>160,000	13	2	0	0	0	0	0	15
Total	577	238	92	5	1	4	0	917
District 7								
<= 1,000	5	45	18	0	0	0	0	68
1,000-2,500	13	76	42	0	1	0	0	132
2,500-5,000	28	48	20	0	0	0	0	96
5,000-7,500	79	40	9	0	4	0	0	132
7,500-10,000	109	26	3	0	3	0	0	141
10,000-20,000	191	40	5	0	1	0	0	237
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	602	301	107	0	9	0	0	1019
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	201	0	0	0	0	0	0	201
20,000-40,000	51	0	0	0	0	0	0	51
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

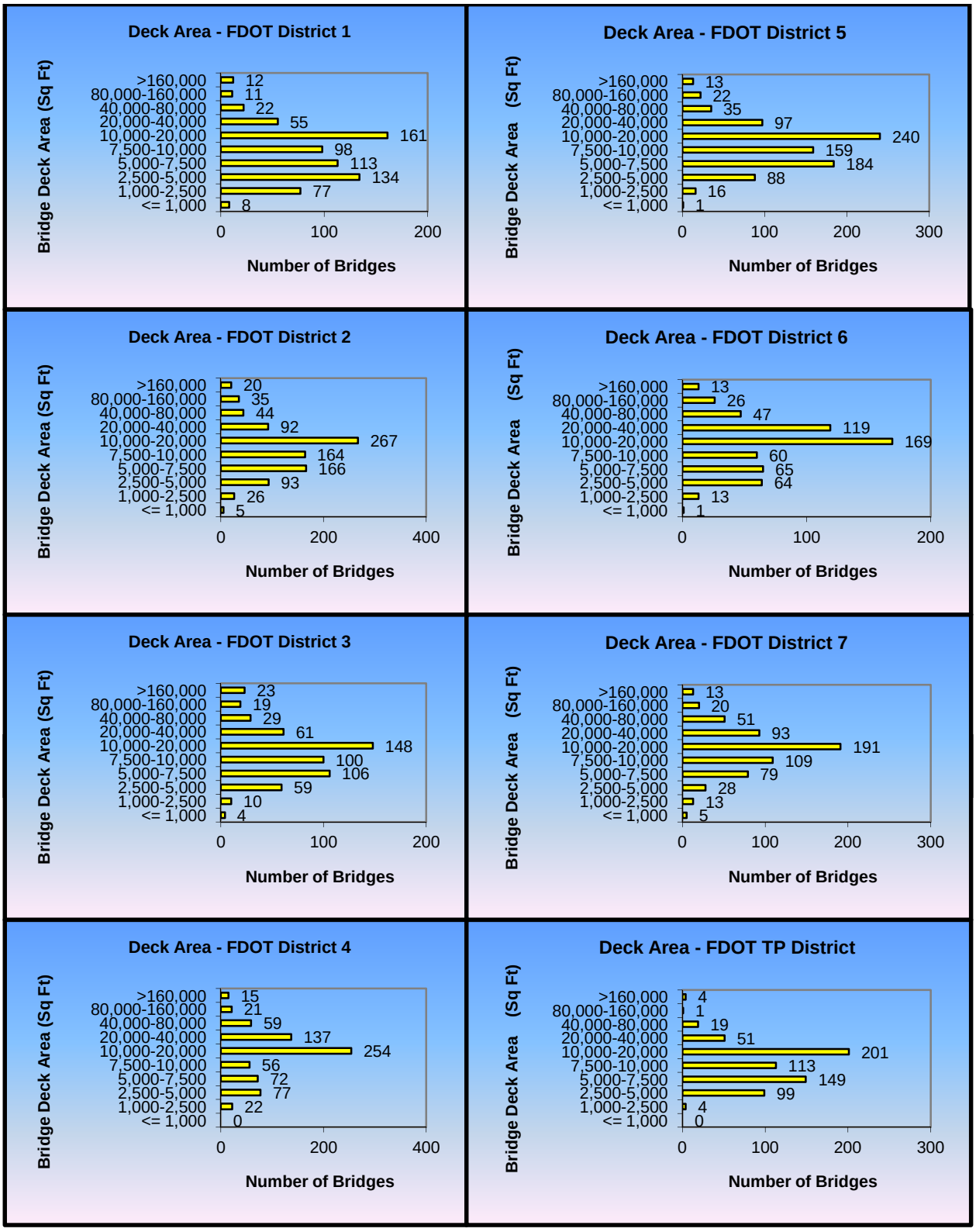
Deck Area - FDOT District 1
Bridge Deck Area (Sq Ft)
>160,000 12
80,000-160,000 11
40,000-80,000 22
20,000-40,000 55
10,000-20,000 161
7,500-10,000 98
5,000-7,500 113
2,500-5,000 134
1,000-2,500 77
<= 1,000 8
0 100 200
Number of Bridges
Deck Area - FDOT District 5
Bridge Deck Area (Sq Ft)
>160,000 13
80,000-160,000 22
40,000-80,000 35
20,000-40,000 97
10,000-20,000 240
7,500-10,000 159
5,000-7,500 184
2,500-5,000 88
1,000-2,500 16
<= 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 92
10,000-20,000 267
7,500-10,000 164
5,000-7,500 166
2,500-5,000 93
1,000-2,500 26
<= 1,000 5
0 200 400
Number of Bridges
Deck Area - FDOT District 6
Bridge Deck Area (Sq Ft)
>160,000 13
80,000-160,000 26
40,000-80,000 47
20,000-40,000 119
10,000-20,000 169
7,500-10,000 60
5,000-7,500 65
2,500-5,000 64
1,000-2,500 13
<= 1,000 1
0 100 200
Number of Bridges
Deck Area - FDOT District 3
Bridge Deck Area (Sq Ft)
>160,000 23
80,000-160,000 19
40,000-80,000 29
20,000-40,000 61
10,000-20,000 148
7,500-10,000 100
5,000-7,500 106
2,500-5,000 59
1,000-2,500 10
<= 1,000 4
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
10,000-20,000 191
7,500-10,000 109
5,000-7,500 79
2,500-5,000 28
1,000-2,500 13
<= 1,000 5
0 100 200 300
Number of Bridges
Deck Area - FDOT District 4
Bridge Deck Area (Sq Ft)
>160,000 15
80,000-160,000 21
40,000-80,000 59
20,000-40,000 137
10,000-20,000 254
7,500-10,000 56
5,000-7,500 72
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 51
10,000-20,000 201
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

Bridge Inventory - 2012 Annual Report

Overall Structural Condition

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

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

Figure 18 shows, for each of the maintenance responsibility groups, the percentage of bridges in excellent, good, fair, and poor condition. Approximately 95.62% of the FDOT maintained bridges are in excellent or good condition. However, the number drops to 87.08% for County bridges, 87.04% for City/Town bridges, and 88.73% for Other Agency bridges. Figures 19 and 20 provide similar views of the FDOT maintained bridges, by district. An alternative view of the data from Figure 44 is presented in Figures 21, 22, and 23, for each of the three maintenance groups, shown by FDOT District.

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

	Overall Structural Condition								
		Maintenance Responsibility							
		FDOT	County	City/Town	Other State	Other Local	Federal	Others	Total
Statewide	Excellent	796	325	80	15	11	0	5	1232
	Good	5573	3025	968	118	43	4	48	9779
	Fair	234	347	110	17	1	0	2	711
	Poor	58	150	46	9	1	0	1	265
	Total	6661	3847	1204	159	56	4	56	11987
District 1	Excellent	54	65	16	0	0	0	0	135
	Good	830	770	222	16	22	0	0	1860
	Fair	28	54	5	3	0	0	0	90
	Poor	2	11	2	0	0	0	0	15
	Total	914	900	245	19	22	0	0	2100
District 2	Excellent	62	27	11	0	0	0	0	100
	Good	1070	312	148	7	0	0	1	1538
	Fair	54	95	21	7	0	0	0	177
	Poor	17	52	14	4	0	0	1	88
	Total	1203	486	194	18	0	0	2	1903
District 3	Excellent	111	64	4	14	0	0	0	193
	Good	641	712	36	81	3	0	1	1474
	Fair	23	116	4	5	0	0	0	148
	Poor	17	56	3	4	0	0	0	80
	Total	792	948	47	104	3	0	1	1895
District 4	Excellent	141	47	11	1	0	0	0	200
	Good	583	367	215	0	0	0	0	1165
	Fair	15	27	54	1	0	0	0	97
	Poor	13	3	11	0	0	0	0	27
	Total	752	444	291	2	0	0	0	1489
District 5	Excellent	111	61	18	0	9	0	5	204
	Good	858	298	138	10	10	0	46	1360
	Fair	45	23	6	1	0	0	2	77
	Poor	5	8	1	0	0	0	0	14
	Total	1019	390	163	11	19	0	53	1655
District 6	Excellent	122	29	10	0	0	0	0	161
	Good	438	191	67	4	0	4	0	704
	Fair	20	20	8	0	1	0	0	49
	Poor	2	8	9	1	0	0	0	20
	Total	582	248	94	5	1	4	0	934
District 7	Excellent	104	32	10	0	2	0	0	148
	Good	555	375	142	0	8	0	0	1080
	Fair	39	12	12	0	0	0	0	63
	Poor	2	12	6	0	1	0	0	21
	Total	700	431	170	0	11	0	0	1312
District 8	Excellent	91	0	0	0	0	0	0	
	Good	598	0	0	0	0	0	0	598
	Fair	10	0	0	0	0	0	0	10
	Poor	0	0	0	0	0	0	0	0
	Total	699	0	0	0	0	0	0	699

Table 8

NOTE: The number of FDOT bridges includes 126 MDX bridges and 269 OOCEA bridges.

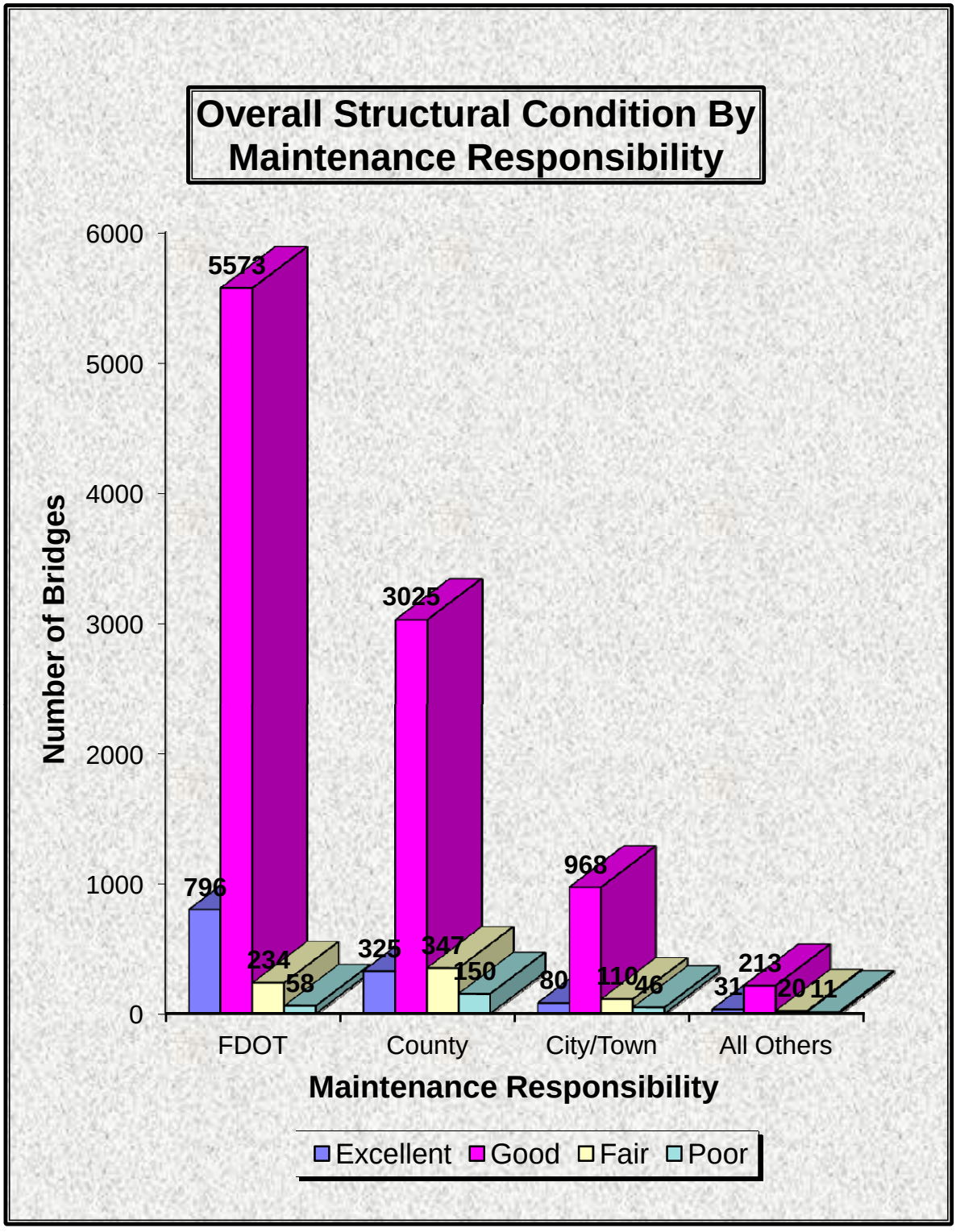
Overall Structural Condition By Maintenance Responsibility
Number of Bridges
6000
5000
4000
3000
2000
1000
0
5573
3025
968
796
234
58
325
347
150
80
110
46
31
213
20
11
FDOT
County
City/Town
All Others
Maintenance Responsibility
Excellent
Good
Fair
Poor

Figure 18

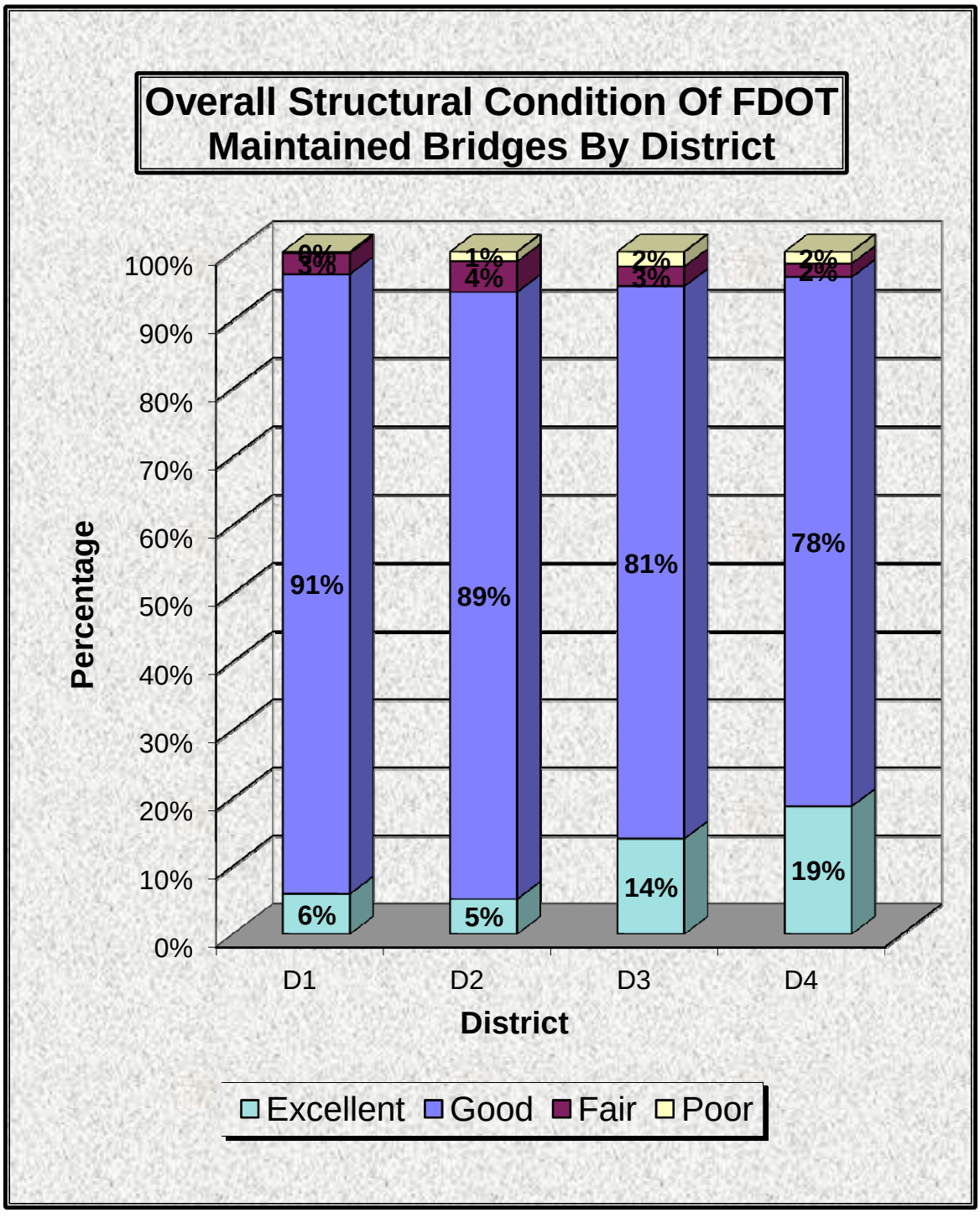
Overall Structural Condition Of FDOT Maintained Bridges By District
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
91%
6%
3%
89%
5%
4%
1%
81%
14%
3%
2%
78%
19%
2%
2%
D1
D2
D3
D4
District
Excellent
Good
Fair
Poor

