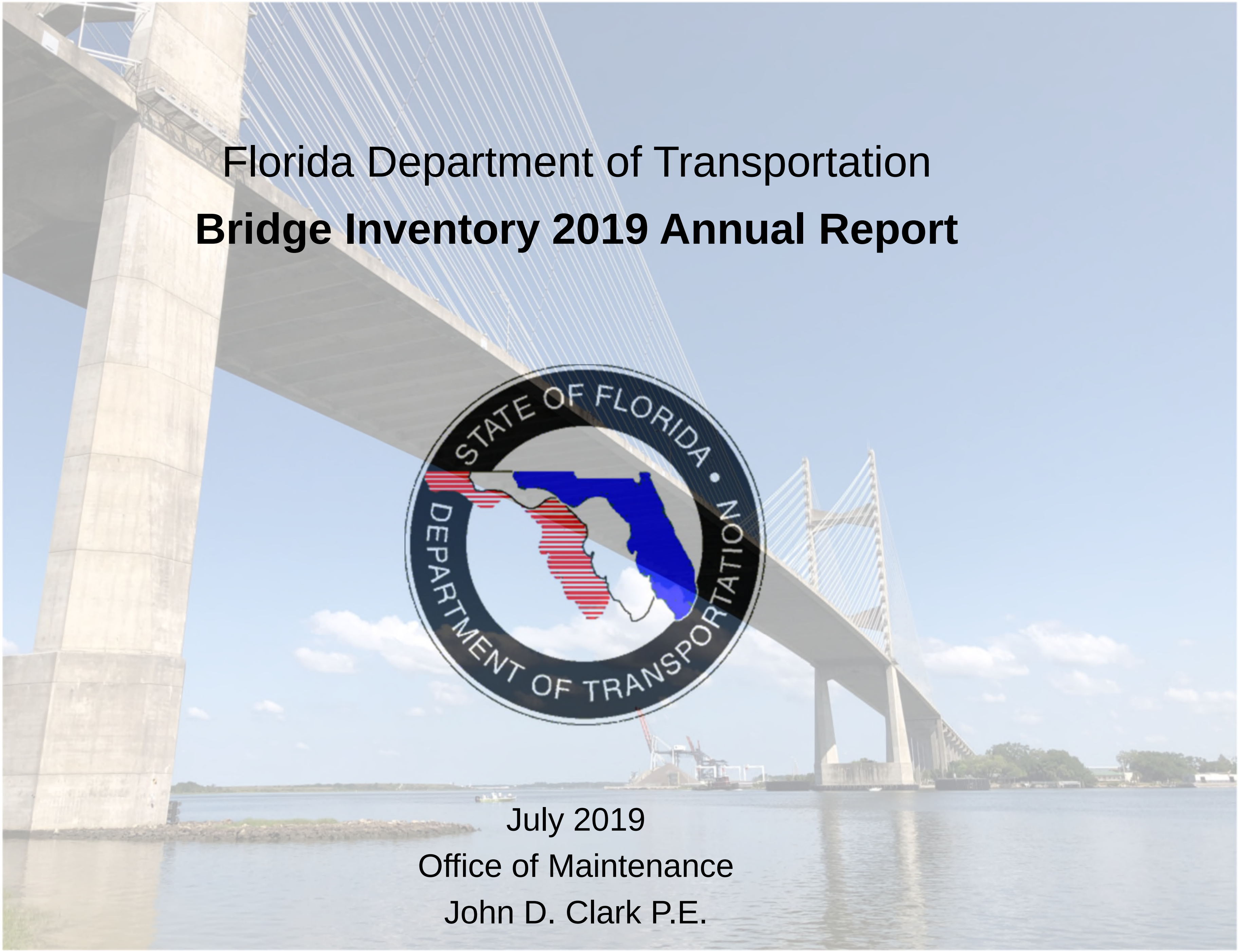

Florida Department of Transportation

Bridge Inventory 2019 Annual Report

July 2019

Office of Maintenance

John D. Clark P.E.

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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 12,471 bridge-structures accounted for in the Florida DOT Bridge Management System. The FDOT has maintenance responsibility for 7,007 of the bridges, or 56.19%. County governments maintain 3,915 bridges (31.39%), city and towns maintain 1,253 bridges (10.05%), with the remaining 296 bridges (2.37%) maintained by others (see Figure 1).

The 7,007 bridges maintained by FDOT are divided by district and shown in Figure 2. District 2 has the most bridges, with 1,271 (18.14%), followed by District 5 (1127 bridges – 16.08%), District 1 (941 bridges – 13.43%), District 3 (824 bridges – 11.76%), District 4 (775 bridges - 11.06%), District 7 (728 bridges – 10.39%), Turnpike District (717 bridges – 10.23%), and District 6 (624 bridges – 8.91%). The number of bridges shown includes the 151 bridges maintained by the Dade County Expressway Authority (MDX) and 346 bridges maintained by the Central Florida Expressway Authority (CFX).

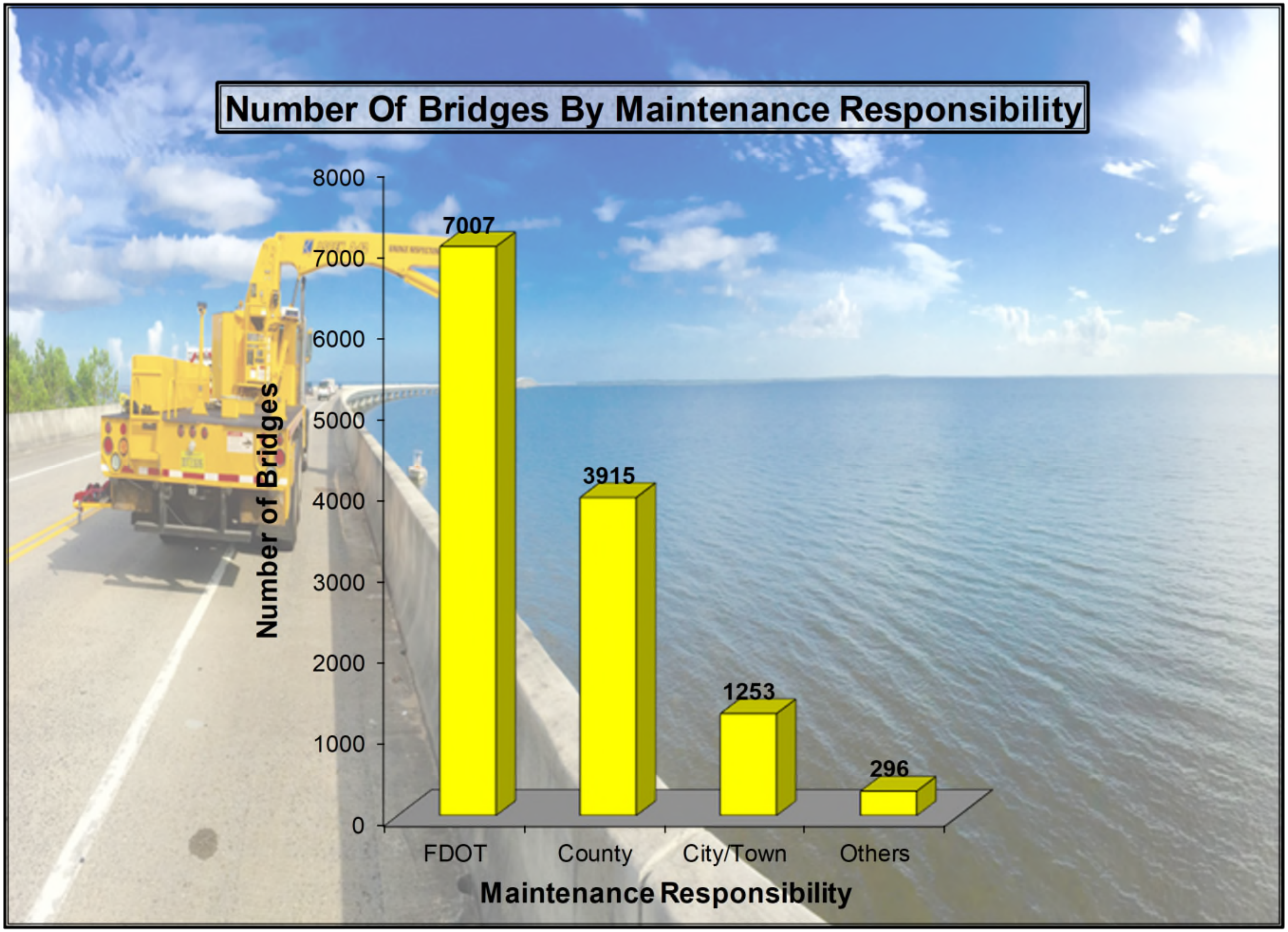


Figure 1

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 CFX bridges.