Figure 19

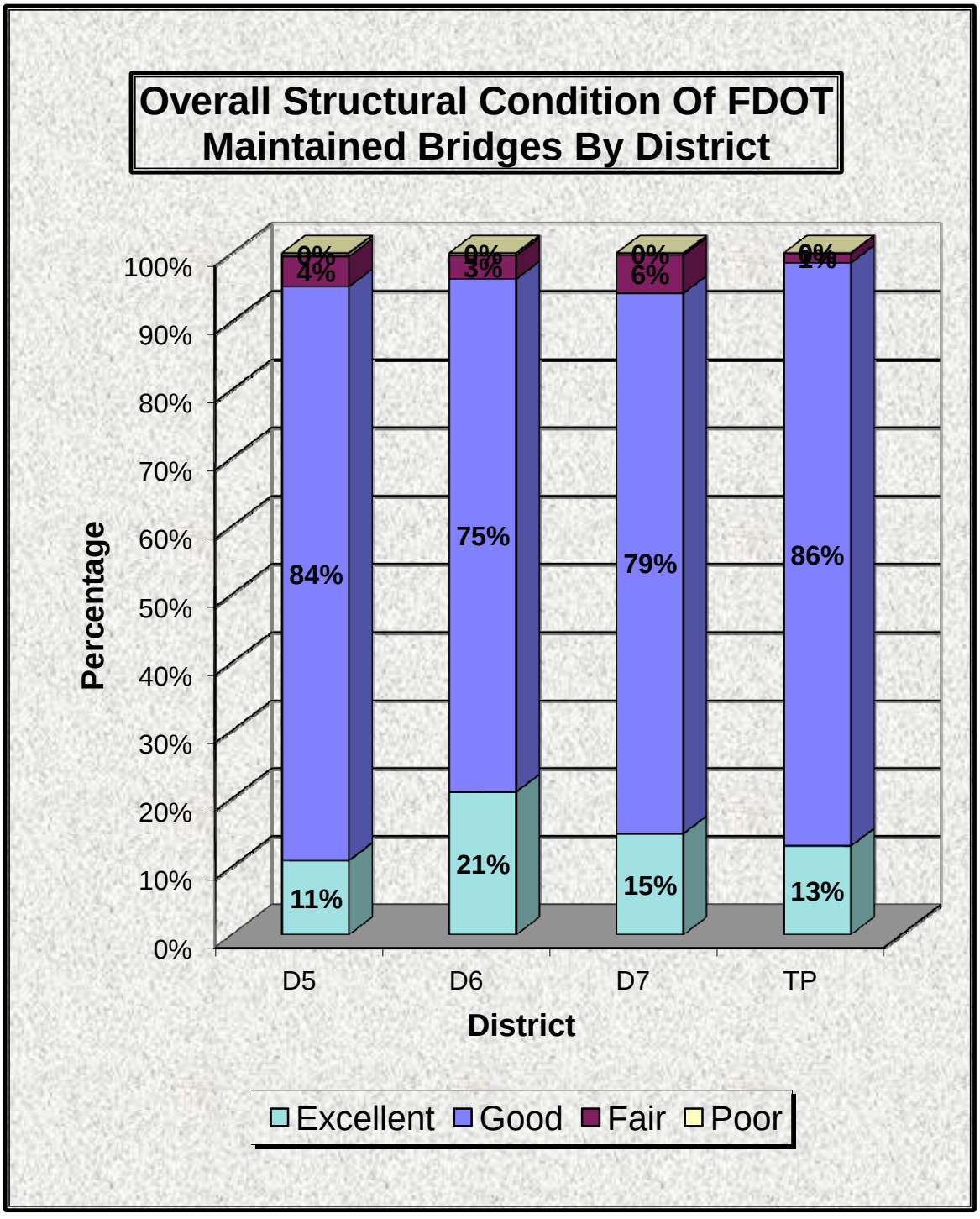
Overall Structural Condition Of FDOT Maintained Bridges By District
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0%
4%
84%
11%
0%
3%
75%
21%
0%
6%
79%
15%
0%
1%
86%
13%
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor

Figure 20

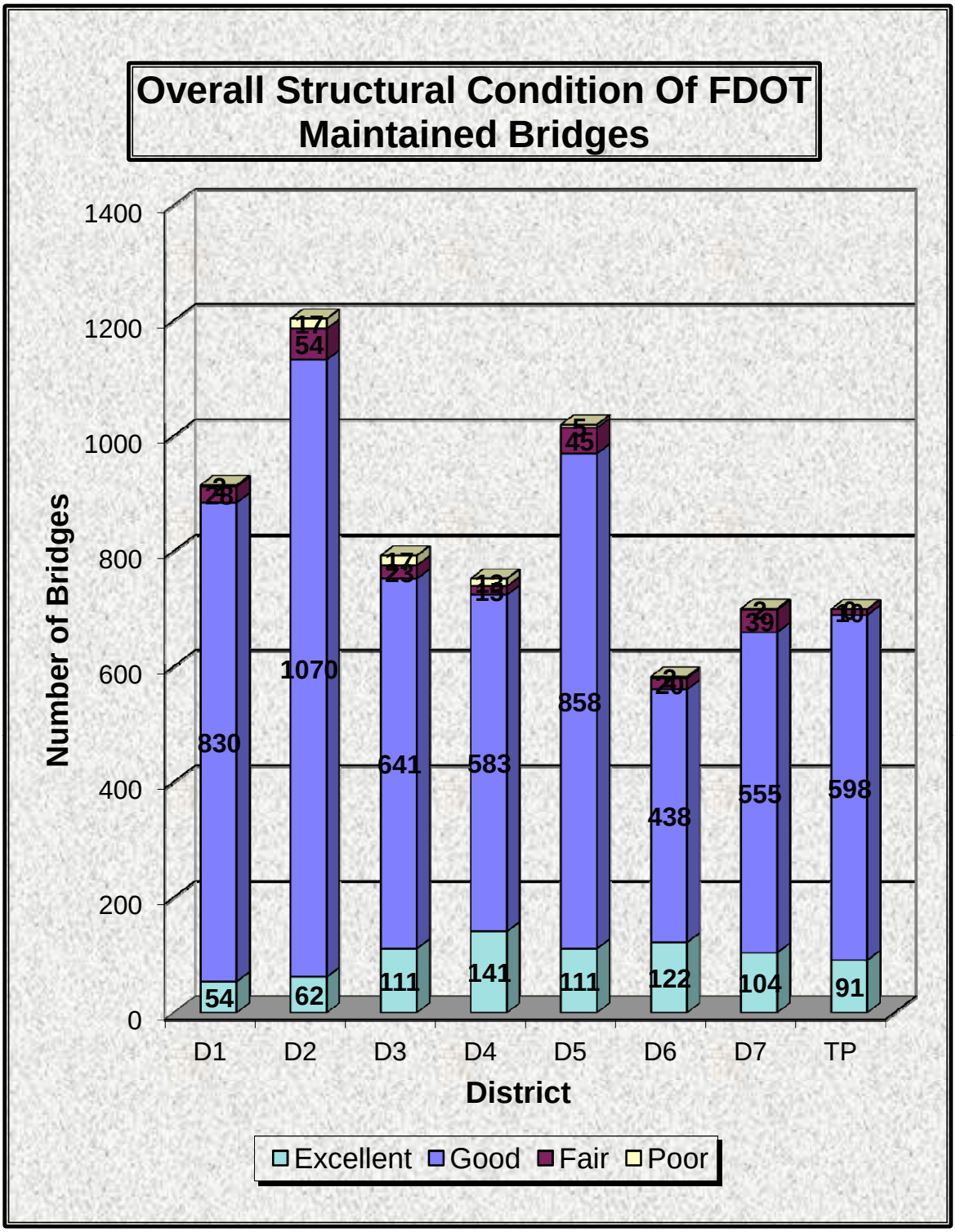
Overall Structural Condition Of FDOT Maintained Bridges
Number of Bridges
1400
1200
1000
800
600
400
200
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
54
830
28
62
1070
54
111
641
23
141
583
15
111
858
45
122
438
20
104
555
39
91
598
10

Figure 21

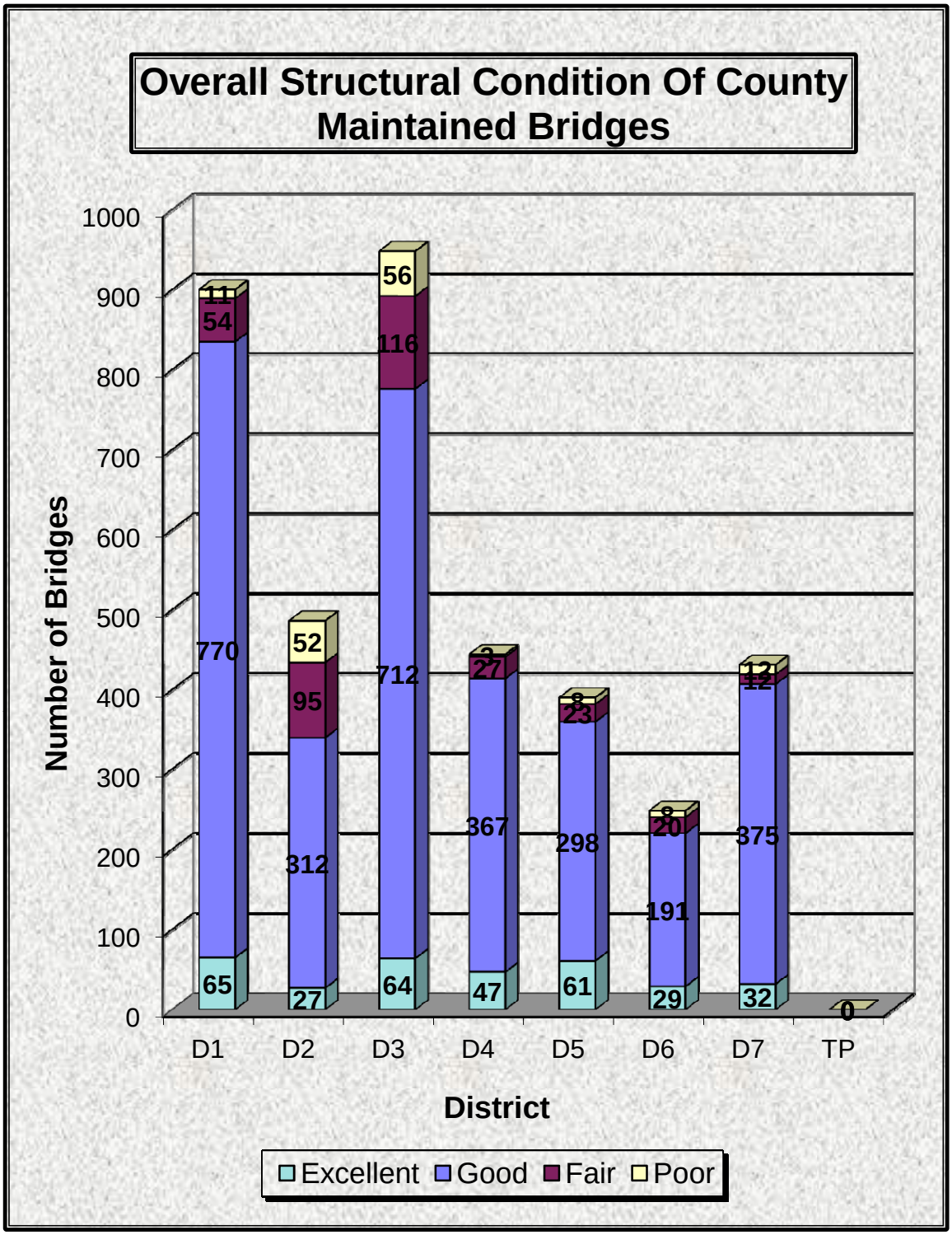
Overall Structural Condition Of County Maintained Bridges
Number of Bridges
1000
900
800
700
600
500
400
300
200
100
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
65
770
54
11
27
312
95
52
64
712
116
56
47
367
27
2
61
298
23
8
29
191
20
8
32
375
12
12
0

Figure 22

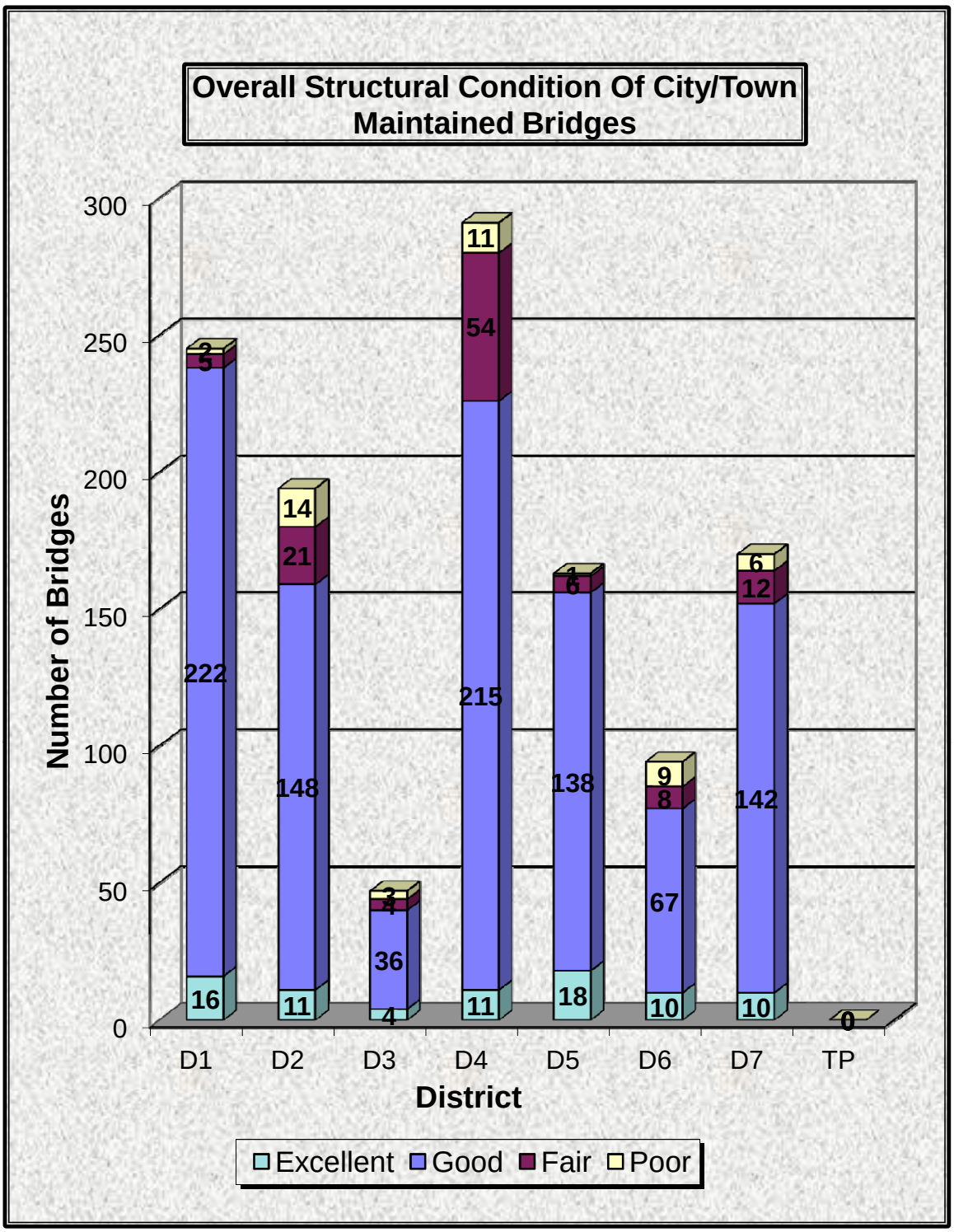
Overall Structural Condition Of City/Town Maintained Bridges
Number of Bridges
300
250
200
150
100
50
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
16
222
3
11
148
21
14
4
36
3
11
215
54
11
18
138
1
6
10
67
8
9
10
142
12
6
0

Figure 23

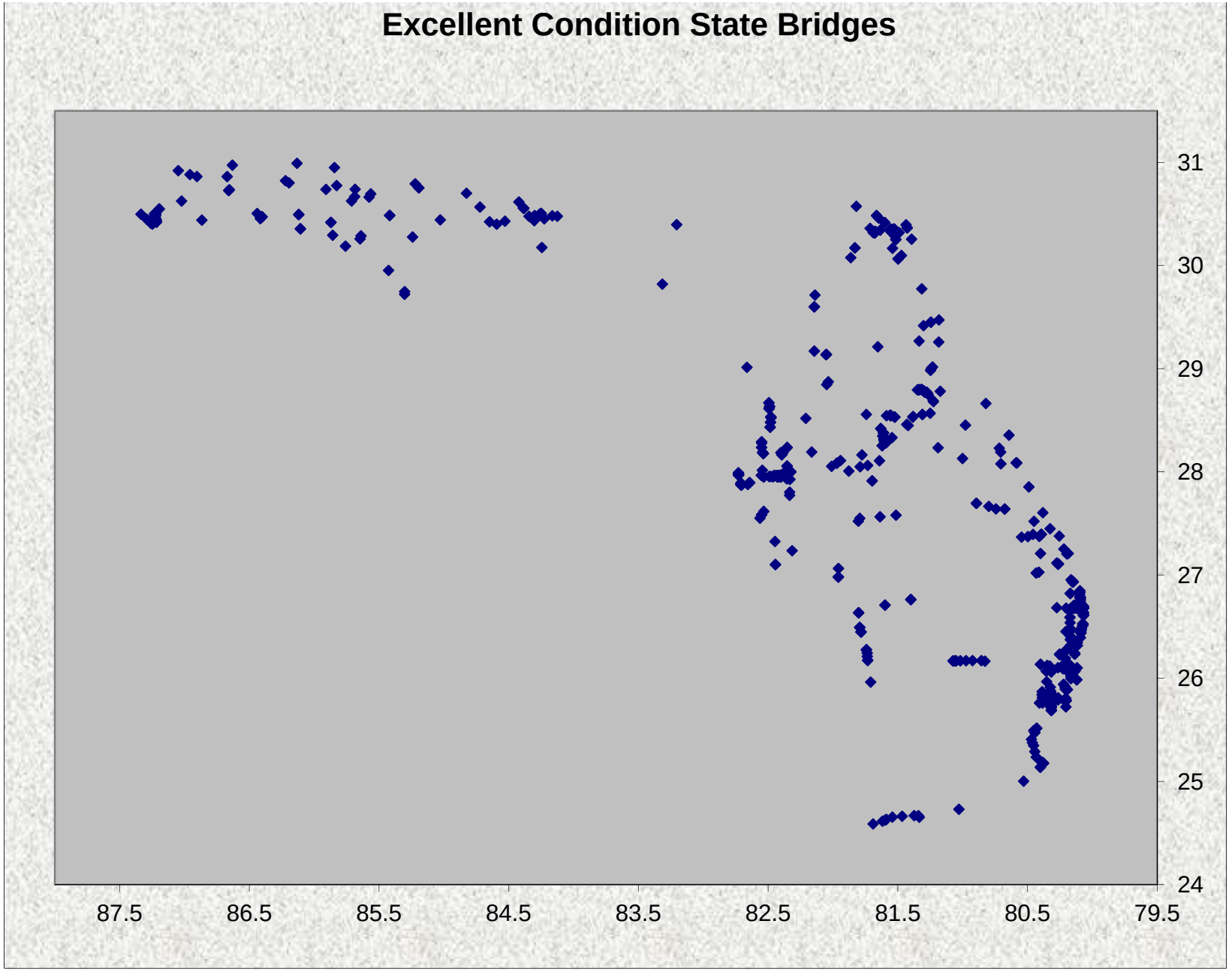
Excellent Condition State Bridges
31
30
29
28
27
26
25
24
87.5
86.5
85.5
84.5
83.5
82.5
81.5
80.5
79.5

Figure 24

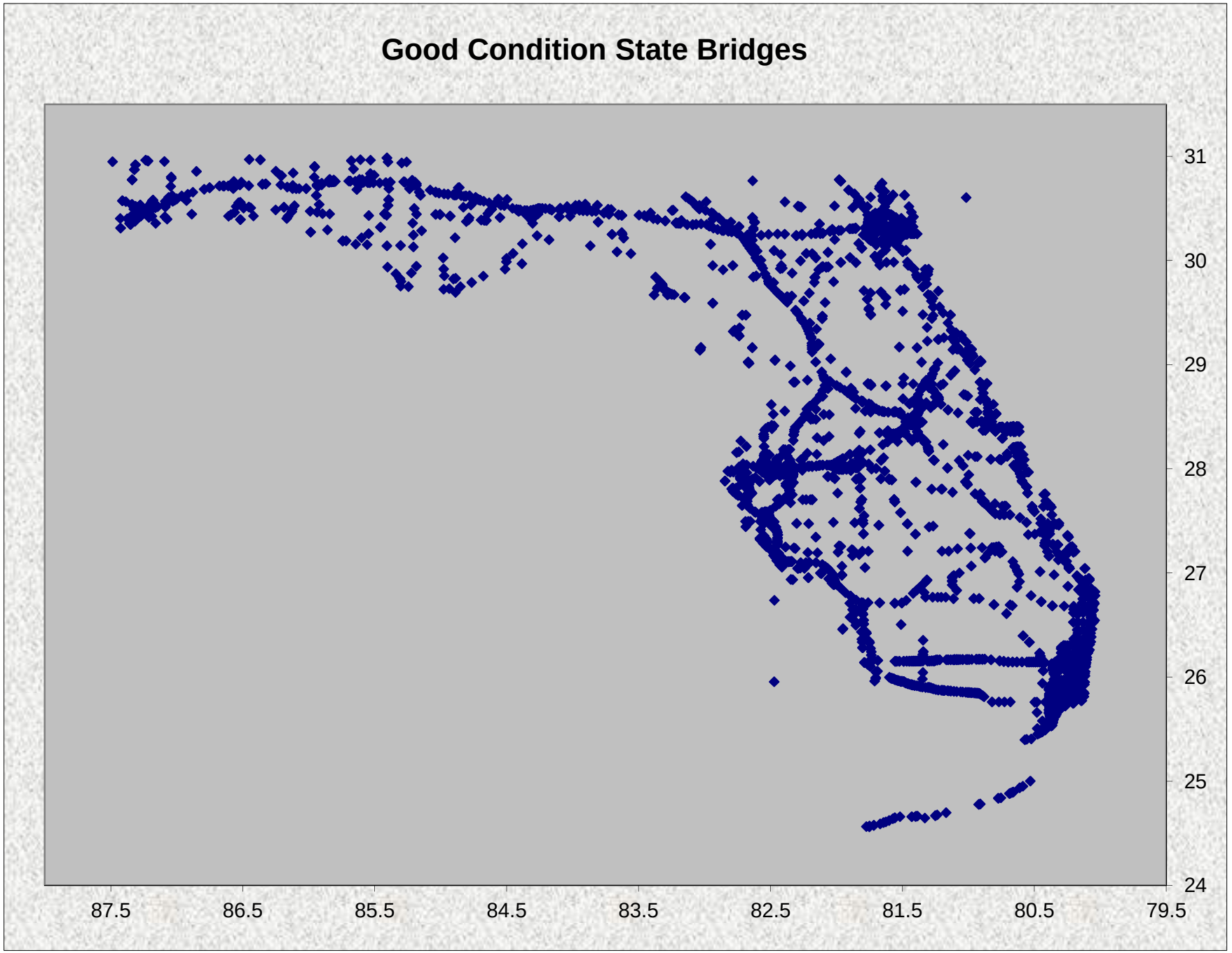
Good Condition State Bridges
31
30
29
28
27
26
25
24
87.5
86.5
85.5
84.5
83.5
82.5
81.5
80.5
79.5

Figure 25

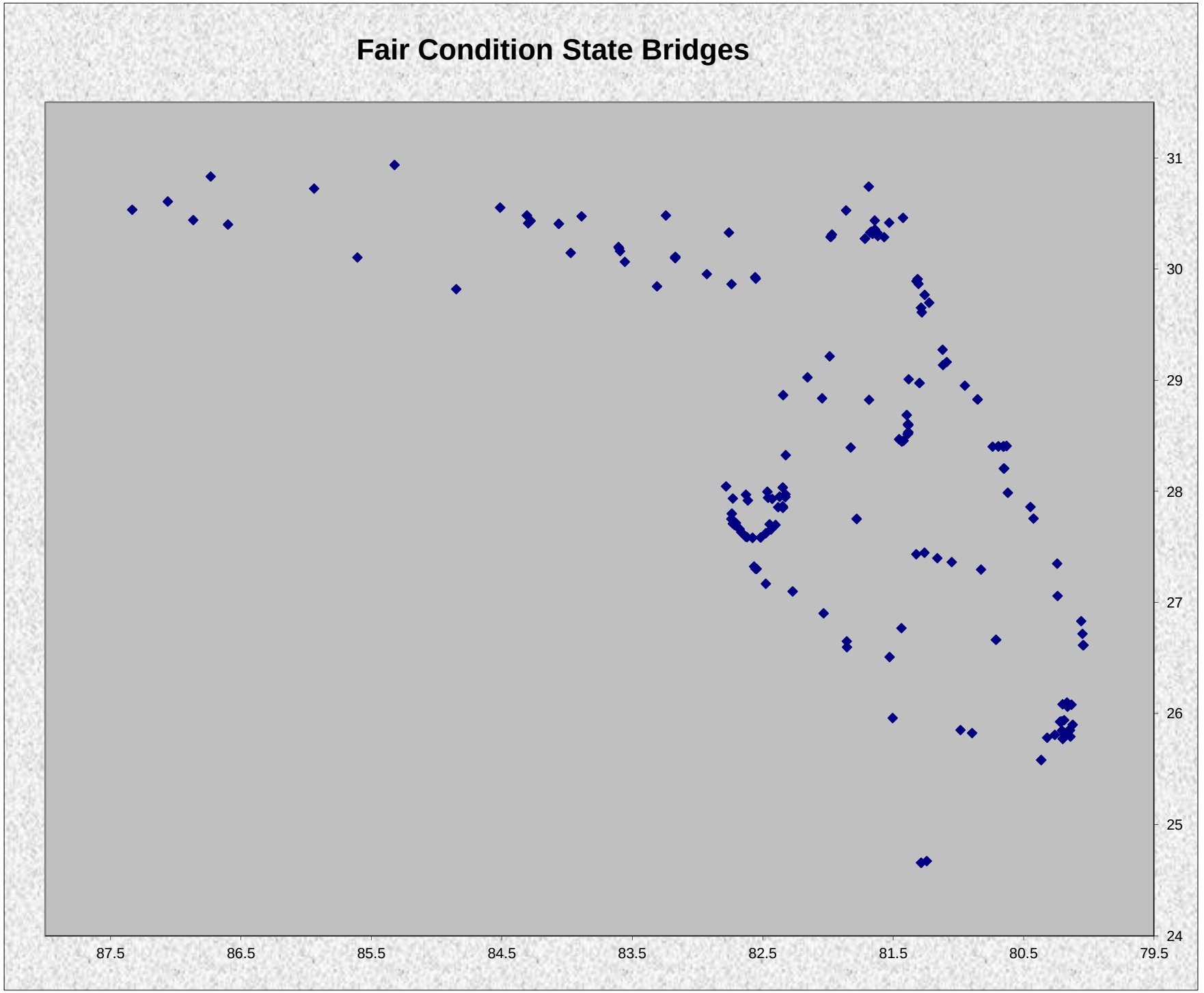
Fair Condition State Bridges
31
30
29
28
27
26
25
24
87.5
86.5
85.5
84.5
83.5
82.5
81.5
80.5
79.5

Figure 26

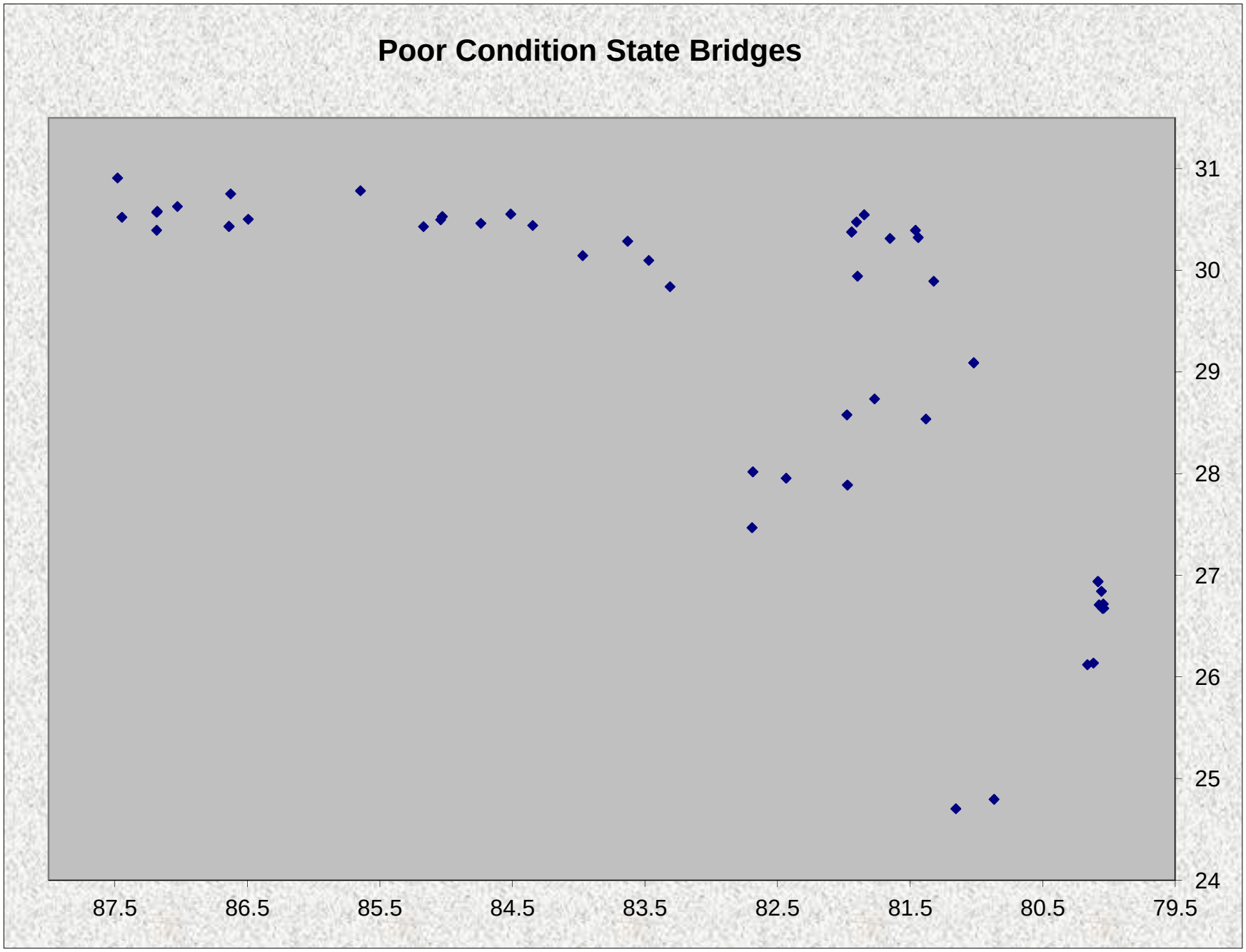
Poor Condition State Bridges
31
30
29
28
27
26
25
24
87.5
86.5
85.5
84.5
83.5
82.5
81.5
80.5
79.5

Figure 27

Structurally Deficient Bridges

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

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

There are currently 235 structurally deficient bridges in Florida, with over 57.87% having county maintenance responsibility. Fifty-one (21.70%) of the structurally deficient bridges are maintained by FDOT (see Figure 28). Refer to Figures 30, 31, and 32 for a presentation of structurally deficient bridges, by sufficiency rating, by FDOT District, for each of the maintenance responsibility groups. For the group of County Government maintained bridges, 75.74% would likely qualify for use of federal bridge construction funds to replace the bridges, while 23.53% would likely qualify for repair or rehabilitation using federal bridge construction funds. Similar results are seen for the City/Town maintenance group, with 92.50% in the replacement range and 7.50% in the repair/rehab range. Over 76.47% of the County Government maintained structurally deficient bridges are concentrated within District 2 and 3. Over 70.00% of the City/Town maintained structurally deficient bridges are concentrated within Districts 2 and 4.

Structurally Deficient Bridges (SD) Bridges By Sufficiency Rating (SR)								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
Statewide								
SD w/SR>80	0	1	0	0	0	0	0	1
SD w/50<SR<=80	21	32	3	3	0	0	0	59
SD w/SR<50	30	103	37	5	0	0	0	175
Total	51	136	40	8	0	0	0	235
District 1								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	0	2	0	0	0	0	0	2
SD w/SR<50	2	6	1	0	0	0	0	9
Total	2	8	1	0	0	0	0	11
District 2								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	7	17	1	0	0	0	0	25
SD w/SR<50	8	33	13	4	0	0	0	58
Total	15	50	14	4	0	0	0	83
District 3								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	6	11	0	3	0	0	0	20
SD w/SR<50	11	43	3	1	0	0	0	58
Total	17	54	3	4	0	0	0	78
District 4								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	3	0	0	0	0	0	0	3
SD w/SR<50	6	3	14	0	0	0	0	23
Total	9	3	14	0	0	0	0	26
District 5								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	3	2	0	0	0	0	0	5
SD w/SR<50	2	6	1	0	0	0	0	9
Total	5	8	1	0	0	0	0	14
District 6								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	1	0	2	0	0	0	0	3
SD w/SR<50	1	7	3	0	0	0	0	11
Total	2	7	5	0	0	0	0	14
District 7								
SD w/SR>80	0	1	0	0	0	0	0	1
SD w/50<SR<=80	1	0	0	0	0	0	0	1
SD w/SR<50	0	5	2	0	0	0	0	7
Total	1	6	2	0	0	0	0	9
District 8								
SD w/SR>80	0	0	0	0	0	0	0	0
SD w/50<SR<=80	0	0	0	0	0	0	0	0
SD w/SR<50	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0

Table 9

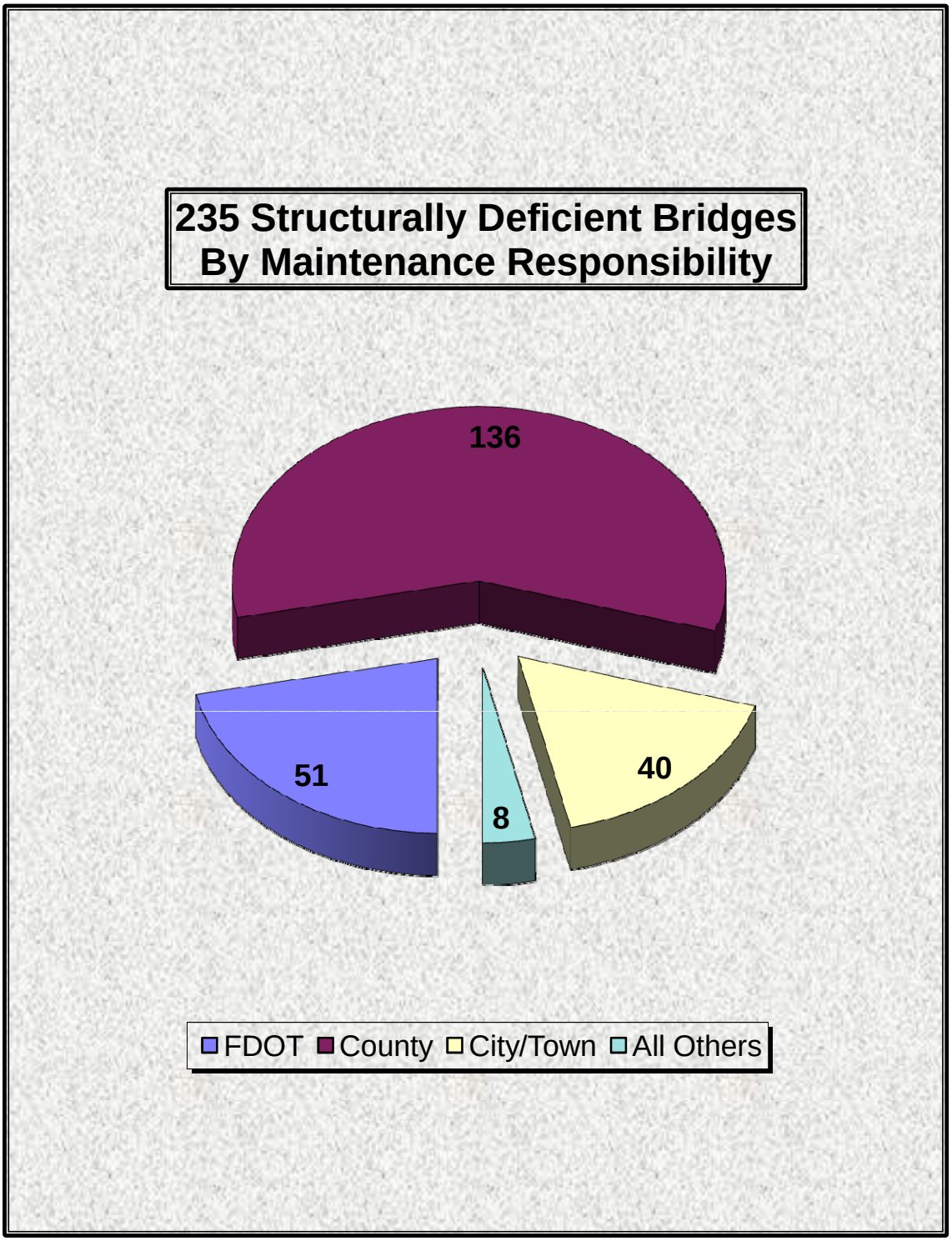
235 Structurally Deficient Bridges
By Maintenance Responsibility
136
51
8
40
FDOT
County
City/Town
All Others