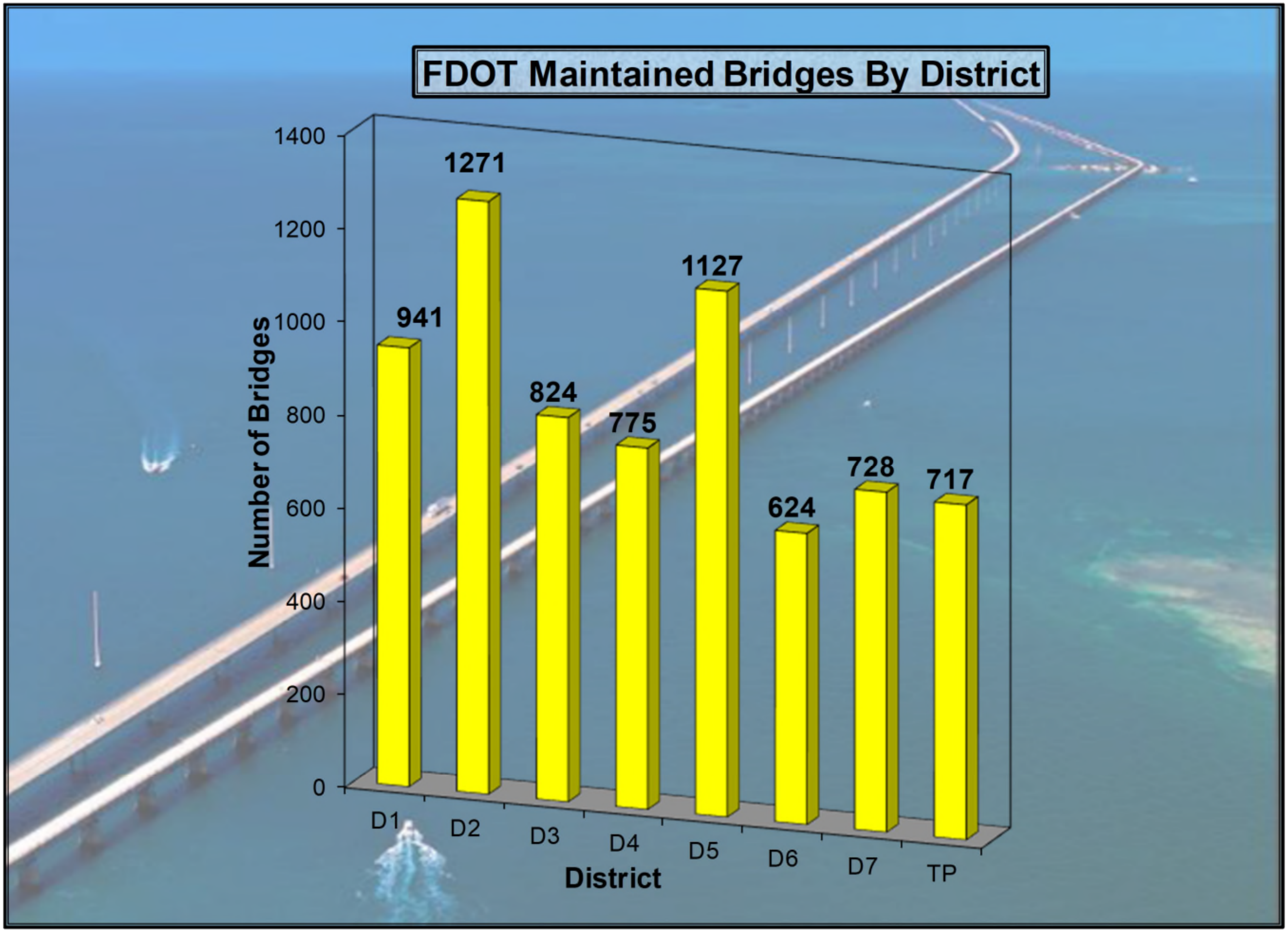


Figure 2

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 CFX bridges.

Age of Bridges

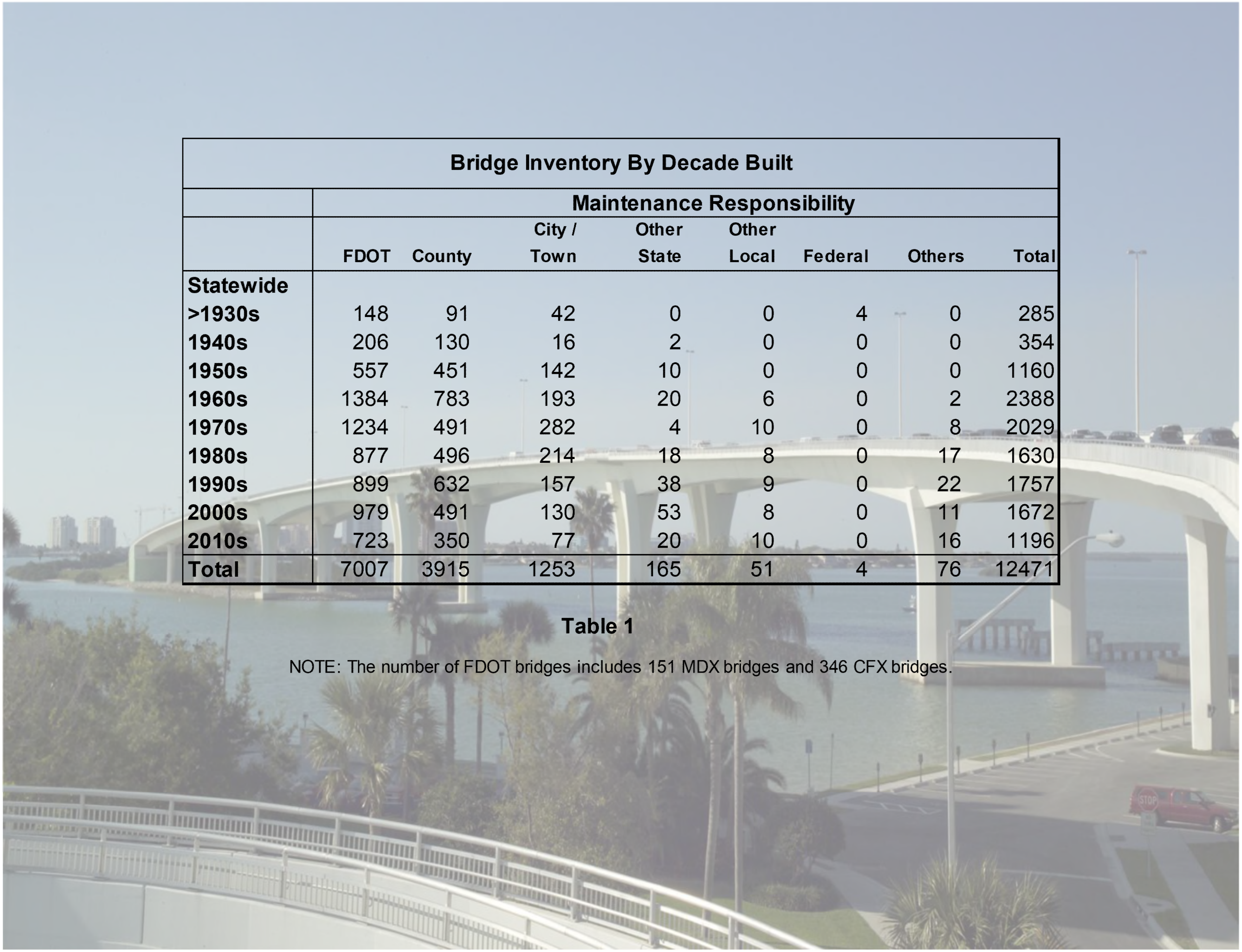
While the industry is now designing bridges to last for 75 years, most bridges built in the past were designed for a service life of 50 years. Looking at bridge age is the most common and simplest method of forecasting long-term budget requirements. This might lead one to conclude that bridges constructed 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 7,007 bridges maintained by FDOT, approximately 13.00% were constructed prior to 1960, about 37.36% were constructed in the 1960's and 1970's, with the remaining 49.64% having been built since 1980 (see Figure 3).

Similar results can be seen with the statewide bridge inventory of county government maintained bridges with 17.16% constructed prior to 1960, 32.54% constructed in the 1960's and 1970's, and 50.29% since 1980 (see Figure 4).

The city and town maintained bridges are very similar as well, with 15.96% constructed prior to 1960, 37.91% constructed in the 1960's and 1970's, and 46.13% since 1980 (see Figure 5).

An examination of the distribution of the decade of construction by FDOT District, for the 7,007 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 – 22.10%, District 2 – 20.06%, District 3 – 16.50%, District 4 – 5.55%, District 5 – 8.34%, District 6 – 9.62%, District 7 – 9.62%, 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	148	91	42	0	0	4	0	285
1940s	206	130	16	2	0	0	0	354
1950s	557	451	142	10	0	0	0	1160
1960s	1384	783	193	20	6	0	2	2388
1970s	1234	491	282	4	10	0	8	2029
1980s	877	496	214	18	8	0	17	1630
1990s	899	632	157	38	9	0	22	1757
2000s	979	491	130	53	8	0	11	1672
2010s	723	350	77	20	10	0	16	1196
Total	7007	3915	1253	165	51	4	76	12471

Table 1

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 CFX bridges.