Figure 28

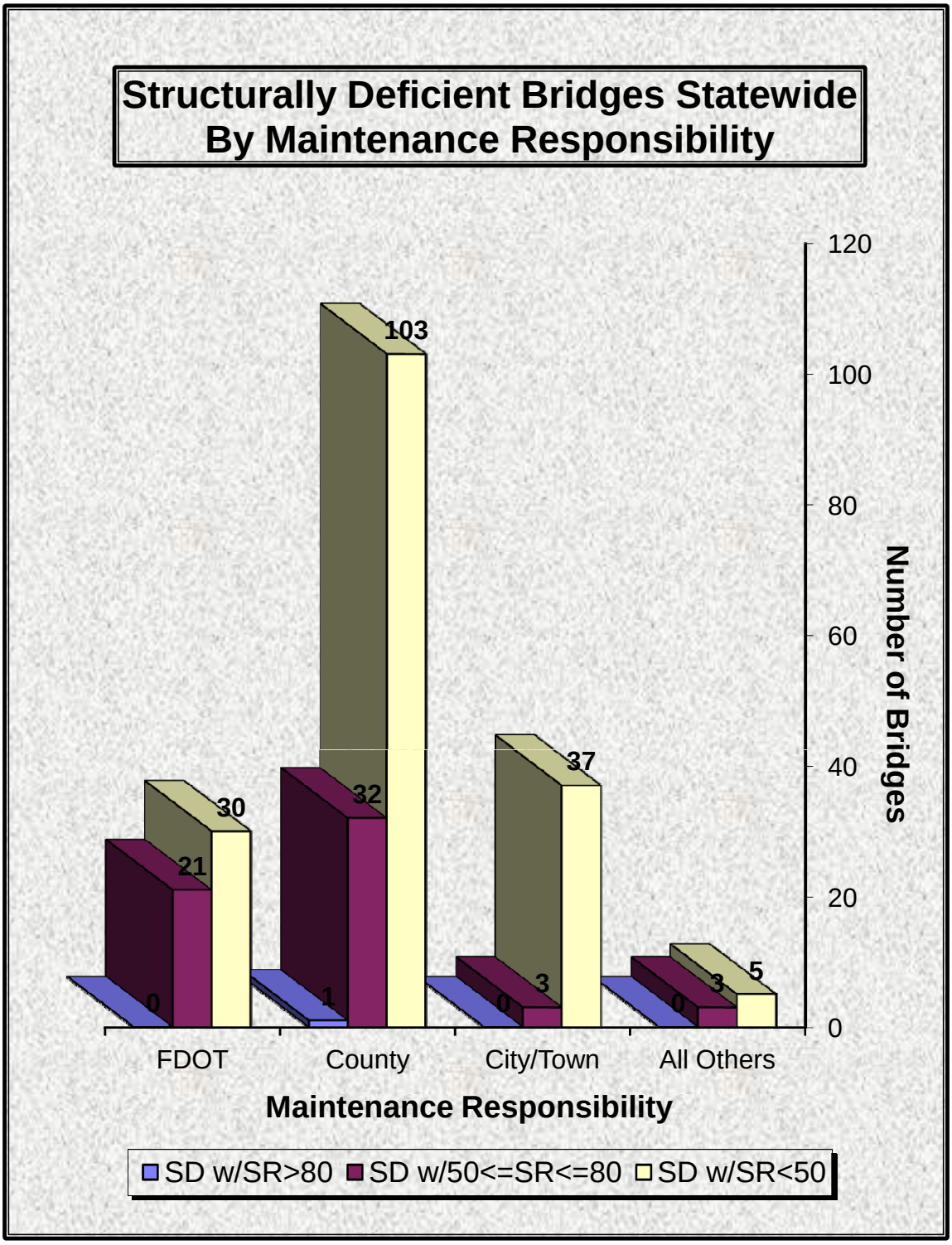
Structurally Deficient Bridges Statewide
By Maintenance Responsibility
120
100
80
60
40
20
0
Number of Bridges
103
30
21
32
37
3
5
3
0
1
0
0
FDOT
County
City/Town
All Others
Maintenance Responsibility
SD w/SR>80
SD w/50<=SR<=80
SD w/SR<50

Figure 29

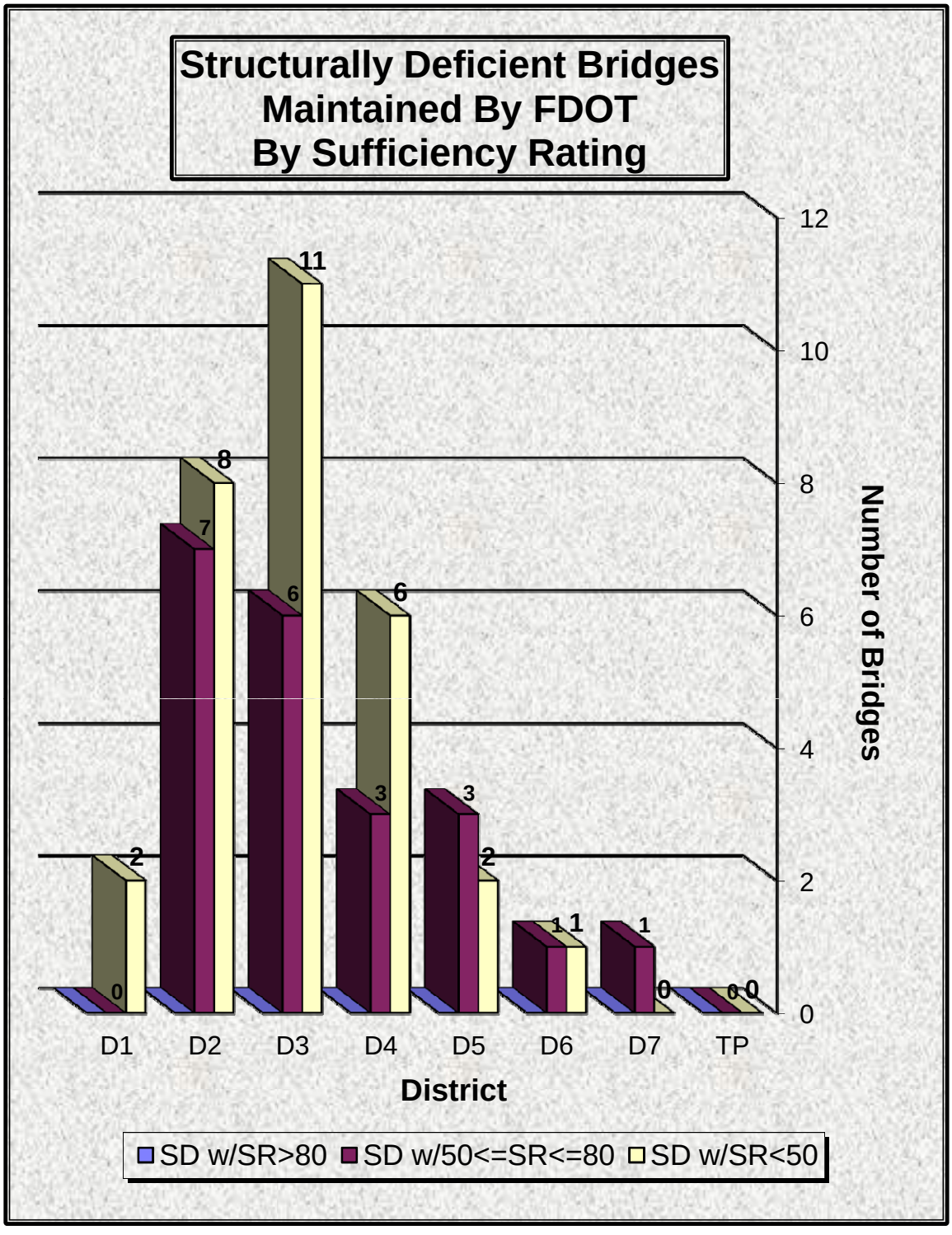
Structurally Deficient Bridges
Maintained By FDOT
By Sufficiency Rating
Number of Bridges
0
2
4
6
8
10
12
D1
D2
D3
D4
D5
D6
D7
TP
District
SD w/SR>80
SD w/50<=SR<=80
SD w/SR<50
0
2
7
8
6
11
6
6
3
3
2
2
1
1
1
0
0
0

Figure 30

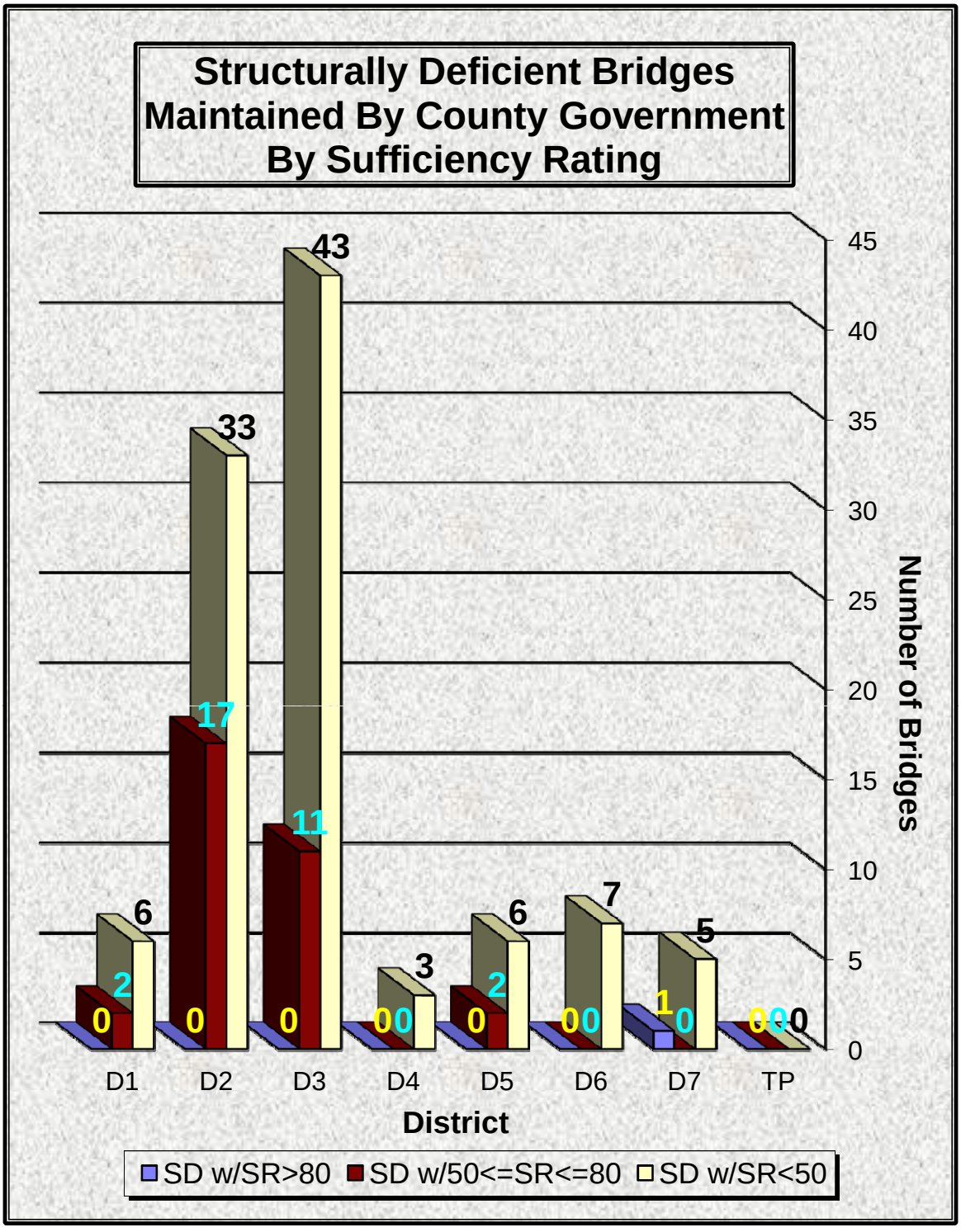
Structurally Deficient Bridges
Maintained By County Government
By Sufficiency Rating
45
40
35
30
25
20
15
10
5
0
Number of Bridges
6
33
43
3
6
7
5
0
2
17
11
0
2
1
0
0
0
0
0
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
SD w/SR>80
SD w/50<=SR<=80
SD w/SR<50

Figure 31

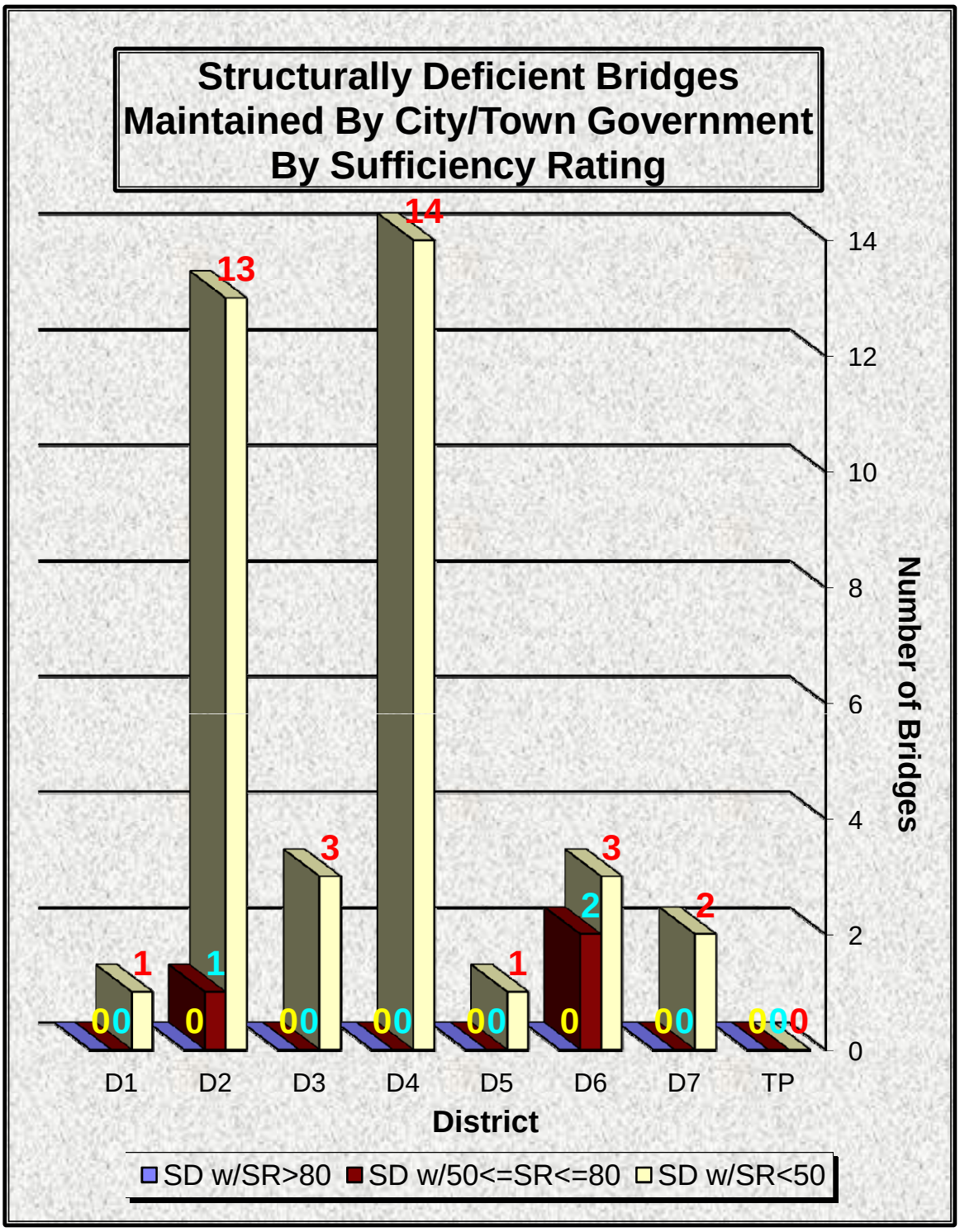
Structurally Deficient Bridges
Maintained By City/Town Government
By Sufficiency Rating
14
12
10
8
6
4
2
0
Number of Bridges
0 1 0 13 0 3 0 14 0 1 0 3 0 2 0 0
D1
D2
D3
D4
D5
D6
D7
TP
District
SD w/SR>80
SD w/50<=SR<=80
SD w/SR<50

Figure 32

Posted and Closed Bridges

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

Table 10 presents the number of posted and closed bridges by maintenance responsibility group, for each of the FDOT Districts. There are currently 840 posted or closed bridges in Florida, with County Governments having maintenance responsibility for over 75.95% of the total. City and Town Governments are responsible for the maintenance of over 18.81% of the total, while the FDOT is responsible for only 7 of the 840 bridges (0.83%) (see Figure 33). The number of posted County bridges (638 bridges) is much greater than the number of structurally deficient County bridges (136), which indicated that the majority of County bridge posting restrictions are caused by obsolete design, rather than advanced structural deterioration (see Figure 34).