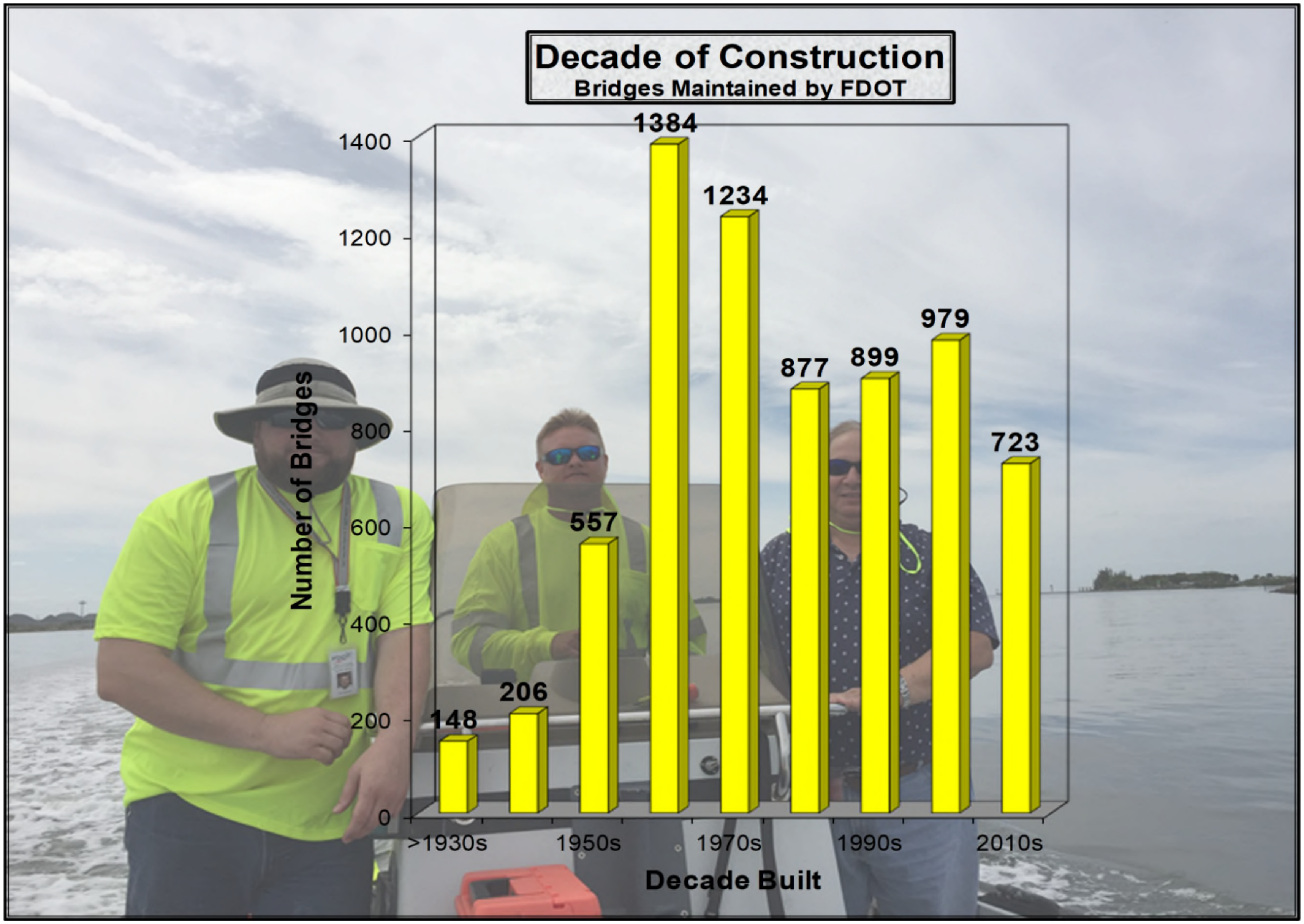


Figure 3

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 CFX bridges.

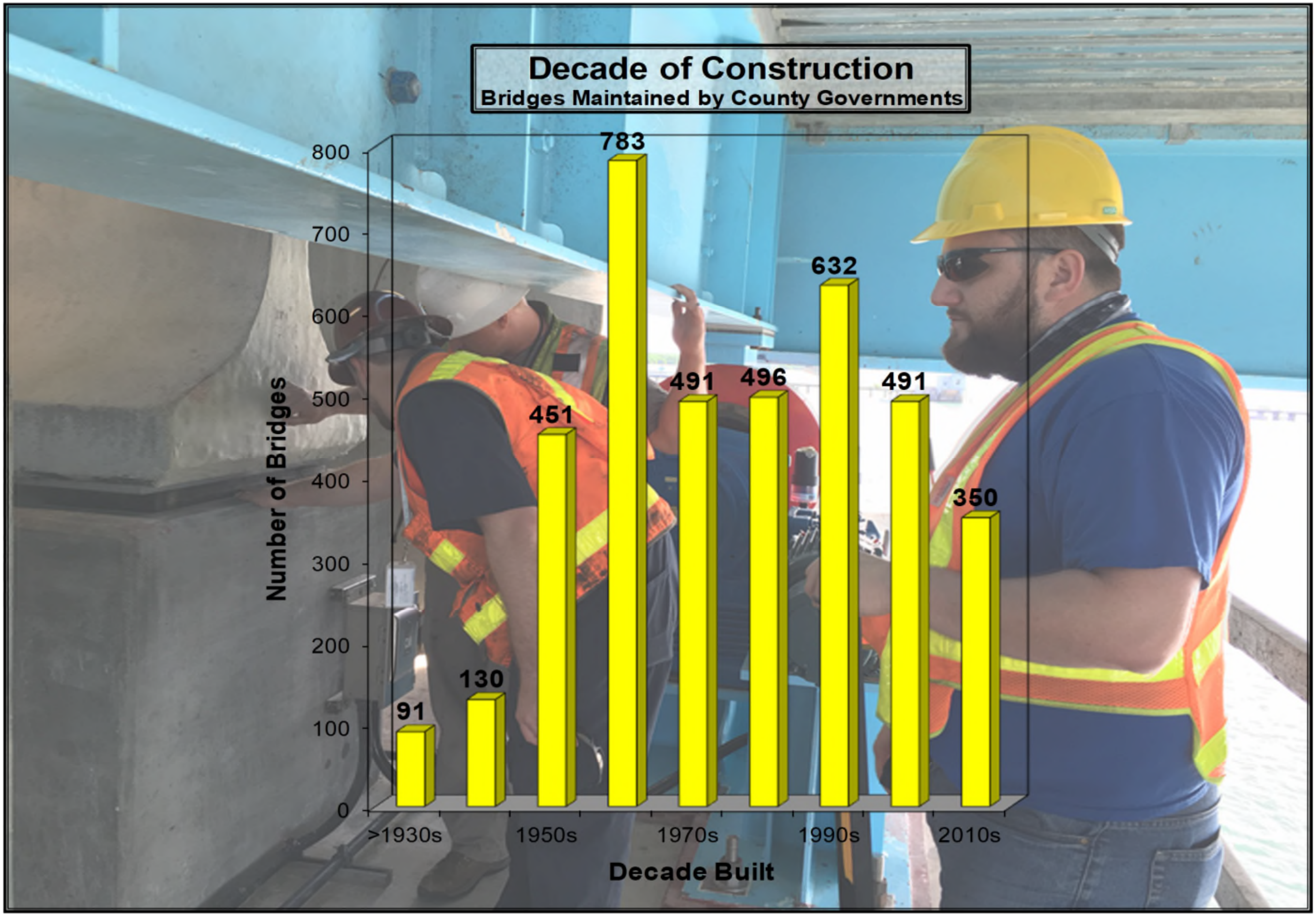


Figure 4

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 CFX bridges.

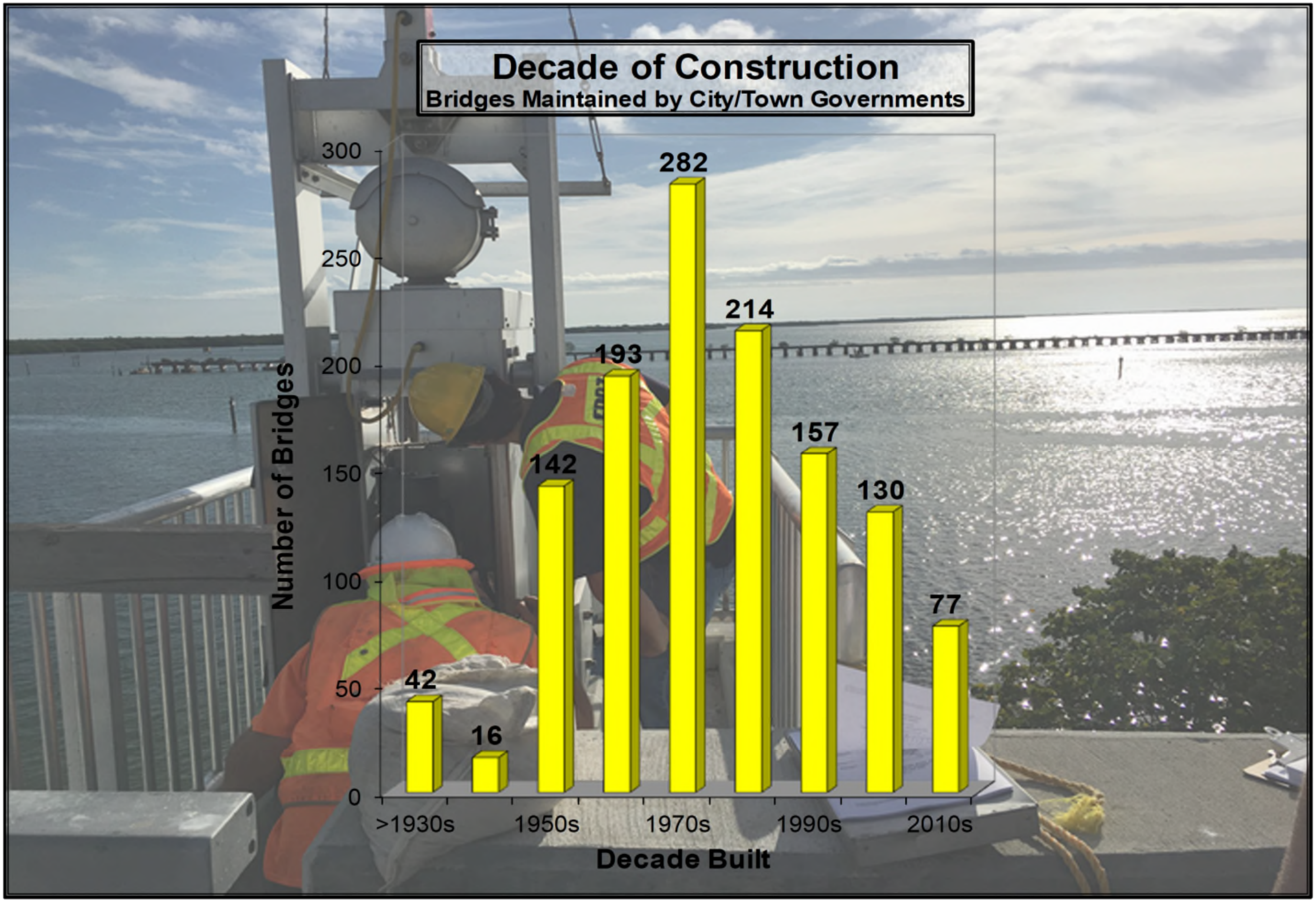


Figure 5

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 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	23	9	5	0	0	0	0	37	10	24	0	0	0	0	0	34
1940s	59	24	1	1	0	0	0	85	52	32	2	1	0	0	0	87
1950s	126	99	13	1	0	0	0	239	74	134	4	0	0	0	0	212
1960s	110	206	36	7	6	0	0	365	102	155	5	5	0	0	0	267
1970s	152	133	85	0	3	0	0	373	284	88	8	3	2	0	0	385
1980s	176	136	48	2	5	0	0	367	58	66	8	14	0	0	1	147
1990s	138	126	26	6	8	0	0	304	103	187	11	26	0	0	0	327
2000s	97	103	20	4	1	0	0	225	68	152	10	41	1	0	0	272
2010s	60	90	14	4	1	0	0	169	73	112	4	8	0	0	0	197
Total	941	926	248	25	24	0	0	2164	824	950	52	98	3	0	1	1928
	District 2								District 4							
>1930s	53	16	4	0	0	0	0	73	4	4	6	0	0	0	0	14
1940s	61	51	3	0	0	0	0	115	3	2	2	0	0	0	0	7
1950s	141	115	32	4	0	0	0	292	36	37	58	5	0	0	0	136
1960s	415	94	32	1	0	0	0	542	70	69	54	4	0	0	1	198
1970s	194	40	31	0	0	0	1	266	149	74	66	0	0	0	0	289
1980s	45	45	28	0	0	0	0	118	226	72	54	1	0	0	0	353
1990s	97	45	27	2	0	0	0	171	99	105	17	1	0	0	0	222
2000s	146	52	37	3	0	0	1	239	124	65	18	3	0	0	0	210
2010s	119	33	11	1	0	0	0	164	64	35	20	1	0	0	0	120
Total	1271	491	205	11	0	0	2	1980	775	463	295	15	0	0	1	1549

Table 2

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 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	25	10	3	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	58	26	5	0	0	0	0	89	31	18	17	0	0	0	0	66
1960s	245	60	11	0	0	0	1	317	105	102	37	1	0	0	0	245
1970s	136	37	53	1	0	0	7	234	111	87	23	0	5	0	0	226
1980s	79	78	39	1	0	0	16	213	166	73	20	0	3	0	0	262
1990s	153	65	27	3	0	0	22	270	64	90	39	0	1	0	0	194
2000s	233	58	23	2	4	0	9	329	122	38	14	0	2	0	1	177
2010s	187	49	19	5	4	0	16	280	90	17	6	0	1	0	0	114
Total	1127	393	182	12	8	0	71	1793	728	439	173	1	12	0	1	1354
	District 6								Turnpike							
>1930s	4	18	10	0	0	4	0	36	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	216	97	18	2	0	0	0	333	121	0	0	0	0	0	0	121
1970s	74	32	16	0	0	0	0	122	134	0	0	0	0	0	0	134
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	116	0	0	0	0	0	0	116
2010s	89	14	3	1	4	0	0	111	41	0	0	0	0	0	0	41
Total	624	253	98	3	4	4	0	986	717	0	0	0	0	0	0	717

Table 3

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 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 15.90% of the total inventory. Similarly, slab bridges maintained by counties are 35.81%, and by cities and towns are 53.71%.

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 62.69% of the state maintained inventory, 33.59% of the county bridges, and 24.66% 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

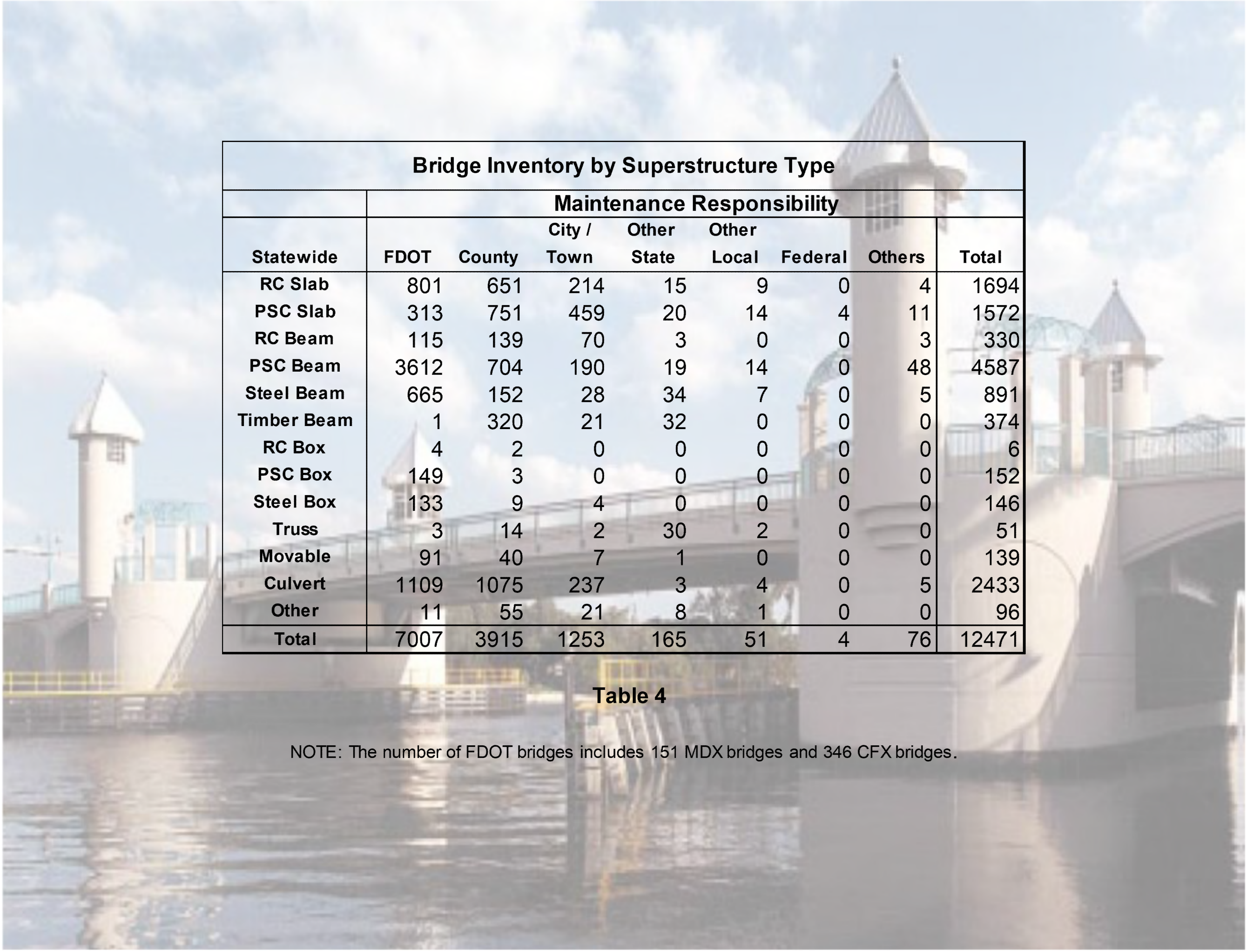
A culvert is typically a buried drainage structure. When the overall opening of the culvert is at least 20 feet it is considered a bridge by the Federal Government, and hence is treated like a bridge for inspection and maintenance purposes. Culverts represent 15.83% of the state maintained bridges. County inventories include 27.46% culverts, and city/towns include 18.91% 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 1.30% of the total state bridge inventory. County inventories include 1.02% movables, and city/towns include 0.56% 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

Statewide	Maintenance Responsibility							
	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
RC Slab	801	651	214	15	9	0	4	1694
PSC Slab	313	751	459	20	14	4	11	1572
RC Beam	115	139	70	3	0	0	3	330
PSC Beam	3612	704	190	19	14	0	48	4587
Steel Beam	665	152	28	34	7	0	5	891
Timber Beam	1	320	21	32	0	0	0	374
RC Box	4	2	0	0	0	0	0	6
PSC Box	149	3	0	0	0	0	0	152
Steel Box	133	9	4	0	0	0	0	146
Truss	3	14	2	30	2	0	0	51
Movable	91	40	7	1	0	0	0	139
Culvert	1109	1075	237	3	4	0	5	2433
Other	11	55	21	8	1	0	0	96
Total	7007	3915	1253	165	51	4	76	12471

Table 4

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 CFX bridges.

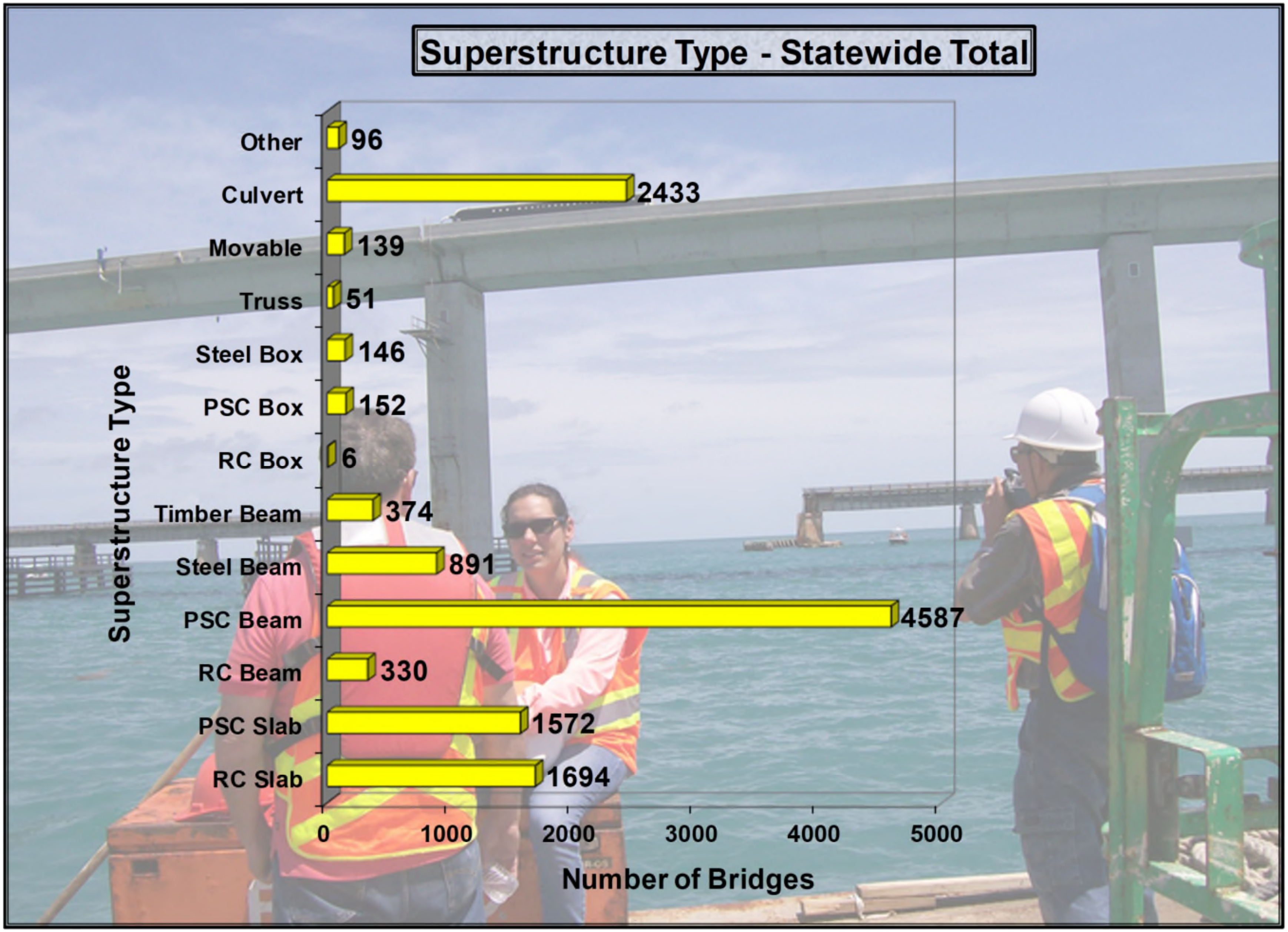

Superstructure Type - Statewide Total
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
96
2433
139
51
146
152
6
374
891
4587
330
1572
1694
0
1000
2000
3000
4000
5000
Number of Bridges