Of the 7 posted or closed bridges maintained by the FDOT, Districts 3, 5, and Turnpike had none, and District 7 and 4 constituted 42.86% of the posted or closed bridges (see Figure 35). Seventy percent (73.98%) of the posted or closed bridges maintained by County Governments are concentrated within Districts 2 and 3 (see Figure 36). Eighty-three (52.53%) of the posted or closed bridges maintained by City/Town Governments are concentrated within Districts 2 and 4 (see Figure 37). Statewide, 66.19% 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	3	629	154	34	0	0	0	820
Closed	4	9	4	2	1	0	0	20
Total	7	638	158	36	1	0	0	840
District 1								
Posted	0	86	26	2	0	0	0	114
Closed	0	0	0	0	0	0	0	0
Total	0	86	26	2	0	0	0	114
District 2								
Posted	1	120	43	7	0	0	0	171
Closed	0	2	0	1	0	0	0	3
Total	1	122	43	8	0	0	0	174
District 3								
Posted	0	346	10	21	0	0	0	377
Closed	0	4	1	0	0	0	0	5
Total	0	350	11	21	0	0	0	382
District 4								
Posted	2	26	40	0	0	0	0	68
Closed	0	0	0	0	0	0	0	0
Total	2	26	40	0	0	0	0	68
District 5								
Posted	0	25	21	4	0	0	0	50
Closed	1	0	1	0	0	0	0	2
Total	1	25	22	4	0	0	0	52
District 6								
Posted	0	18	9	0	0	0	0	27
Closed	2	3	2	1	1	0	0	9
Total	2	21	11	1	1	0	0	36
District 7								
Posted	0	8	5	0	0	0	0	13
Closed	1	0	0	0	0	0	0	1
Total	1	8	5	0	0	0	0	14
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

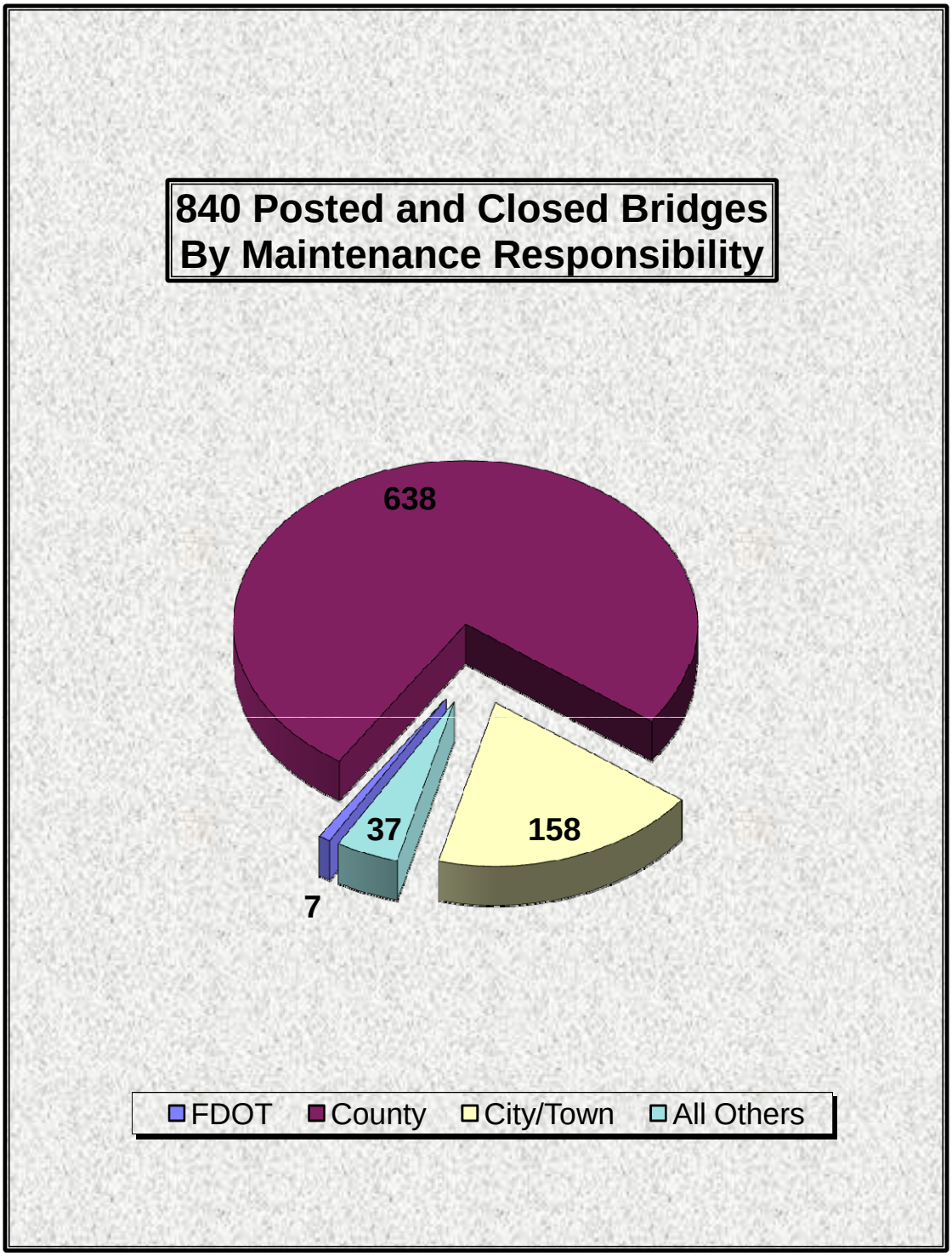
840 Posted and Closed Bridges
By Maintenance Responsibility
638
37
158
7
FDOT
County
City/Town
All Others

Figure 33

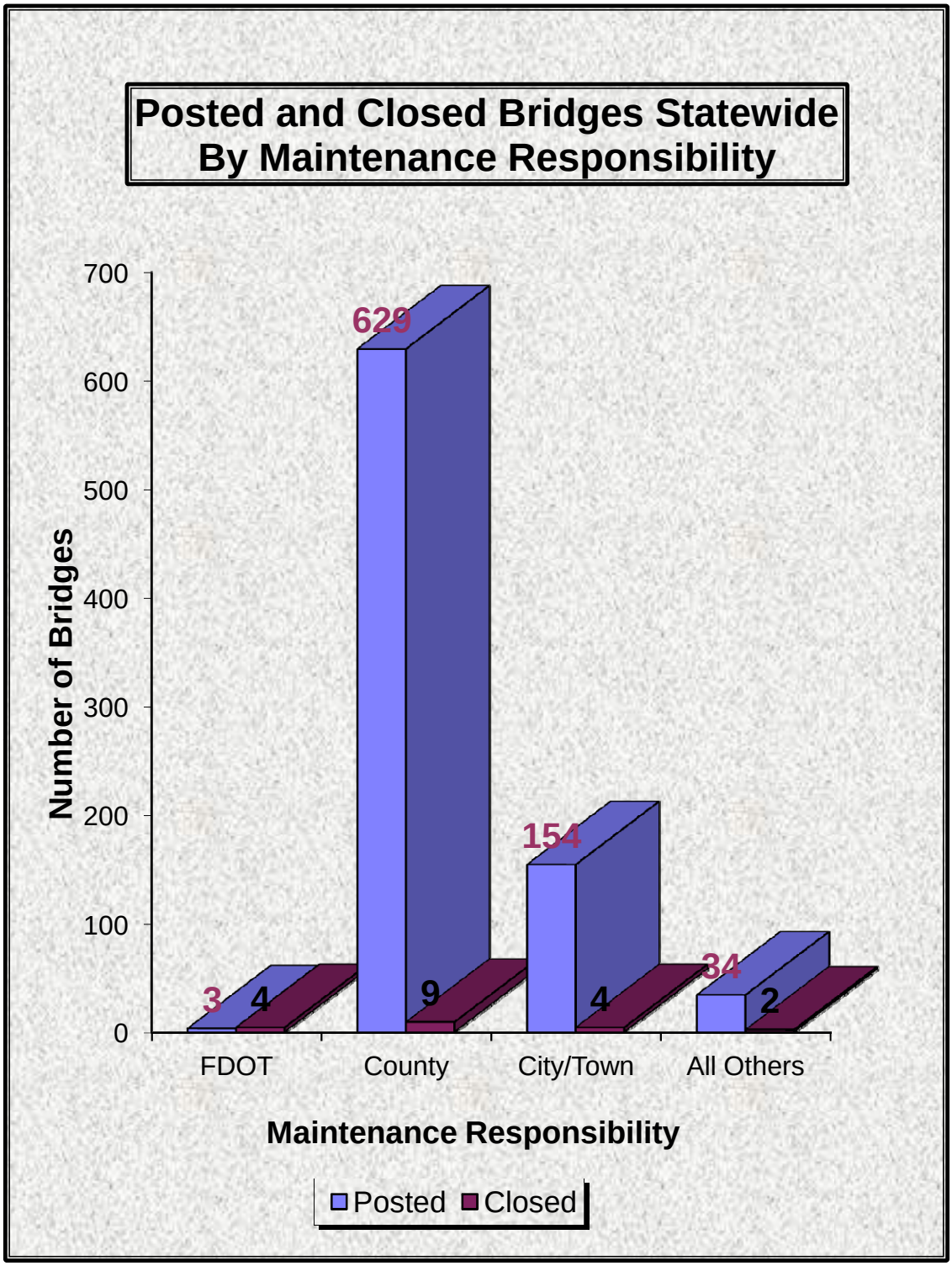
Posted and Closed Bridges Statewide
By Maintenance Responsibility
Number of Bridges
700
600
500
400
300
200
100
0
629
154
34
3
4
9
4
2
FDOT
County
City/Town
All Others
Maintenance Responsibility
Posted
Closed

Figure 34

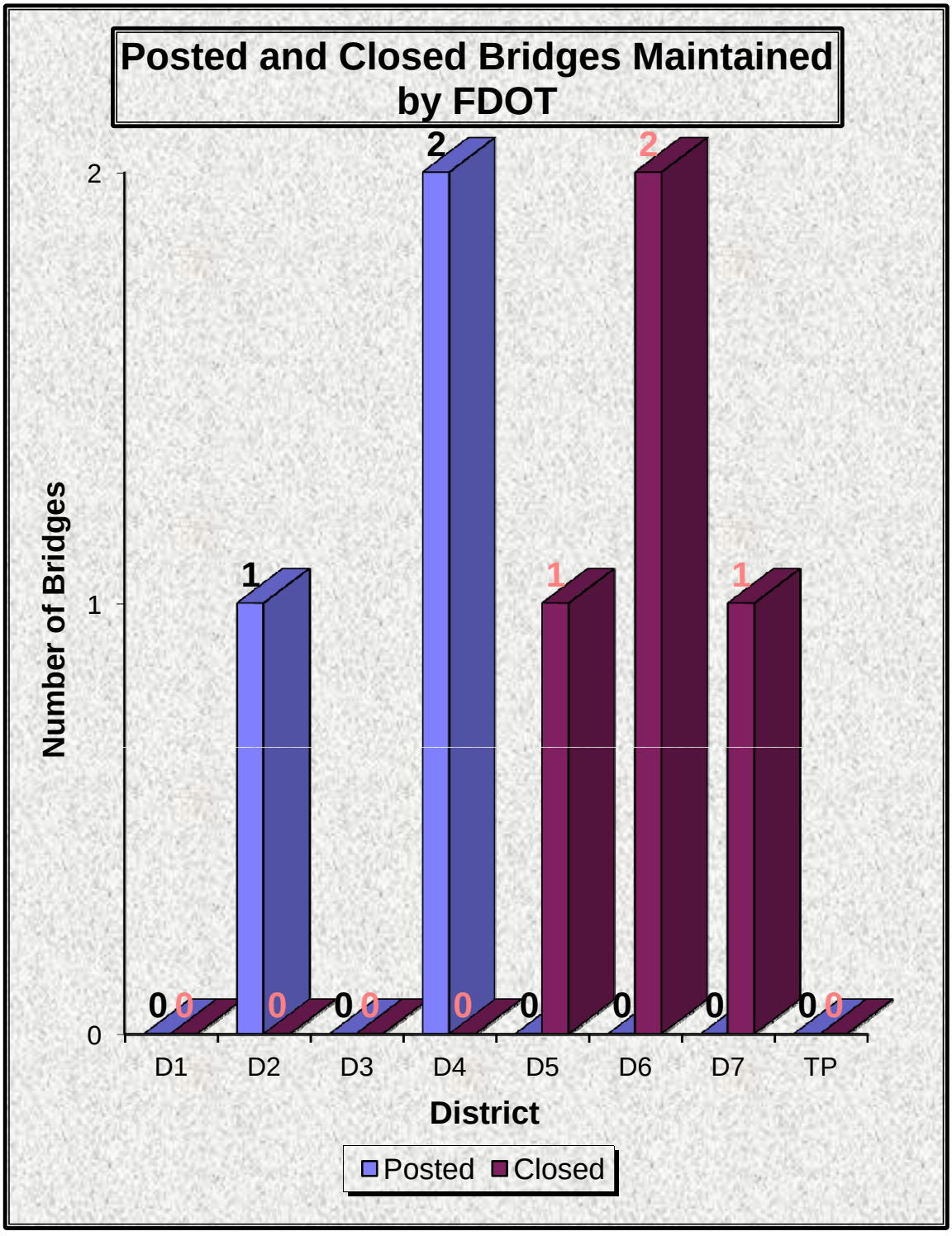
Posted and Closed Bridges Maintained by FDOT
Number of Bridges
2
1
0
0 0
1
0
0 0
2
0
1
0
2
0
1
0
0 0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 35

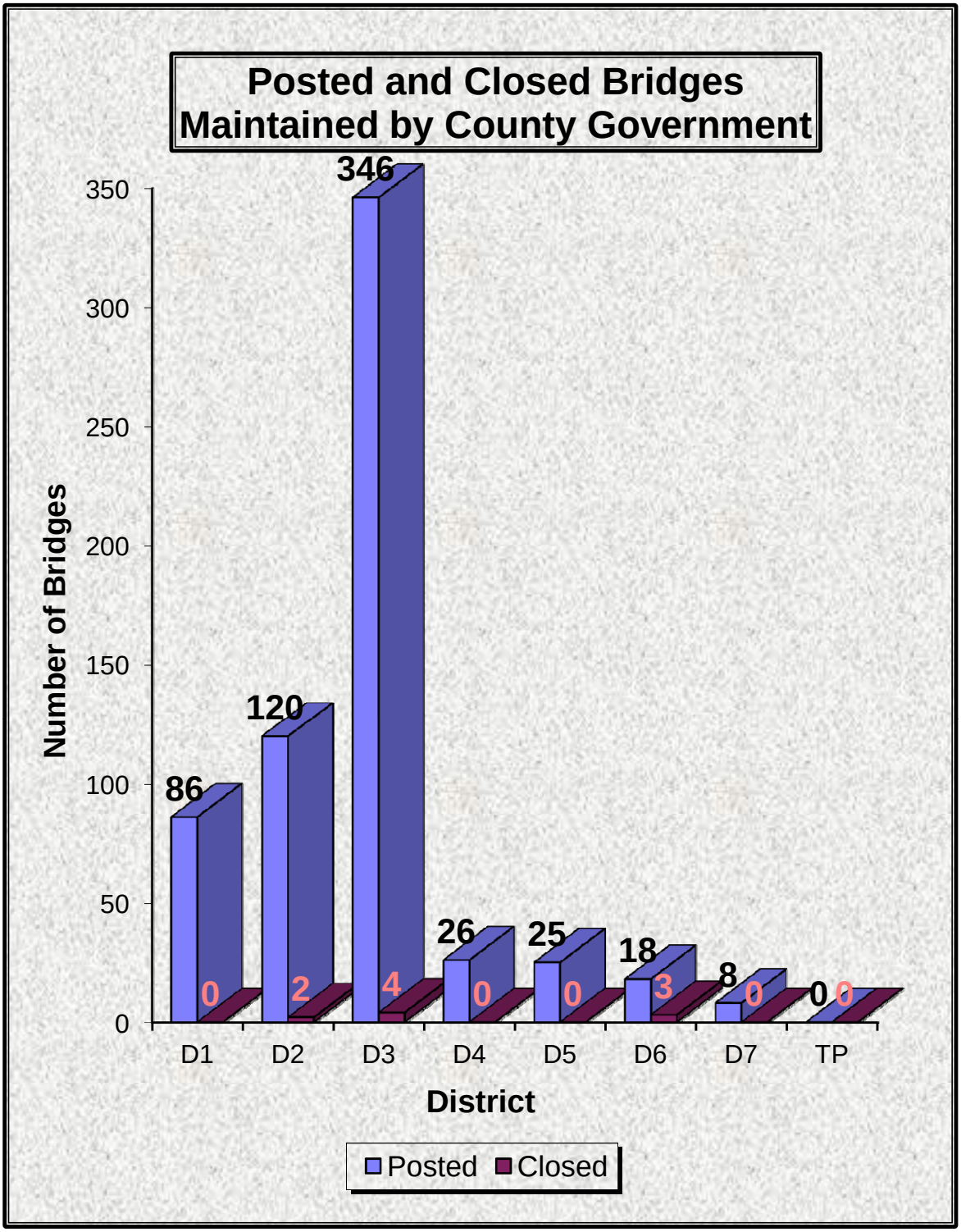
Posted and Closed Bridges
Maintained by County Government
Number of Bridges
350
300
250
200
150
100
50
0
86
0
120
2
346
4
26
0
25
0
18
3
8
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 36