Figure 6

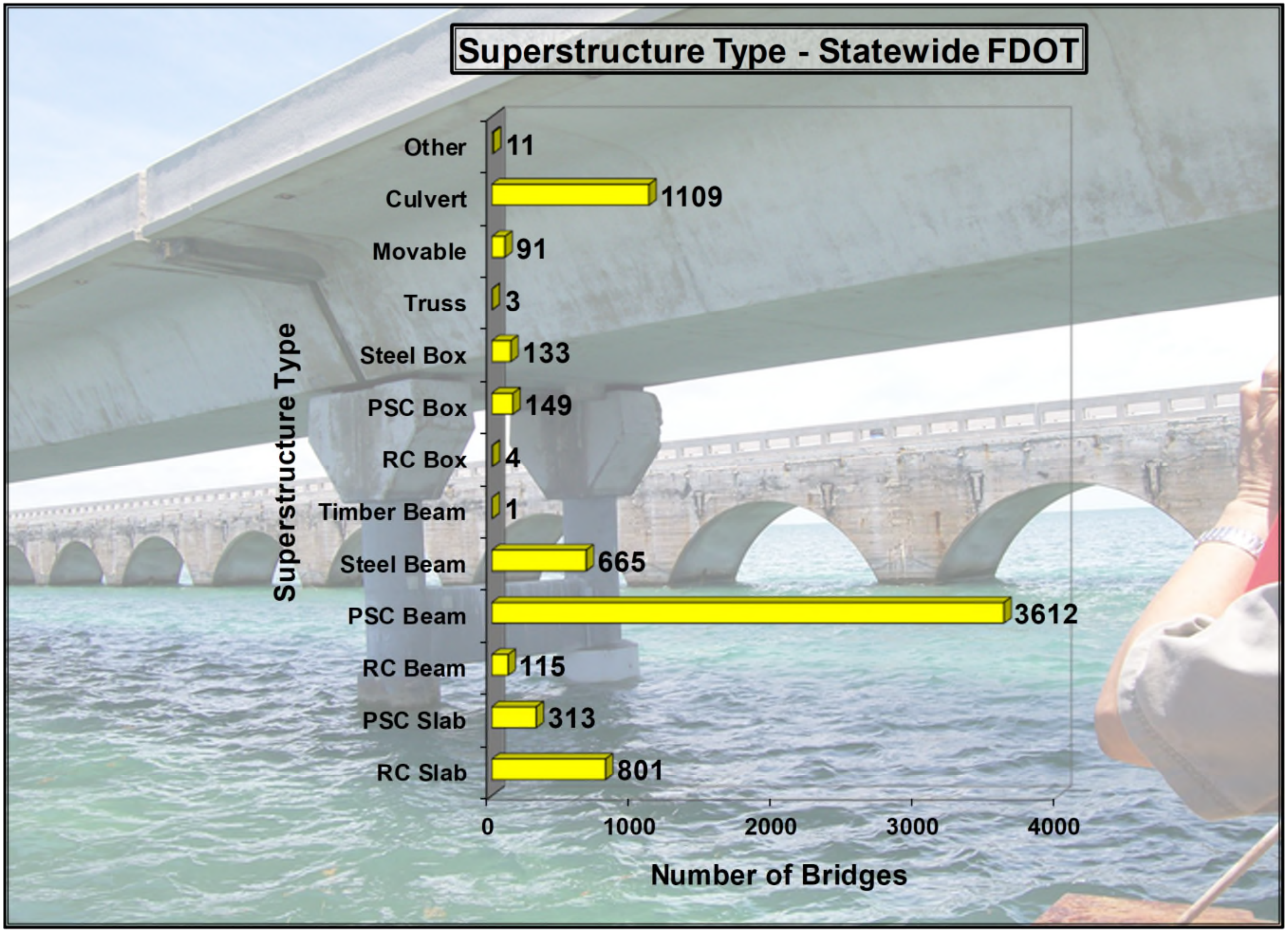

Superstructure Type - Statewide FDOT
Superstructure Type
Other
11
Culvert
1109
Movable
91
Truss
3
Steel Box
133
PSC Box
149
RC Box
4
Timber Beam
1
Steel Beam
665
PSC Beam
3612
RC Beam
115
PSC Slab
313
RC Slab
801
0
1000
2000
3000
4000
Number of Bridges

Figure 7

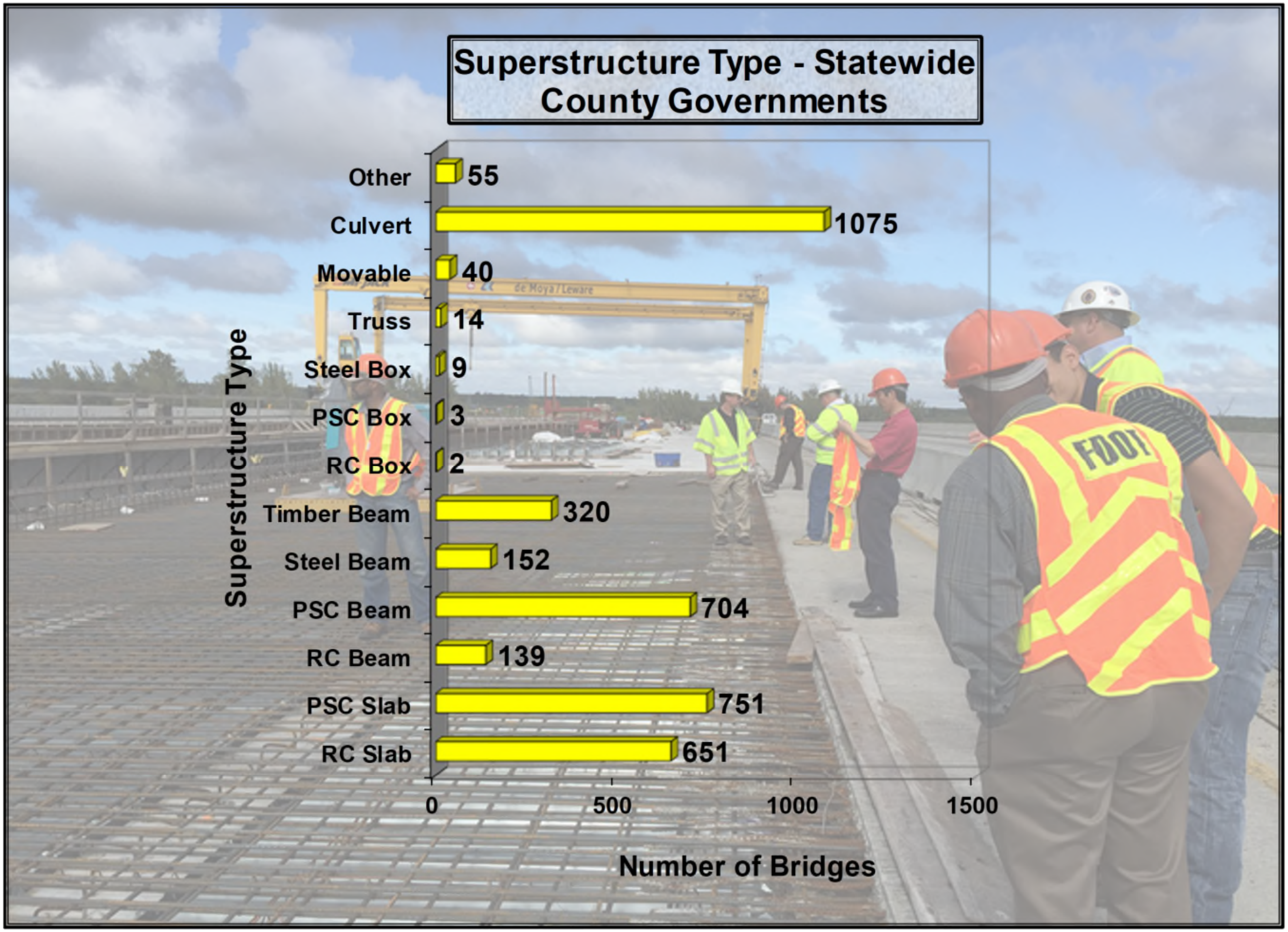

Superstructure Type - Statewide
County Governments
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
55
1075
40
14
9
3
2
320
152
704
139
751
651
0
500
1000
1500
Number of Bridges

Figure 8

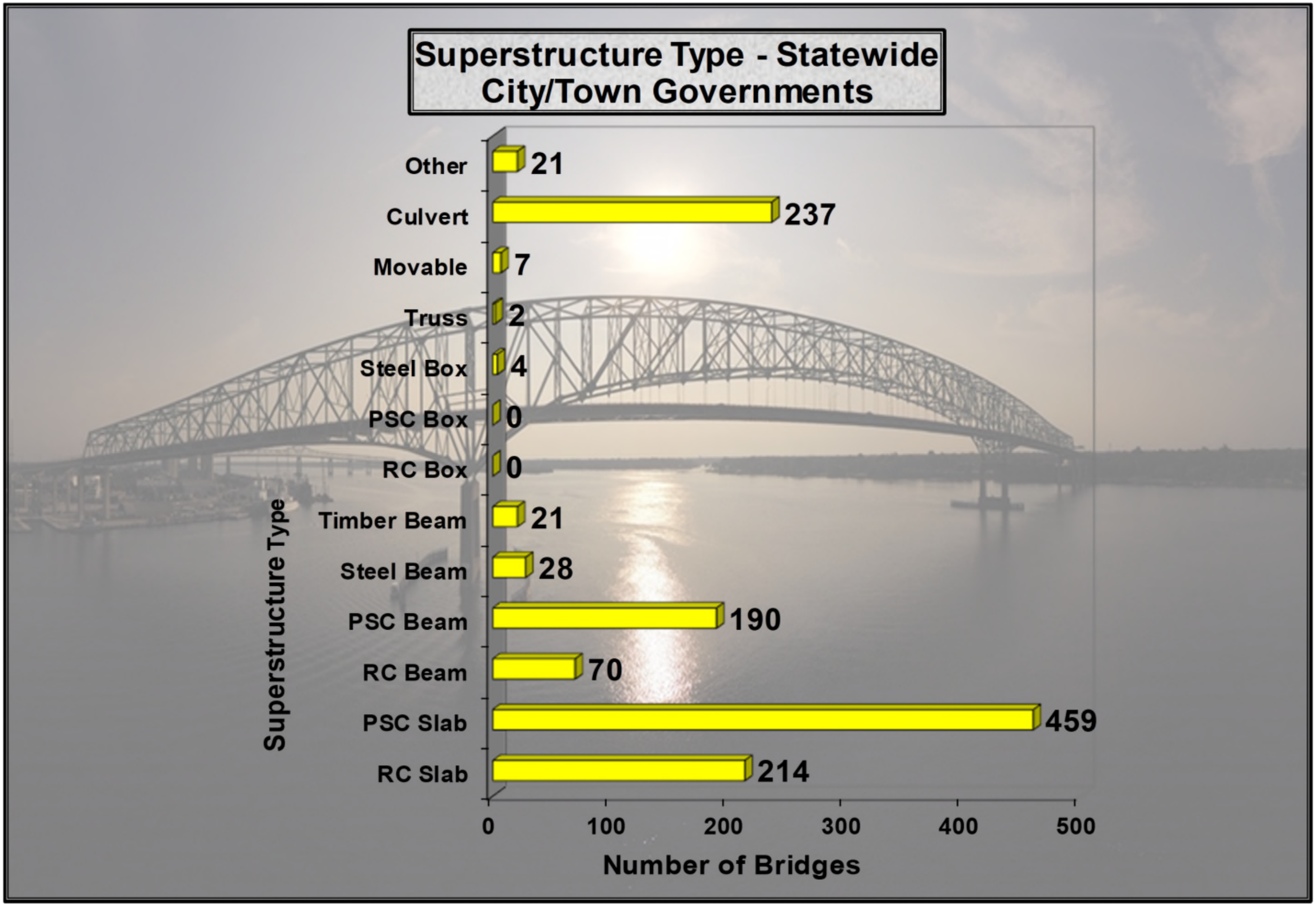

Superstructure Type - Statewide
City/Town Governments
Other
21
Culvert
237
Movable
7
Truss
2
Steel Box
4
PSC Box
0
RC Box
0
Timber Beam
21
Steel Beam
28
PSC Beam
190
RC Beam
70
PSC Slab
459
RC Slab
214
Superstructure Type
0
100
200
300
400
500
Number of Bridges

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

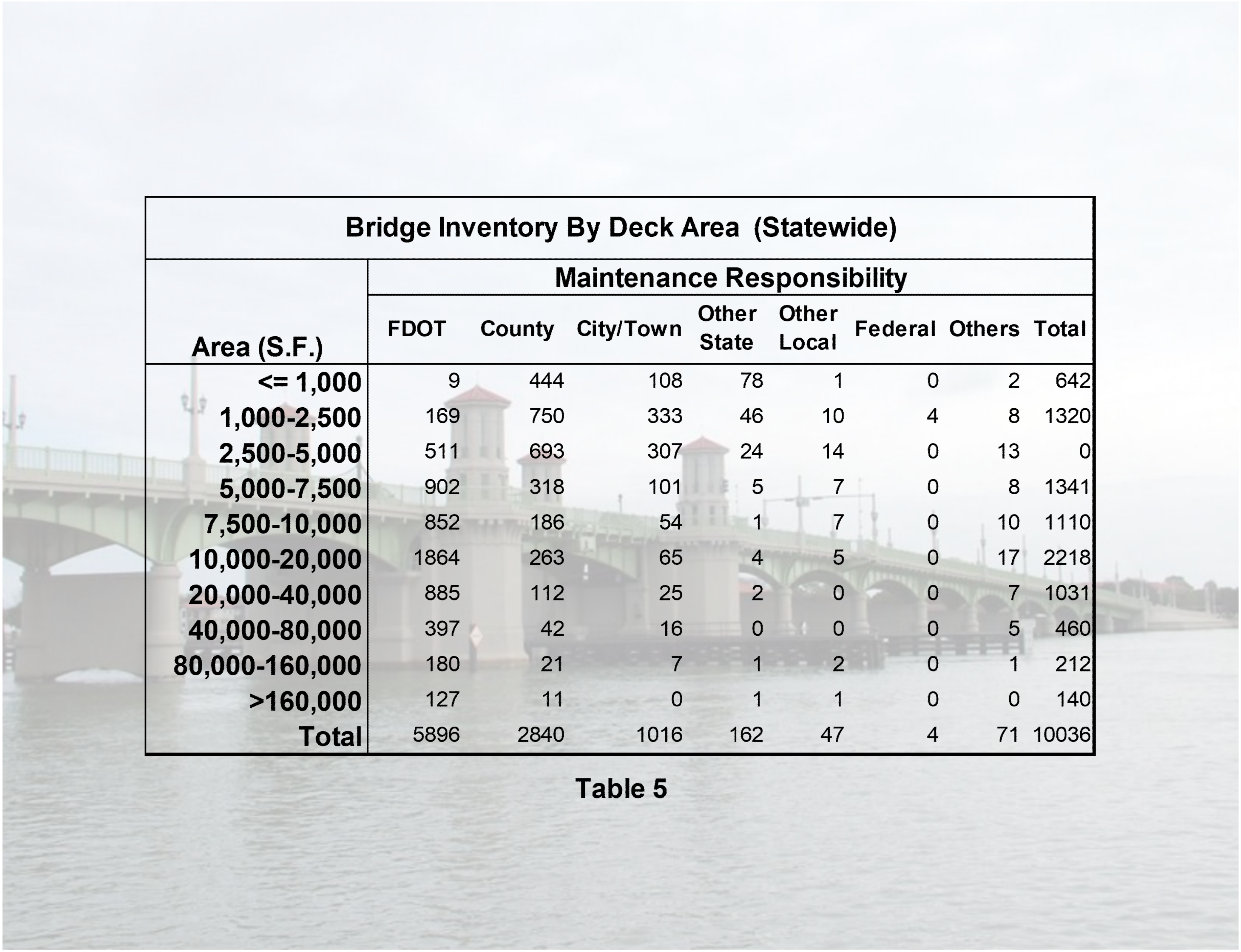
Figure 10 presents the 5,896 FDOT bridges grouped by the deck area ranges (culverts and other miscellaneous structures are not included in this group). The range with the largest number of bridges is the 10,000 to 20,000 square foot range, with 1,864 bridges, 31.61% of the total. 11.69% of the FDOT bridges fall into the 0 to 5,000 square foot range; 29.75% are in the 5,000 to 10,000 square foot range; and 26.95% 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 66.44% of their bridges under 5,000 square feet; with 17.75% between 5,000 and 10,000 square feet; 9.26% between 10,000 to 20,000 square feet; and only 6.55% over 20,000 square feet (see Figure 11). The results for the City/Town and Others groups are similar; with 73.62% 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, 22.19% of the District 1 bridges are less than 5,000 square feet and only 16.15% of their bridges are over 20,000 square feet. In contrast, only 9.15% of District 4 bridges are less than 5,000 square feet, while 39.03% 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	9	444	108	78	1	0	2	642
1,000-2,500	169	750	333	46	10	4	8	1320
2,500-5,000	511	693	307	24	14	0	13	0
5,000-7,500	902	318	101	5	7	0	8	1341
7,500-10,000	852	186	54	1	7	0	10	1110
10,000-20,000	1864	263	65	4	5	0	17	2218
20,000-40,000	885	112	25	2	0	0	7	1031
40,000-80,000	397	42	16	0	0	0	5	460
80,000-160,000	180	21	7	1	2	0	1	212
>160,000	127	11	0	1	1	0	0	140
Total	5896	2840	1016	162	47	4	71	10036