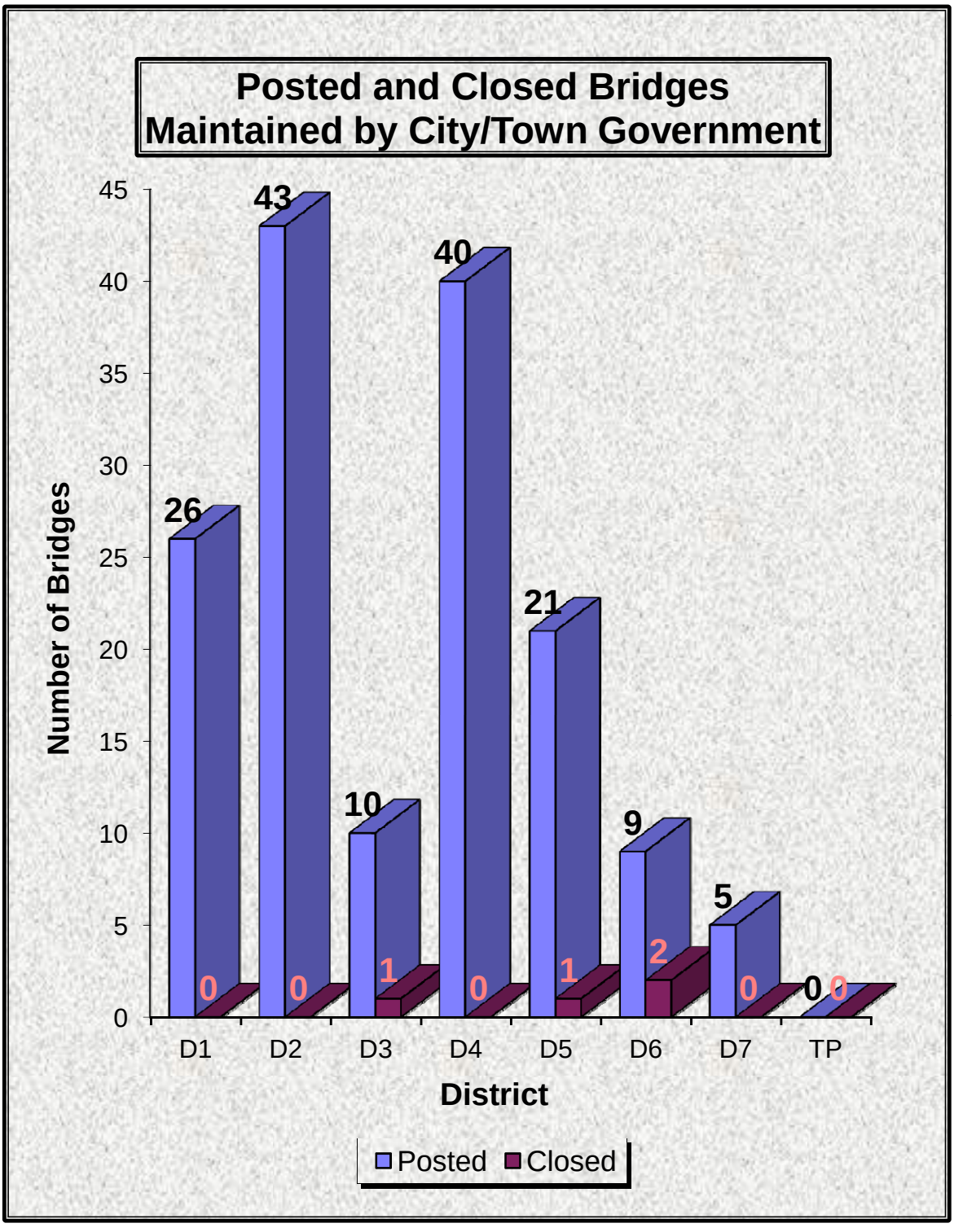
Posted and Closed Bridges
Maintained by City/Town Government
Number of Bridges
45
40
35
30
25
20
15
10
5
0
26
0
43
0
10
1
40
0
21
1
9
2
5
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 37

Functionally Obsolete Bridges

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

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

There are currently 1,747 functionally obsolete bridges in Florida, about 14.57% of the total. The FDOT has maintenance responsibility for over 41.50% of all functionally obsolete bridges (see Figure 38). Refer to Figures 40, 41, and 42 for a presentation of functionally obsolete bridges, by sufficiency rating, by FDOT District, for each of the three maintenance responsibility groups.

For the FDOT group, 51.45% of the functionally obsolete bridges would likely qualify for use of federal bridge construction funds for rehabilitation work, while only 1.93% of the bridges would qualify for replacement using the federal bridge construction funds. Over 46.62% of these bridges would not qualify to use any federal funds.

For the County bridges, 74.60% of the functionally obsolete bridges would likely qualify for use of federal bridge construction funds for rehabilitation work, while 13.58% of the bridges would qualify for replacement using the federal bridge construction funds. Almost 11.82% of the bridges would not qualify to use any federal funds.

Of the City/Town functionally obsolete bridges, 68.35% would likely qualify for use of federal bridge construction funds for rehabilitation work, while 15.15% of the bridges would qualify for replacement using the federal bridge construction funds. Over 16.50% of the bridges would not qualify to use any federal funds.

Functionally Obsolete Bridges (FO) Bridges By Sufficiency Rating (SR)								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
Statewide								
FO w/SR>80	338	74	49	2	2	0	8	473
FO w/50<=SR<=80	373	467	203	61	10	0	3	1117
FO w/SR<50	14	85	45	13	0	0	0	157
Total	725	626	297	76	12	0	11	1747
District 1								
FO w/SR>80	22	17	25	0	0	0	0	64
FO w/50<=SR<=80	50	130	55	2	2	0	0	239
FO w/SR<50	3	20	5	5	0	0	0	33
Total	75	167	85	7	2	0	0	336
District 2								
FO w/SR>80	65	3	3	0	0	0	0	71
FO w/50<=SR<=80	89	24	14	2	0	0	0	129
FO w/SR<50	4	16	4	3	0	0	0	27
Total	158	43	21	5	0	0	0	227
District 3								
FO w/SR>80	10	9	0	2	0	0	1	22
FO w/50<=SR<=80	22	77	2	54	0	0	0	155
FO w/SR<50	0	33	1	2	0	0	0	36
Total	32	119	3	58	0	0	1	213
District 4								
FO w/SR>80	14	10	6	0	0	0	0	30
FO w/50<=SR<=80	35	83	48	1	0	0	0	167
FO w/SR<50	0	6	21	0	0	0	0	27
Total	49	99	75	1	0	0	0	224
District 5								
FO w/SR>80	68	6	7	0	0	0	7	88
FO w/50<=SR<=80	50	35	31	0	4	0	3	123
FO w/SR<50	1	1	9	3	0	0	0	14
Total	119	42	47	3	4	0	10	225
District 6								
FO w/SR>80	84	15	3	0	0	0	0	102
FO w/50<=SR<=80	68	60	17	2	0	0	0	147
FO w/SR<50	2	5	4	0	0	0	0	11
Total	154	80	24	2	0	0	0	260
District 7								
FO w/SR>80	35	14	5	0	2	0	0	56
FO w/50<=SR<=80	44	58	36	0	4	0	0	142
FO w/SR<50	4	4	1	0	0	0	0	9
Total	83	76	42	0	6	0	0	207
District 8								
FO w/SR>80	40	0	0	0	0	0	0	40
FO w/50<=SR<=80	15	0	0	0	0	0	0	15
FO w/SR<50	0	0	0	0	0	0	0	0
Total	55	0	0	0	0	0	0	55

Table 11

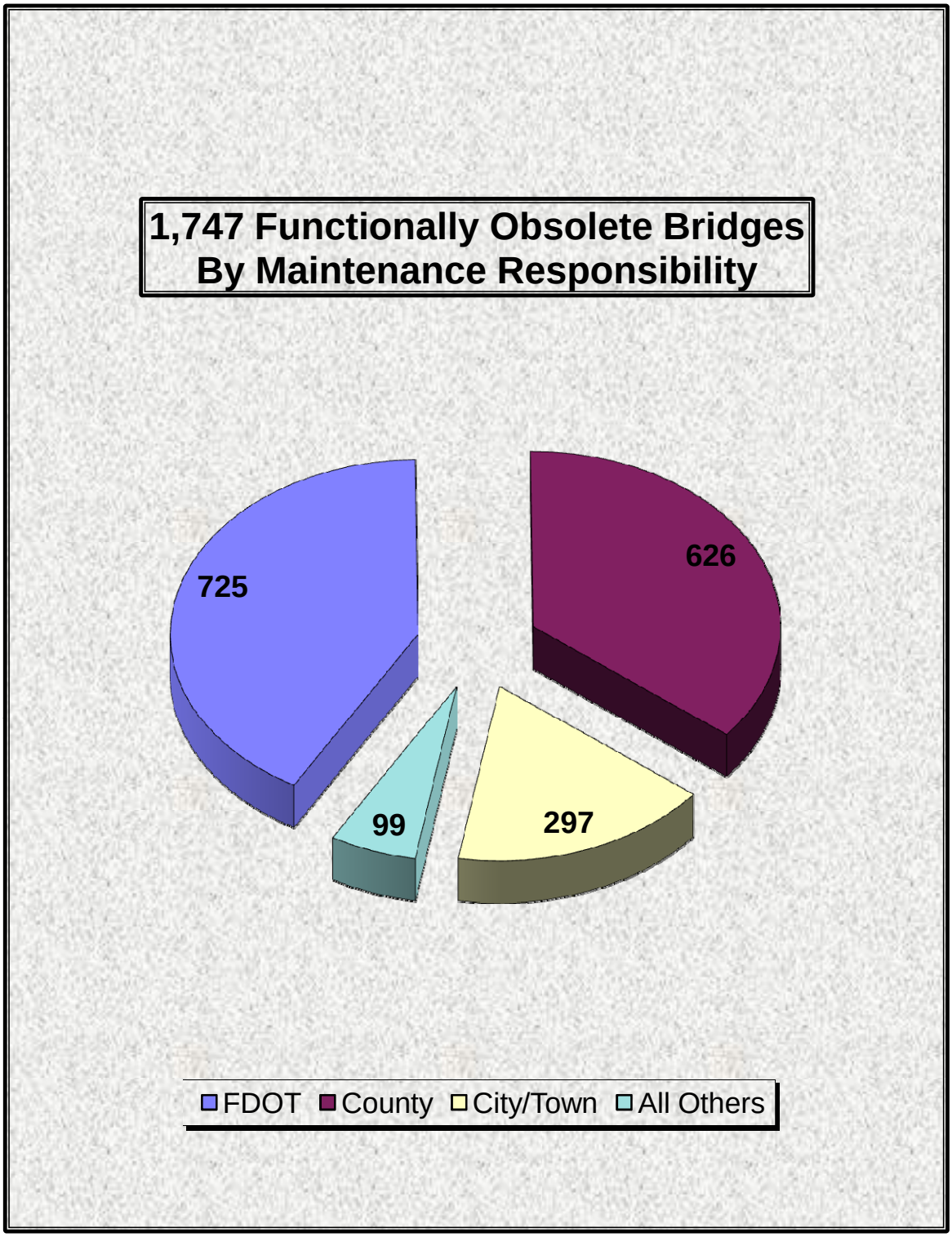
1,747 Functionally Obsolete Bridges
By Maintenance Responsibility
725
626
99
297
FDOT
County
City/Town
All Others

Figure 38

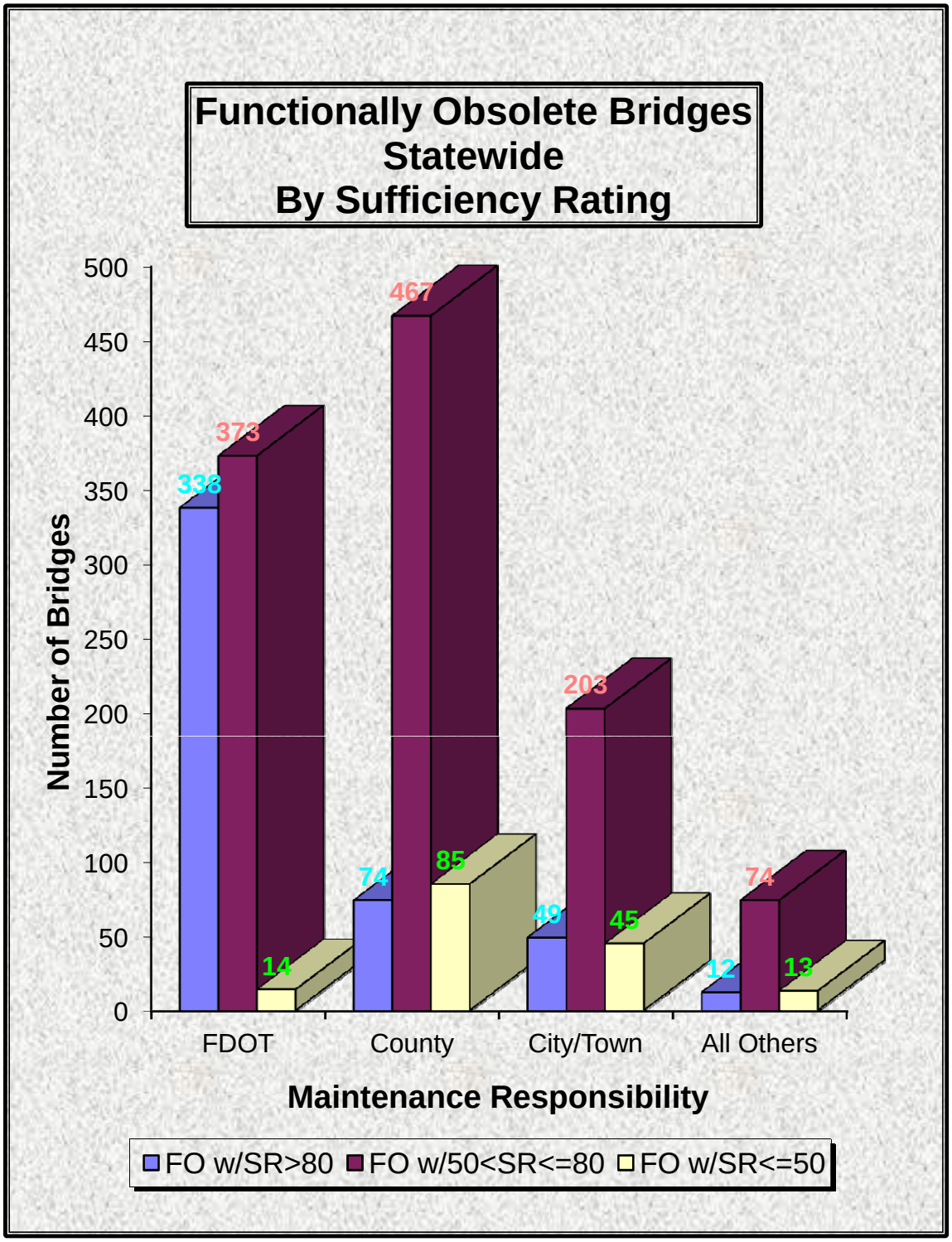
Functionally Obsolete Bridges
Statewide
By Sufficiency Rating
Number of Bridges
500
450
400
350
300
250
200
150
100
50
0
338
373
14
74
467
85
49
203
45
12
74
13
FDOT
County
City/Town
All Others
Maintenance Responsibility
FO w/SR>80
FO w/50<SR<=80
FO w/SR<=50

Figure 39

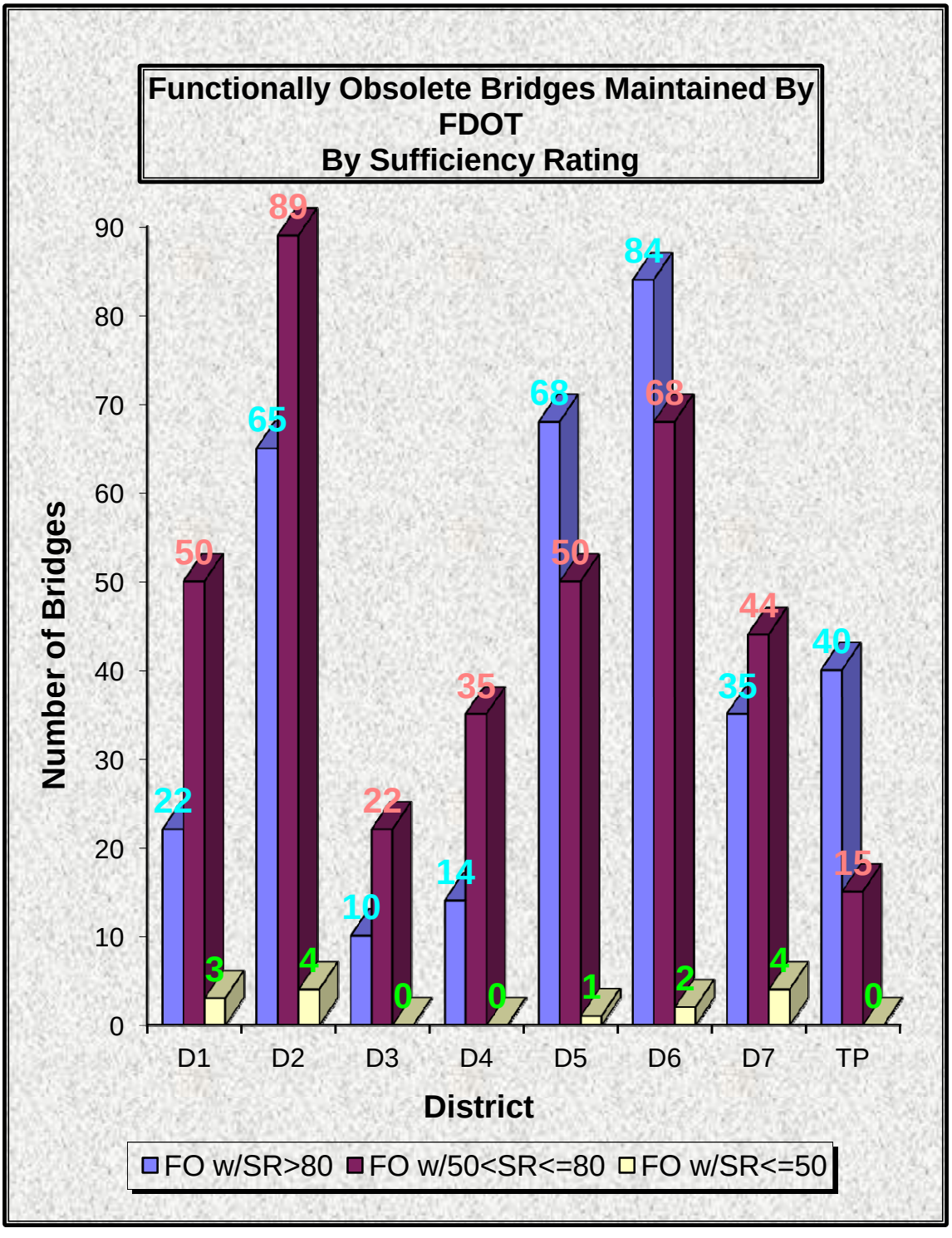
Functionally Obsolete Bridges Maintained By FDOT
By Sufficiency Rating
Number of Bridges
0
10
20
30
40
50
60
70
80
90
22
50
3
65
89
4
10
22
0
14
35
0
68
50
1
84
68
2
35
44
4
40
15
0
D1
D2
D3
D4
D5
D6
D7
TP
District
FO w/SR>80
FO w/50<SR<=80
FO w/SR<=50

Figure 40

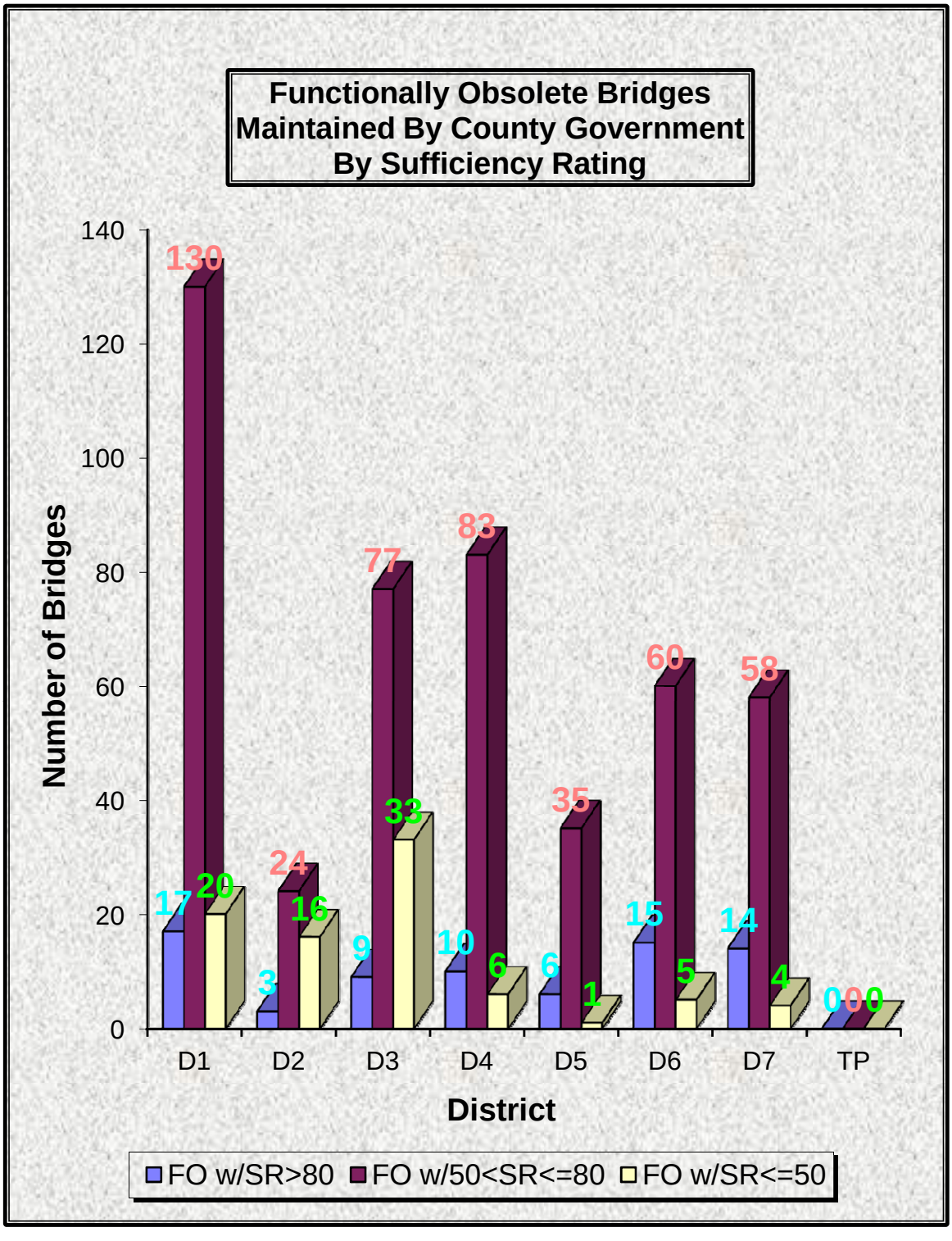
Functionally Obsolete Bridges
Maintained By County Government
By Sufficiency Rating
Number of Bridges
140
120
100
80
60
40
20
0
130
17
20
24
3
16
77
9
33
83
10
6
35
6
1
60
15
5
58
14
4
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
FO w/SR>80
FO w/50<SR<=80
FO w/SR<=50

Figure 41

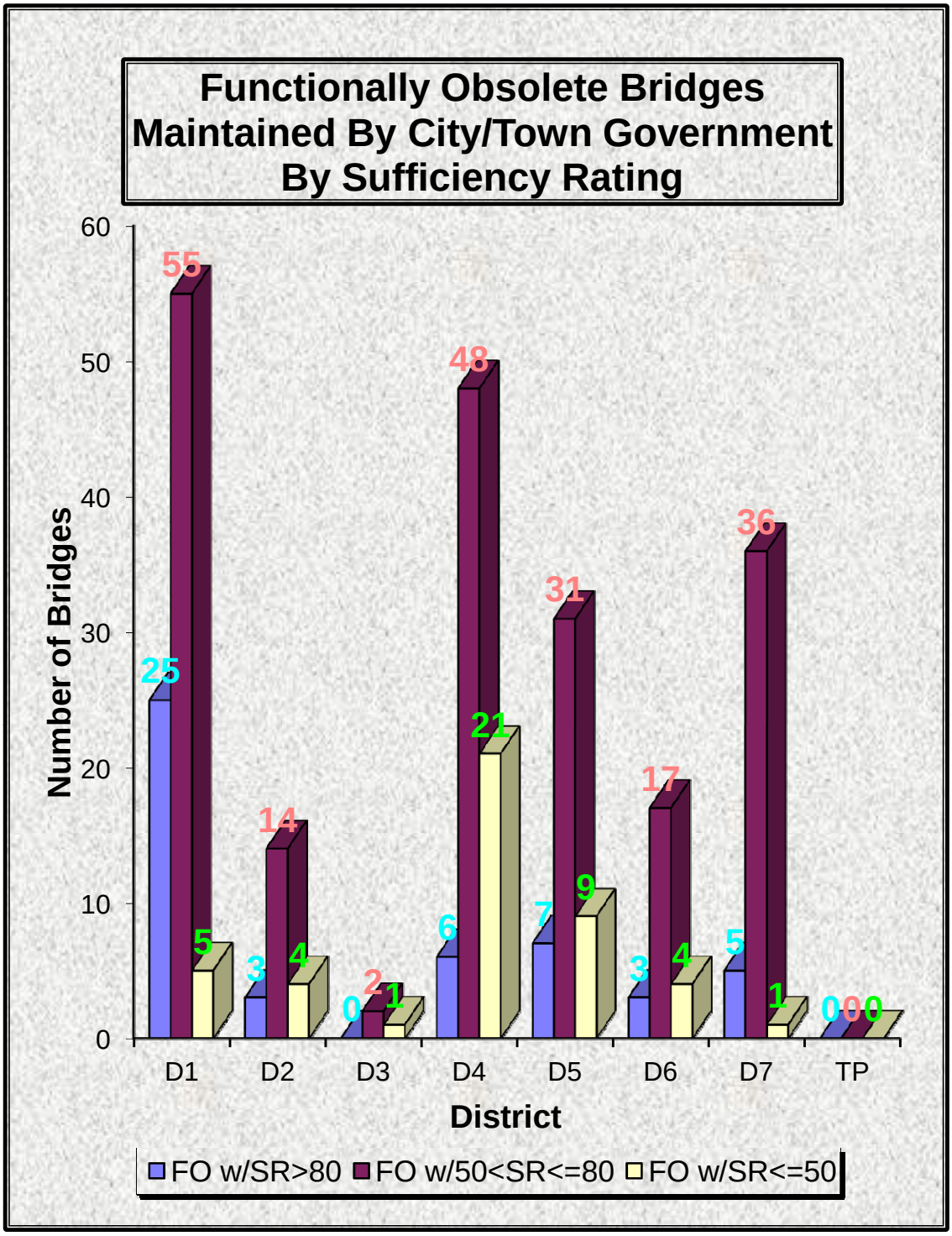
Functionally Obsolete Bridges
Maintained By City/Town Government
By Sufficiency Rating
Number of Bridges
60
50
40
30
20
10
0
25
55
5
3
14
4
0
2
1
6
48
21
7
31
9
3
17
4
5
36
1
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
FO w/SR>80
FO w/50<SR<=80
FO w/SR<=50

Figure 42

Bridge Inventory - 2012 Annual Report

Bridge Replacement Cost

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

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

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

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

FDOT Bridge Deck Area (Square Feet)

	Decade Constructed									
	>1930's	**1940's**	**1950's**	**1960's**	**1970's**	**1980's**	**1990's**	**2000's**	**2010's**	**Total**
R/C Slab	57,128	252,208	590,328	723,083	629,612	654,799	1,677,953	1,108,942	130,939	5,824,991
P/C Slab	39,386	0	84,687	922,082	786,269	718,024	337,609	36,146	137,118	3,061,322
R/C Beam	231,881	225,569	590,080	0	0	0	0	31,402	79,376	1,158,308
P/C Beam	54,164	0	3,384,224	13,437,568	16,507,321	15,348,662	12,493,674	15,551,495	1,085,123	77,862,231
Steel Beam	479,957	217,020	2,328,463	4,847,566	7,051,631	2,783,710	3,171,738	3,647,929	434,580	24,962,593
Timber Beam	0	0	0	986	0	0	0	0	0	986
R/C Box	0	0	0	40,835	51,587	0	0	0	0	92,422
P/C Box	-11	0	0	0	0	0	0	303,650	0	303,639
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	1,246,568	474,164	564,115	67,337	4,783,276
Culvert	84,652	126,907	322,450	619,807	353,651	149,055	158,467	186,802	14,294	2,016,083
Other	12,483	20,050	130,729	56,995	0	6,715,192	2,916,770	4,714,702	110,683	14,677,605
Total	1,511,751	929,597	8,577,562	21,536,394	26,150,491	28,951,652	22,917,268	27,584,013	2,120,161	140,278,888

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	6,855	30,541	71,454	95,060	90,116	95,217	246,571	157,402	17,055	810,271
P/C Slab	5,908	0	12,703	138,312	117,940	107,704	50,641	5,422	20,568	459,198
R/C Beam	22,029	21,429	56,058	0	0	0	0	2,983	8,064	110,562
P/C Beam	5,687	0	355,344	1,410,945	1,739,644	1,622,786	1,366,873	1,682,474	116,422	8,300,174
Steel Beam	53,662	25,422	268,910	610,474	836,782	353,319	399,856	453,556	54,848	3,056,828
Timber Beam	0	0	0	94	0	0	0	0	0	94
R/C Box	0	0	0	6,125	7,738	0	0	0	0	13,863
P/C Box	-2	0	0	0	0	0	22,849	44,029	0	66,877
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	177,553	153,593	177,407	32,236	1,304,422
Culvert	8,042	12,056	30,633	58,882	33,597	14,160	15,054	17,746	1,358	191,528
Other	1,872	3,008	19,609	8,549	0	1,007,279	437,516	707,205	16,602	2,201,641
Total	238,205	119,348	1,132,240	2,606,547	3,007,335	3,578,364	2,922,350	3,464,048	276,259	17,344,697

Table 13

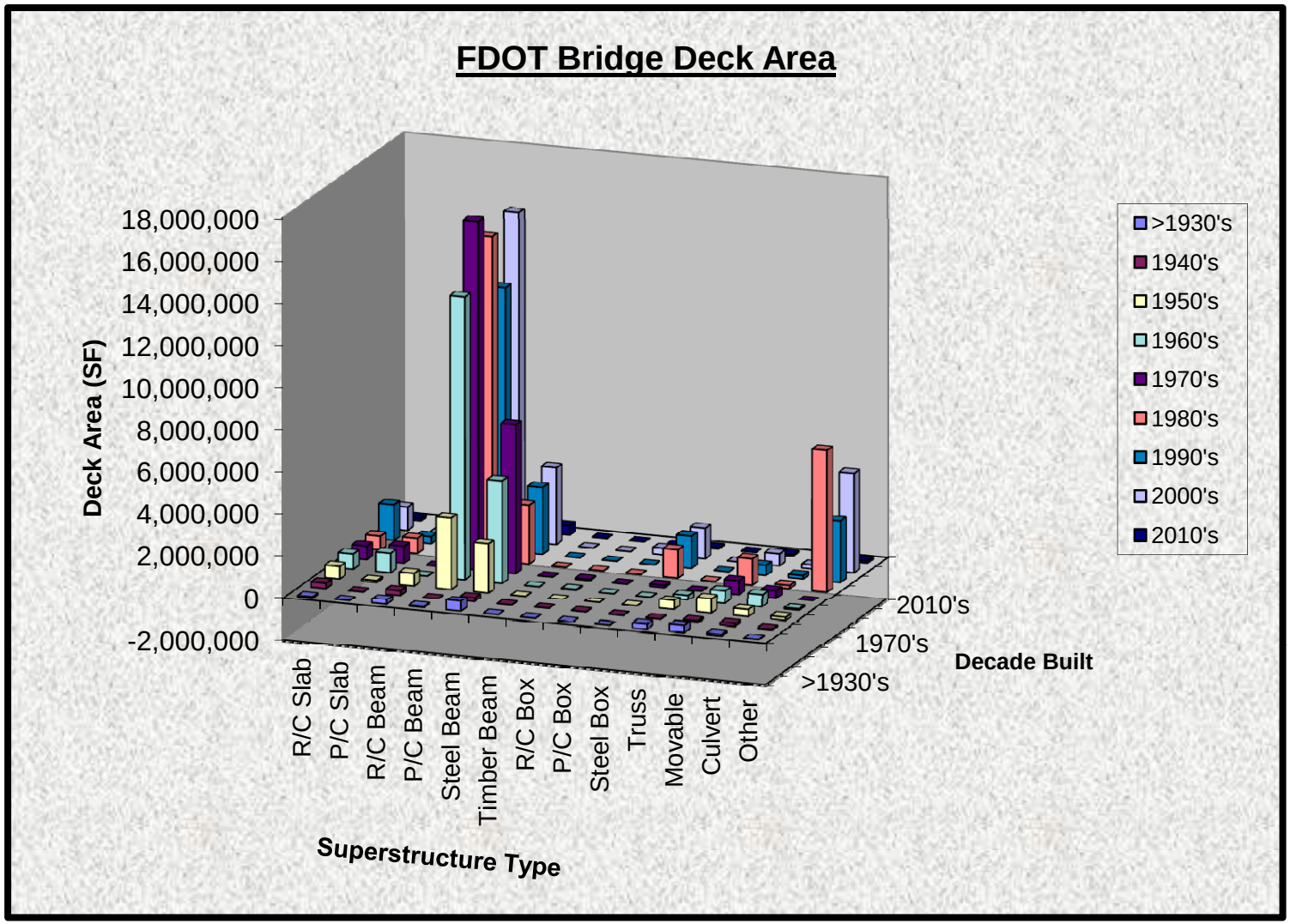
FDOT Bridge Deck Area
Deck Area (SF)
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
-2,000,000
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Superstructure Type
>1930's
1970's
2010's
Decade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