Table 5

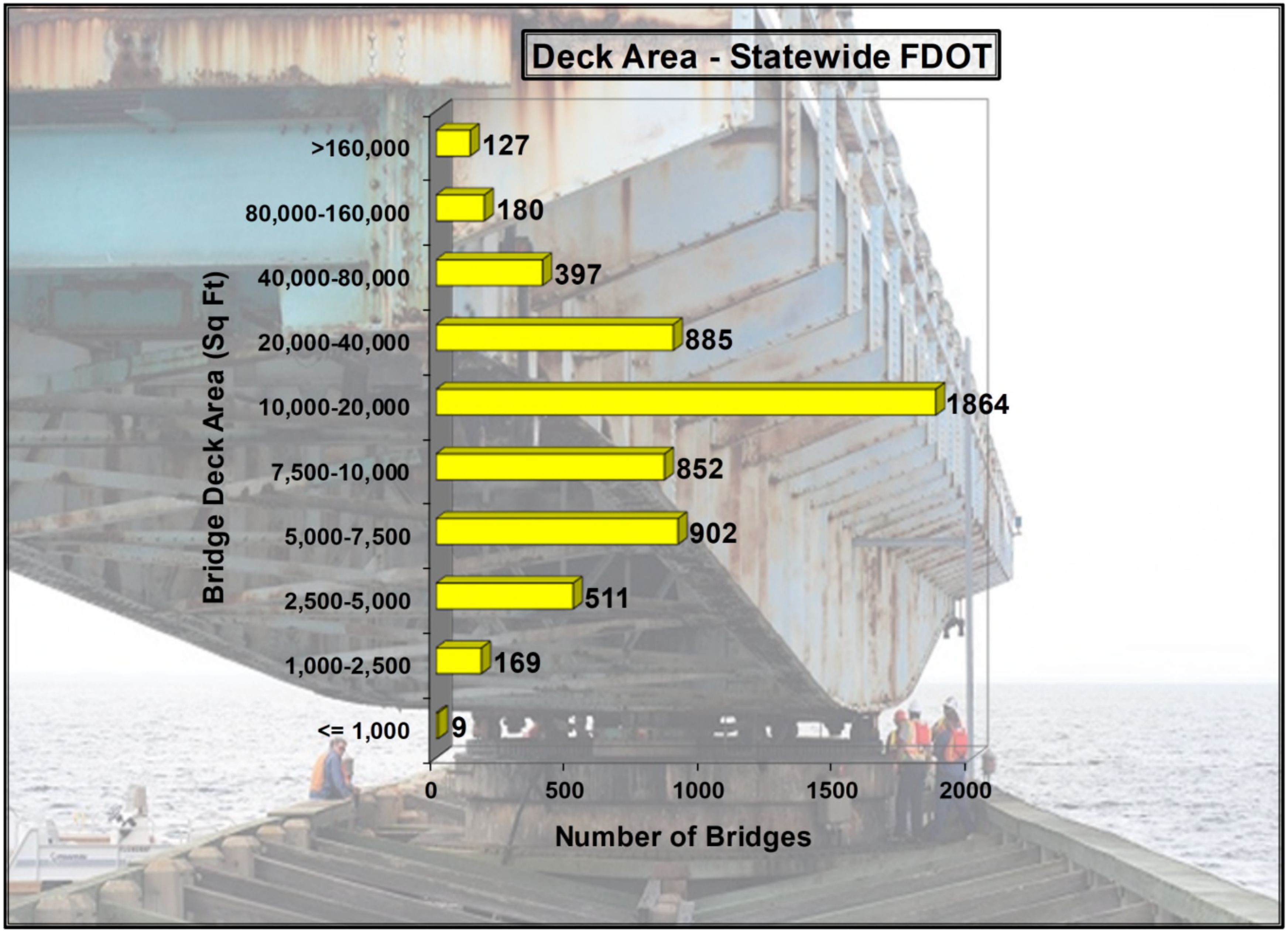

Deck Area - Statewide FDOT
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
127
180
397
885
1864
852
902
511
169
9
0
500
1000
1500
2000
Number of Bridges

Figure 10

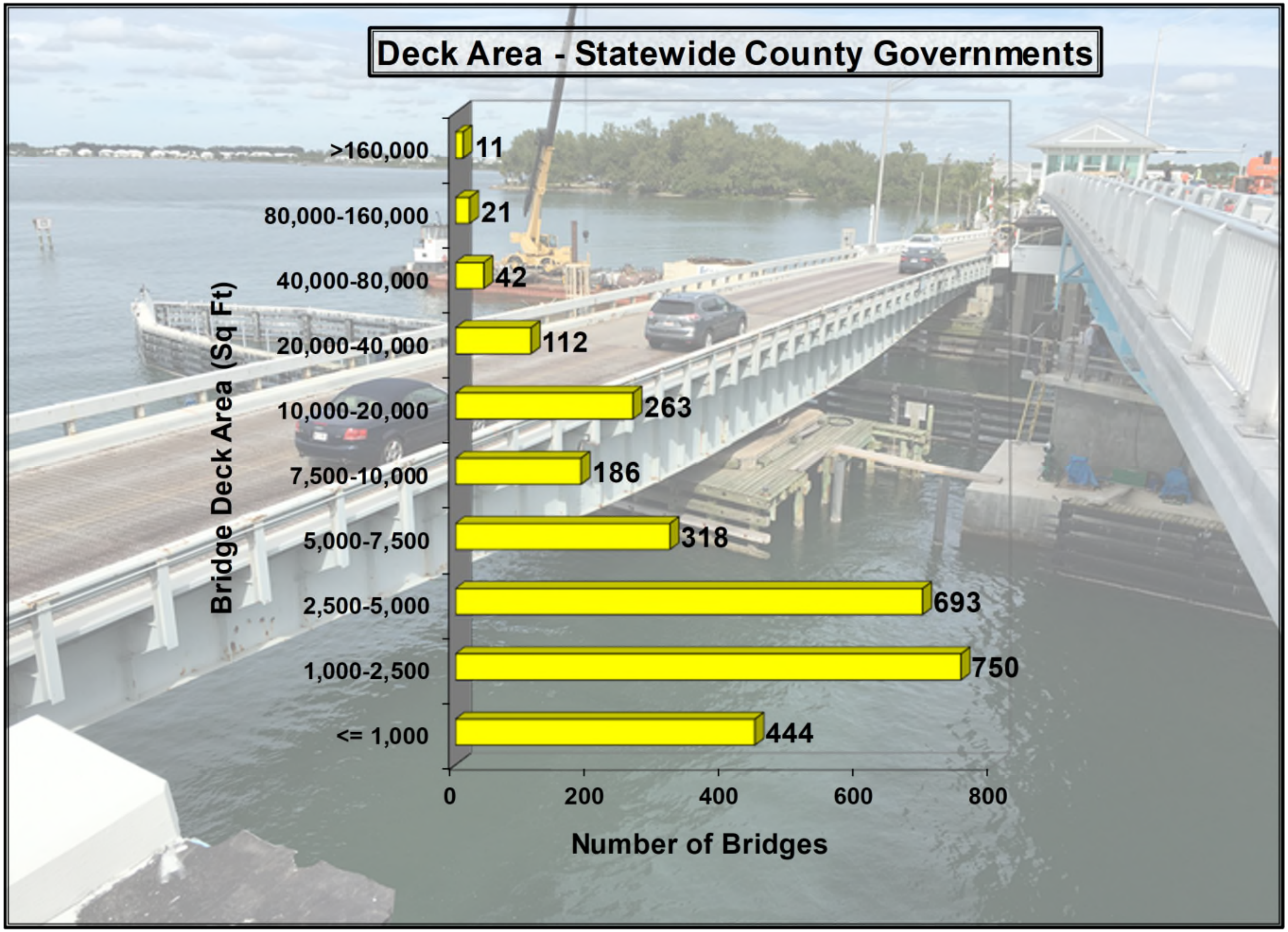

Deck Area - Statewide County Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
11
21
42
112
263
186
318
693
750
444
0
200
400
600
800
Number of Bridges

Figure 11

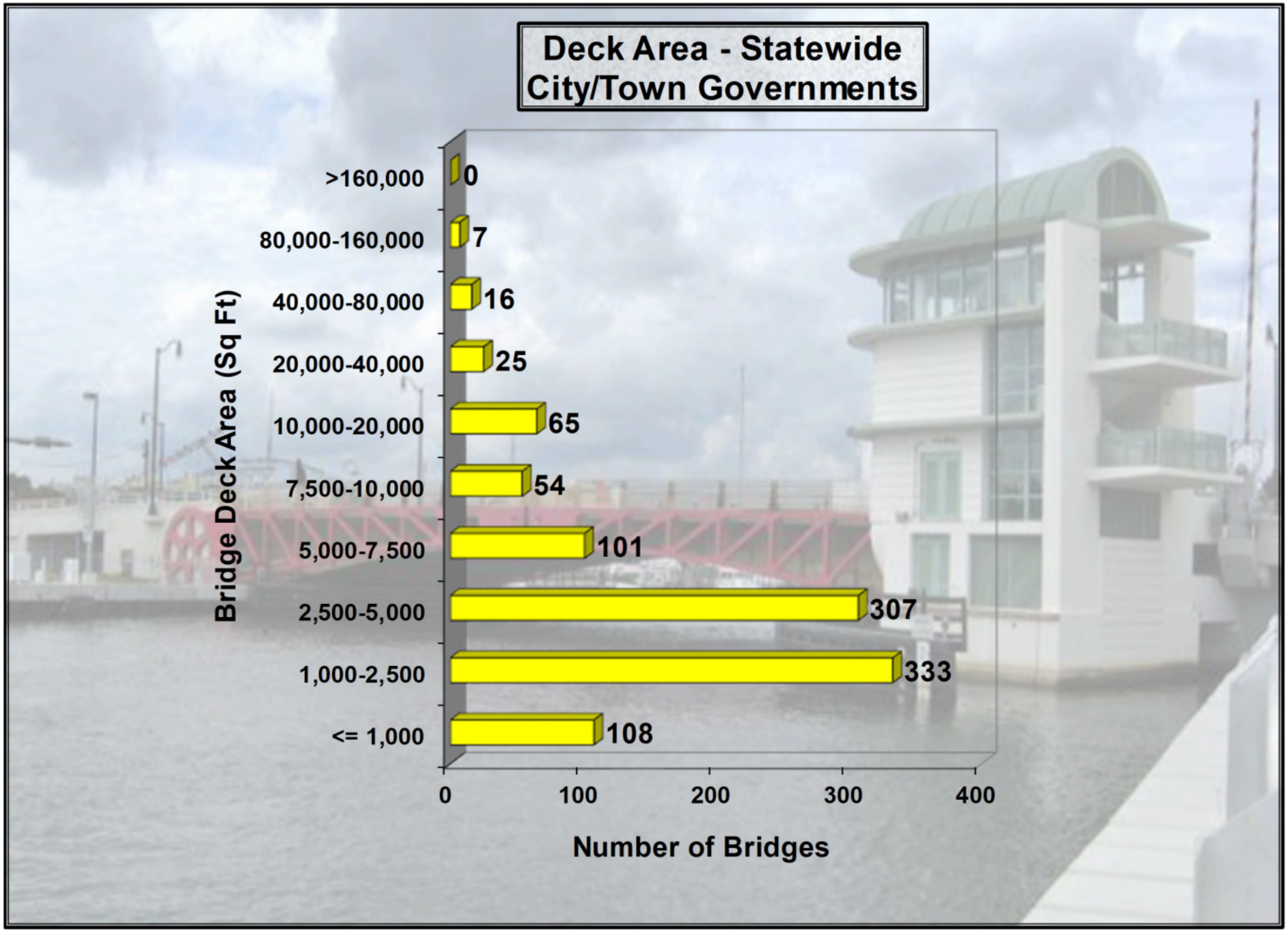

Deck Area - Statewide
City/Town Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
7
16
25
65
54
101
307
333
108
0
100
200
300
400
Number of Bridges