Figure 43

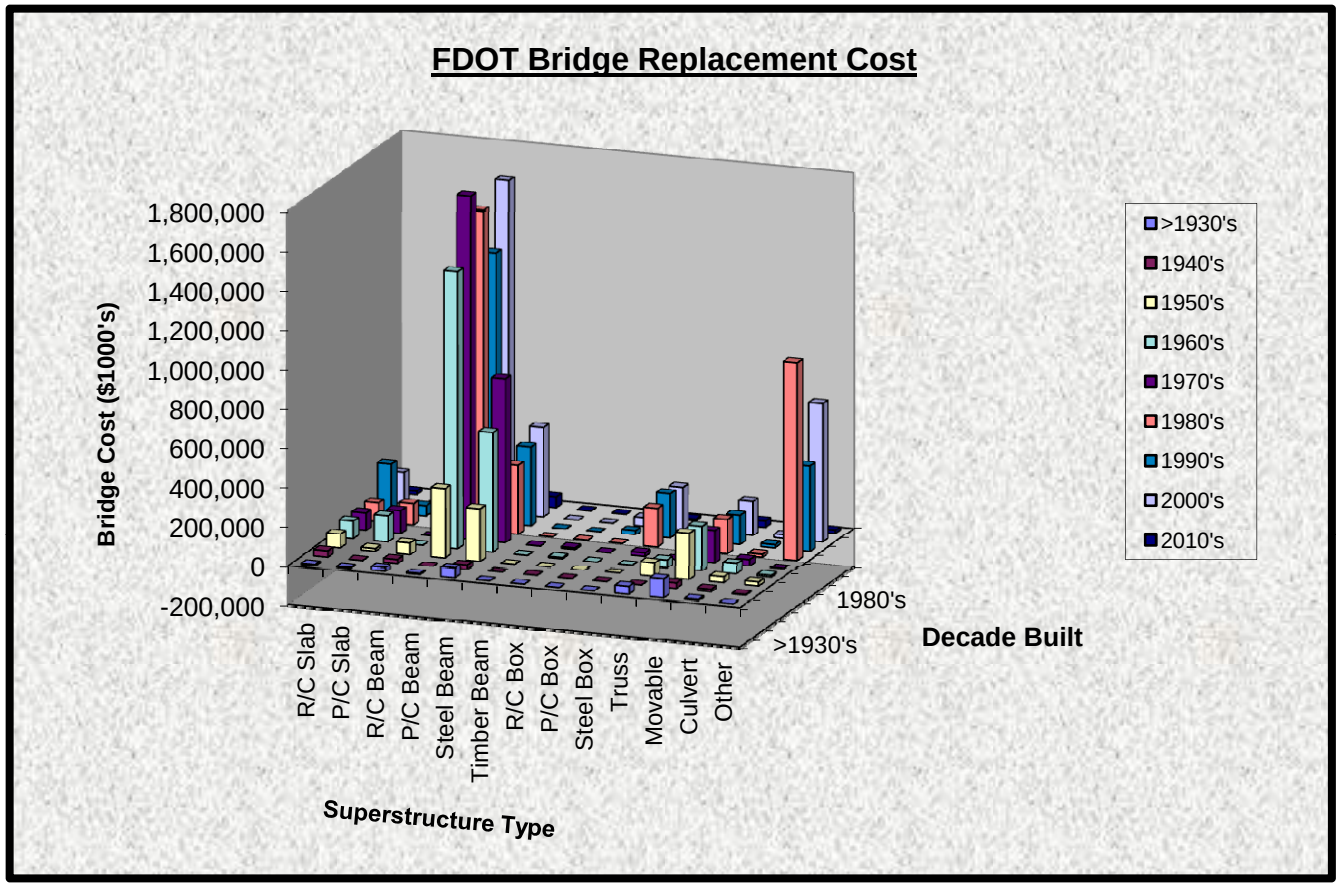
FDOT Bridge Replacement Cost
Bridge Cost ($1000's)
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
-200,000
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Superstructure Type
>1930's
1980's
Decade Built
>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	399,044	288,090	223,301	75,882	306,052	153,673	0	1,511,751
1940's	181,829	339,608	235,002	25,485	33,515	86,540	27,617	0	929,597
1950's	919,334	2,155,300	783,391	520,333	635,667	1,538,872	1,398,108	626,557	8,577,562
1960's	1,504,730	5,545,578	2,174,727	1,269,246	3,909,517	4,084,916	2,259,649	788,032	21,536,394
1970's	2,165,714	5,977,787	4,353,505	4,208,723	1,506,639	2,118,192	3,909,866	1,910,065	26,150,491
1980's	3,689,810	2,381,455	2,591,753	6,525,492	1,098,082	5,613,220	5,887,330	1,164,510	28,951,652
1990's	1,866,881	2,750,925	5,286,571	3,090,442	2,357,541	1,465,943	3,288,413	2,810,552	22,917,268
2000's	2,987,113	5,319,931	4,908,701	3,703,206	3,303,719	1,319,924	4,221,056	1,820,363	27,584,013
2010's	141,657	663,096	132,403	0	410,936	273,362	354,626	79,878	2,055,957
Total	13,522,777	25,532,723	20,754,142	19,566,229	13,331,499	16,807,021	21,500,338	9,199,956	140,214,684

Table 14

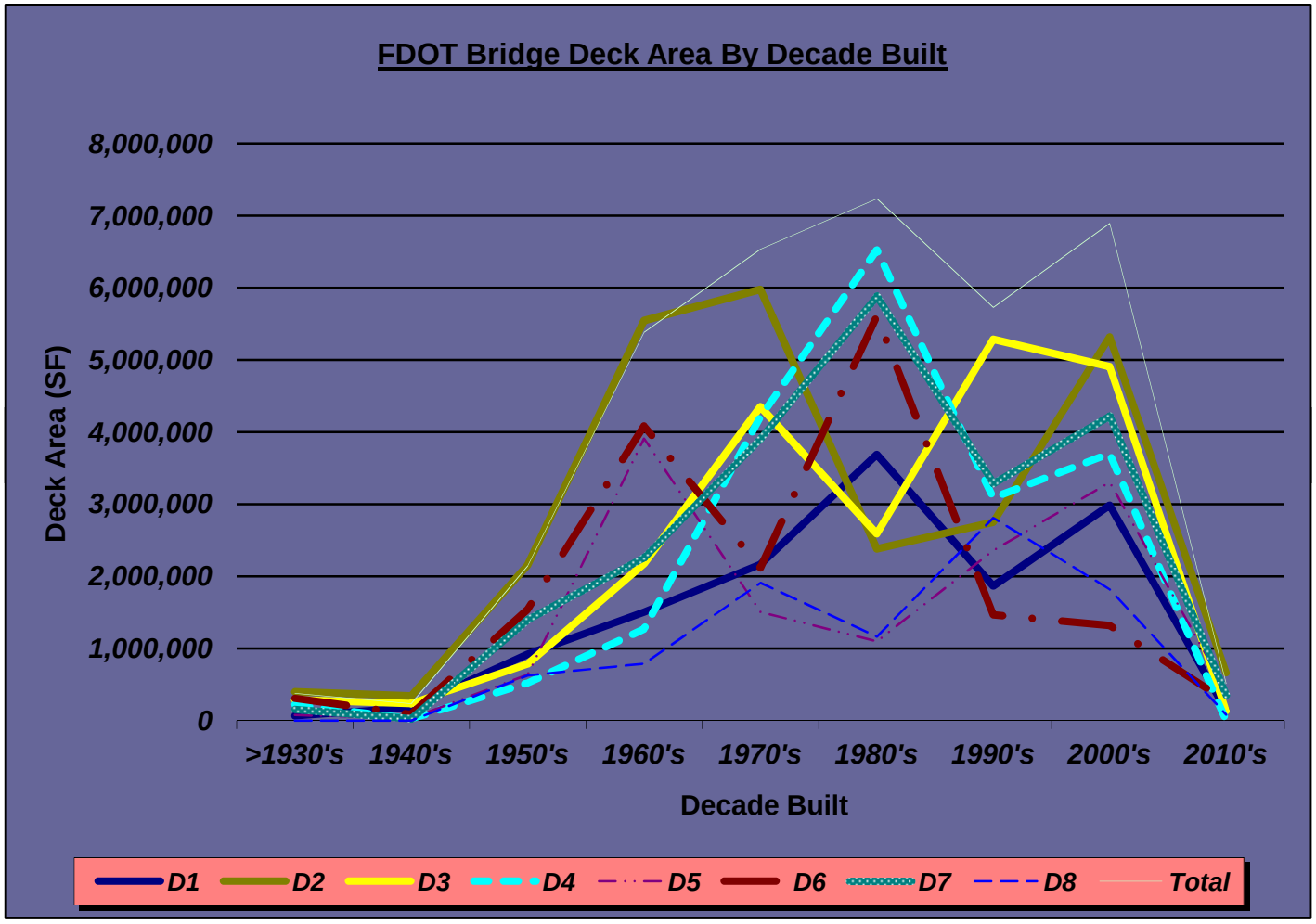
FDOT Bridge Deck Area By Decade Built
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Deck Area (SF)
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
D8
Total

Figure 45

FDOT Bridge Replacement Cost ($1000's)									
	District								
	D1	D2	D3	D4	D5	D6	D7	D8	Total
>1930's	6,700	59,704	46,265	29,842	8,484	44,810	42,400	0	238,205
1940's	32,022	43,472	26,001	2,511	3,593	8,914	2,834	0	119,348
1950's	121,913	274,012	81,838	169,727	74,672	185,963	155,922	68,192	1,132,240
1960's	193,830	640,701	256,257	234,371	442,042	481,087	268,011	90,247	2,606,547
1970's	254,811	676,384	505,457	491,663	177,445	266,607	433,009	201,959	3,007,335
1980's	426,271	308,671	328,752	804,373	135,407	708,443	739,207	127,238	3,578,364
1990's	234,027	341,231	684,860	431,368	297,035	215,754	405,324	312,751	2,922,350
2000's	380,504	617,116	593,953	525,270	389,855	167,589	585,024	204,737	3,464,048
2010's	15,289	80,160	16,452	0	48,833	48,760	49,671	8,587	267,753
Total	1,665,369	3,041,450	2,539,836	2,689,126	1,577,368	2,127,929	2,681,402	1,013,711	4,334,048

Table 15

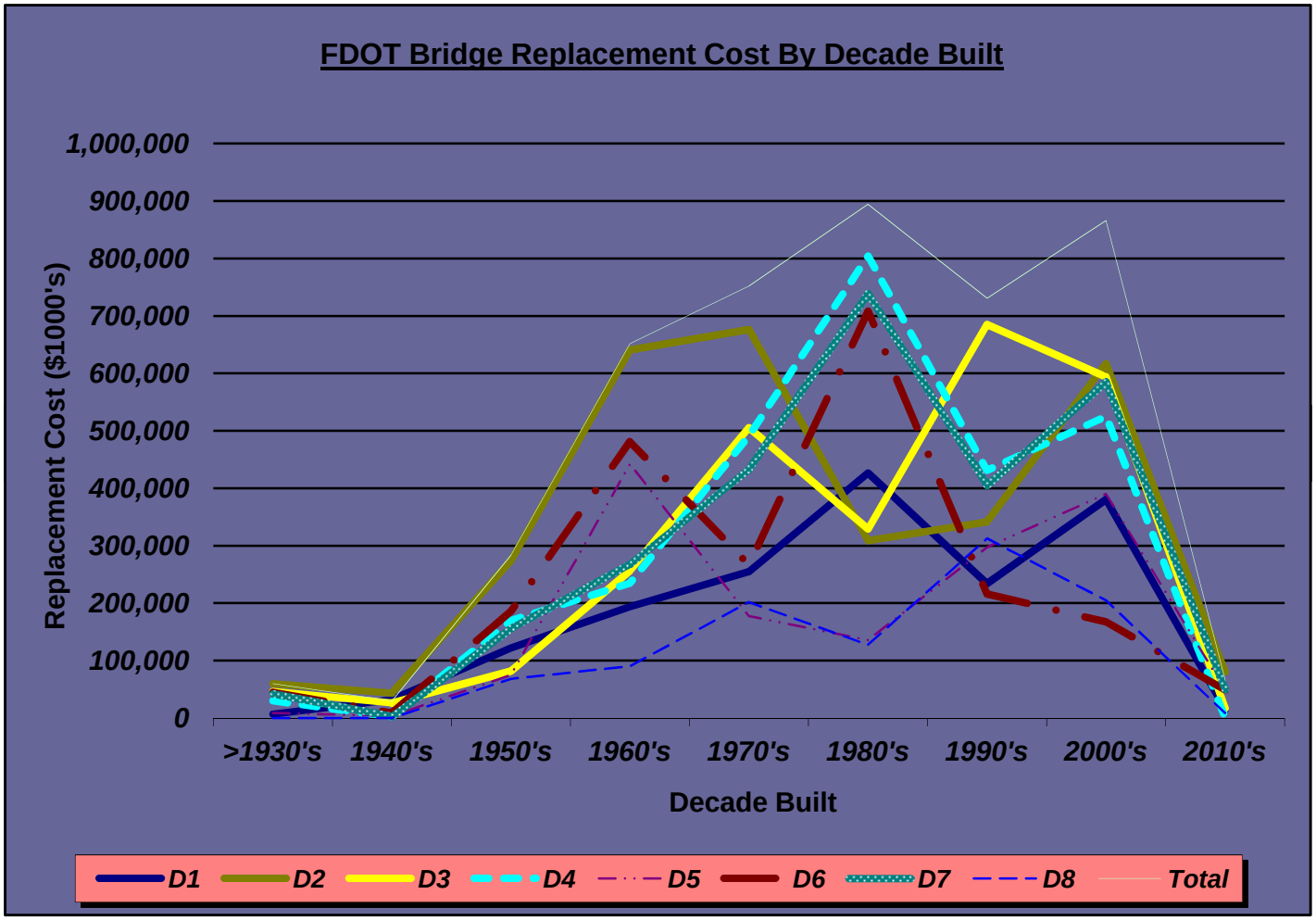
FDOT Bridge Replacement Cost By Decade Built
Replacement Cost ($1000's)
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
D8
Total

Figure 46

FDOT Inventory of Water Crossing (WC) vs. Non-Water Crossing (NWC) Bridges				
	Deck Area (SF)		Bridge Cost ($1000's)	
District	WC	NWC	WC	NWC
1	9,986,265	3,189,464	1,262,513	369,886
2	16,577,247	8,429,060	2,001,212	990,228
3	17,153,858	3,270,558	2,108,784	399,728
4	10,064,416	9,498,880	1,565,854	1,125,400
5	7,977,526	5,035,160	991,330	555,751
6	10,799,727	6,003,762	1,455,186	672,408
7	13,085,272	8,128,170	1,692,362	961,785
8	3,546,487	5,516,952	389,750	610,992
Total	89,190,797	49,072,008	11,466,990	5,686,179

Table 16

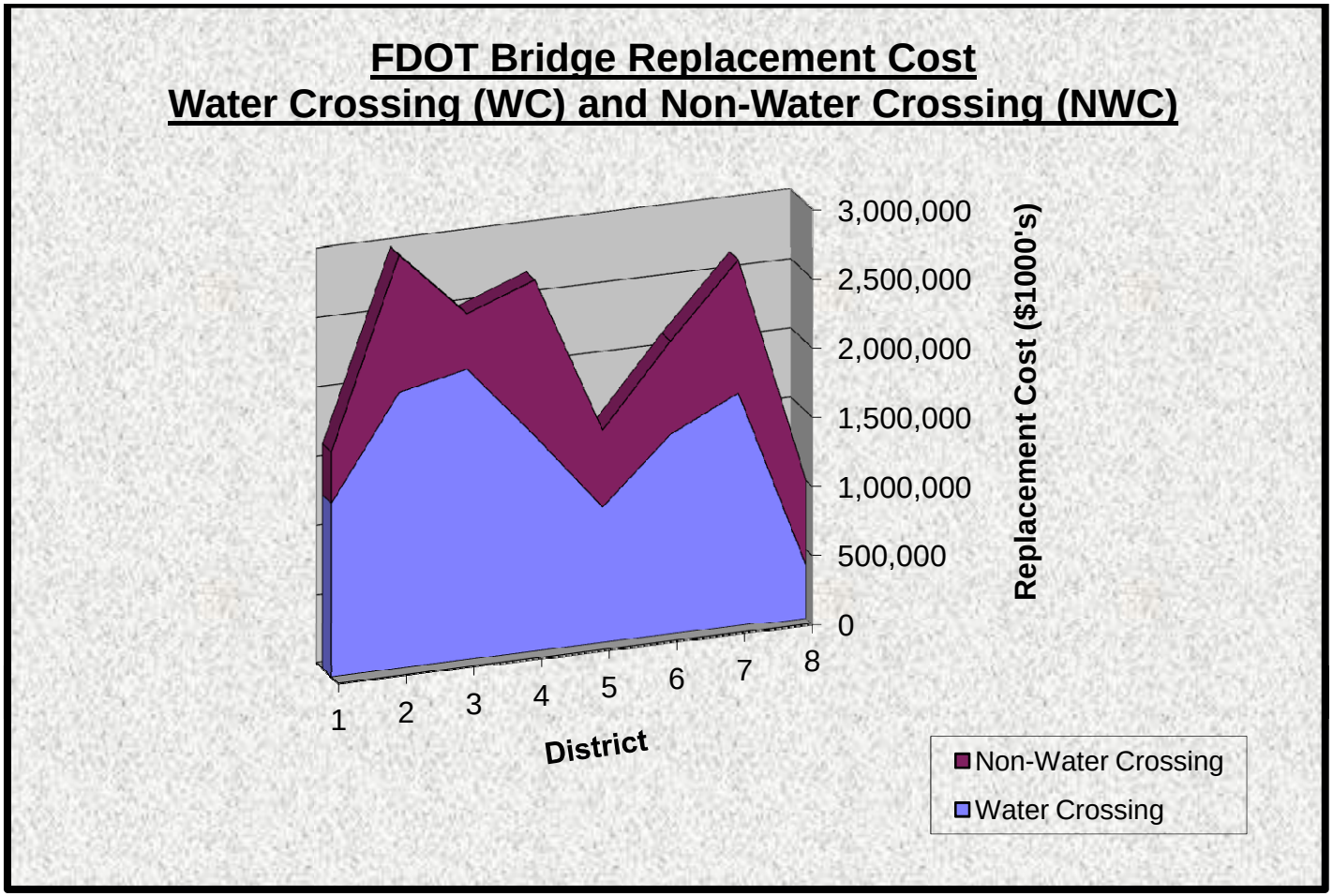
FDOT Bridge Replacement Cost
Water Crossing (WC) and Non-Water Crossing (NWC)
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Replacement Cost ($1000's)
1
2
3
4
5
6
7
8
District
Non-Water Crossing
Water Crossing

Figure 47

Conclusion

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

There are 11,987 bridges accounted for in Florida. The FDOT has maintenance responsibility for 6,661 of the bridges, or 55.57%. County governments maintain 3,847 bridges (32.09%), city and towns maintain 1,204 bridges (10.04%), with the remaining 275 bridges (2.29%) maintained by others. 16.21% of all bridges currently in service in Florida were constructed prior to 1960; 39.28% were constructed in the 1960's and 1970's, while the remaining 44.51% have been built since 1980. This distribution is relatively consistent for the three maintenance groups (FDOT, Counties, and City/Towns) used in this report. Bridges do not last forever. Through aggressive preventive maintenance, the strategy is to leverage advances in material science, design practices, and construction methods to extend the useful life of the bridges, thereby minimizing the need to replace a large number of bridges within a short time period. The challenge is to determine the most cost effective mix of preventive maintenance, routine maintenance, repair, rehabilitation, replacement, and other actions over the life of the bridges.

Florida's bridges are generally in good condition, with those maintained by the FDOT in better condition than those maintained by local governments or others. The most serious threat to bridges in Florida is the corrosion of steel reinforced concrete substructures in coastal regions. Much has been learned in recent years about corrosion in marine environments, affecting material specifications and design practices that helps new bridges built today. However, the older bridges in the coastal regions are beginning to require careful evaluation and extensive corrective actions. On-going research will continue to provide useful information to help meet this challenge. Other challenges include: confronting the increasingly extensive environmental and public health issues related to protective coatings for steel bridges with lead based paint; completing the statewide bridge scour evaluation program to identify scour critical bridges (bridges that could fail during floods) and to provide scour countermeasures as corrective action where required; to stay on top of movable bridge maintenance and rehabilitation; and to improve preventive maintenance on the large population (39.28% of the inventory) of bridges built during the 1960's and 1970's.

Bridge Inventory - 2012 Annual Report

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