Figure 12

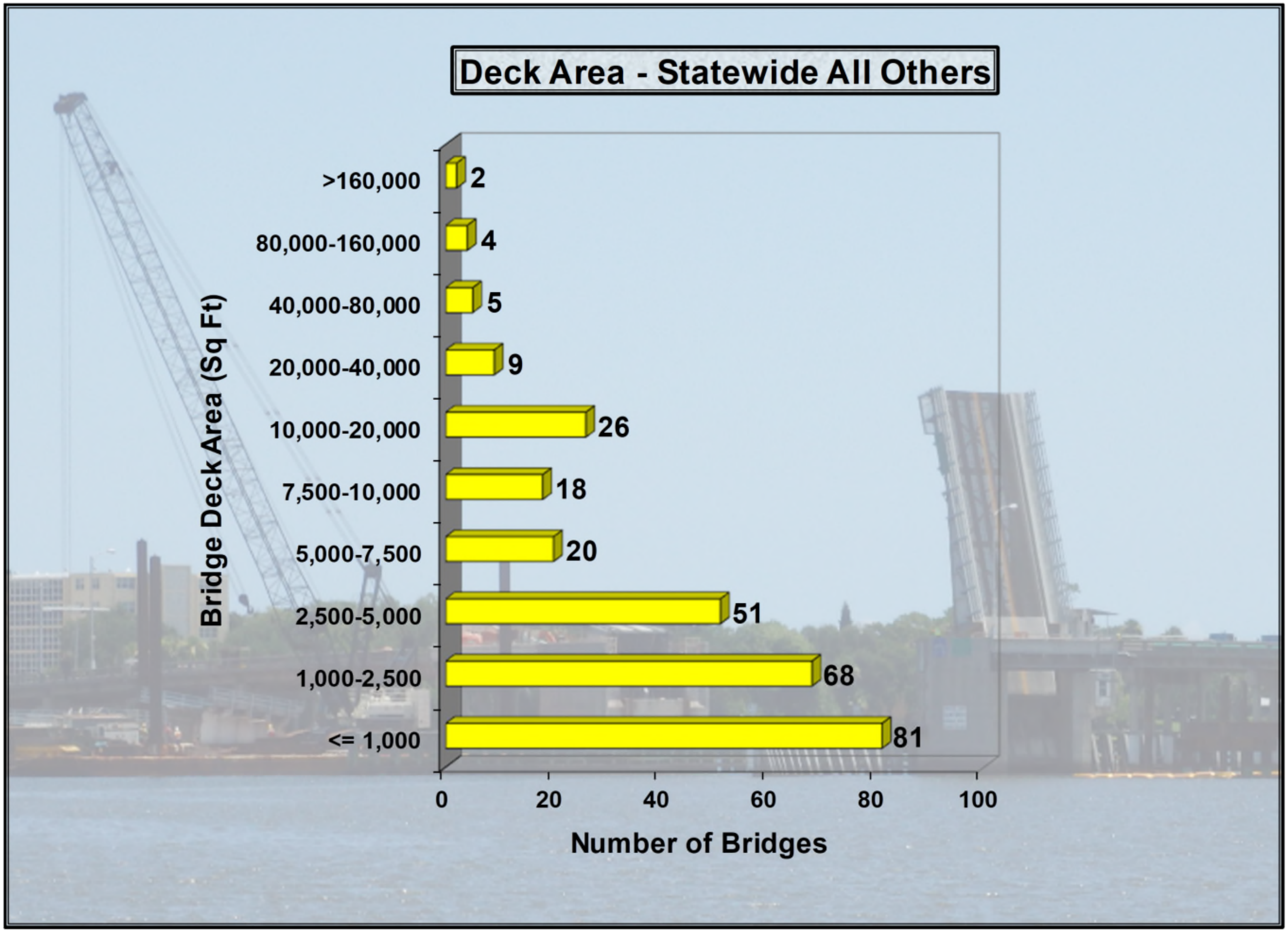

Deck Area - Statewide All Others
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
2
4
5
9
26
18
20
51
68
81
0
20
40
60
80
100
Number of Bridges

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	5	92	24	1	0	0	0	122	0	214	6	61	1	0	0	282
1,000-2,500	77	194	59	9	6	0	0	345	9	212	11	26	0	0	0	258
2,500-5,000	76	177	74	7	12	0	0	346	54	141	11	7	0	0	0	213
5,000-7,500	145	55	25	2	4	0	0	231	101	58	2	1	0	0	0	162
7,500-10,000	91	36	11	0	0	0	0	138	98	26	1	1	0	0	0	126
10,000-20,000	203	50	8	2	1	0	0	264	182	27	2	0	0	0	0	211
20,000-40,000	62	20	0	2	0	0	0	84	74	14	1	0	0	0	0	89
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	1	0	2	0	0	29
>160,000	13	2	0	1	0	0	0	16	26	0	0	0	0	0	0	26
Total	712	638	201	24	23	0	0	1598	599	698	37	96	3	0	0	1433
	District 2								District 4							
<= 1,000	3	51	12	9	0	0	0	75	0	9	34	0	0	0	1	44
1,000-2,500	23	53	53	1	0	0	0	130	21	96	102	6	0	0	0	225
2,500-5,000	87	72	33	1	0	0	0	193	47	135	102	7	0	0	0	291
5,000-7,500	154	27	16	0	0	0	0	197	72	68	20	2	0	0	0	162
7,500-10,000	168	13	13	0	0	0	0	194	67	42	8	0	0	0	0	117
10,000-20,000	308	17	12	0	0	0	2	339	246	49	14	0	0	0	0	309
20,000-40,000	117	8	5	0	0	0	0	130	178	28	4	0	0	0	0	210
40,000-80,000	57	3	4	0	0	0	0	64	74	10	1	0	0	0	0	85
80,000-160,000	40	0	1	0	0	0	0	41	21	3	1	0	0	0	0	25
>160,000	21	1	0	0	0	0	0	22	17	1	0	0	0	0	0	18
Total	978	245	149	11	0	0	2	1385	743	441	286	15	0	0	1	1486

Table 6

Bridge Inventory — 2019 Annual Report

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	20	12	7	0	0	1	40	1	43	16	0	0	0	0	60
1,000-2,500	12	56	41	2	2	0	8	121	16	68	38	0	2	0	0	124
2,500-5,000	93	59	26	2	1	0	13	194	23	51	25	0	0	0	0	99
5,000-7,500	155	33	18	0	1	0	8	215	63	42	10	0	0	0	0	115
7,500-10,000	160	24	10	0	0	0	10	204	87	29	4	0	7	0	0	127
10,000-20,000	318	50	18	1	2	0	15	404	206	43	6	0	1	0	0	256
20,000-40,000	139	18	5	0	0	0	7	169	121	14	6	0	0	0	0	141
40,000-80,000	45	7	5	0	0	0	5	62	70	9	2	0	0	0	0	81
80,000-160,000	31	1	2	0	0	0	1	35	25	3	2	1	0	0	0	31
>160,000	10	0	0	0	1	0	0	11	16	3	0	0	0	0	0	19
Total	963	268	137	12	7	0	68	1455	628	305	109	1	10	0	0	1053
	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	6	71	29	2	0	4	0	112	5	0	0	0	0	0	0	5
2,500-5,000	61	58	36	0	1	0	0	156	70	0	0	0	0	0	0	70
5,000-7,500	76	35	10	0	2	0	0	123	136	0	0	0	0	0	0	136
7,500-10,000	62	16	7	0	0	0	0	85	119	0	0	0	0	0	0	119
10,000-20,000	176	27	5	1	1	0	0	210	225	0	0	0	0	0	0	225
20,000-40,000	121	10	4	0	0	0	0	135	73	0	0	0	0	0	0	73
40,000-80,000	71	5	2	0	0	0	0	78	18	0	0	0	0	0	0	18
80,000-160,000	28	4	0	0	0	0	0	32	2	0	0	0	0	0	0	2
>160,000	20	4	0	0	0	0	0	24	4	0	0	0	0	0	0	4
Total	621	245	97	3	4	4	0	974	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 95.16% of the FDOT maintained bridges are in excellent or good condition. However, the number drops to 80.95% for County bridges, 86.03% for City/Town bridges, and 77.36% for Other Agency bridges.

Figures 18 and 19 show a general graphical view of state maintained bridges, by location, comparing the bridge conditions for years 2014 and 2019.

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.

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	56	82	11	3	0	0	0	152	205	51	15	2	1	0	20	294
Good	857	779	218	20	23	0	0	1897	878	307	147	10	7	0	43	1392
Fair	28	57	15	1	0	0	0	101	41	30	12	0	0	0	8	91
Poor	0	8	4	1	1	0	0	14	3	5	8	0	0	0	0	16
Total	941	926	248	25	24	0	0	2164	1127	393	182	12	8	0	71	1793
	District 2								District 6							
Excellent	81	38	11	0	0	0	1	131	163	26	12	1	4	0	0	206
Good	1104	314	161	7	0	0	1	1587	425	159	69	2	0	4	0	659
Fair	70	89	25	3	0	0	0	187	27	35	10	0	0	0	0	72
Poor	16	50	8	1	0	0	0	75	9	33	7	0	0	0	0	49
Total	1271	491	205	11	0	0	2	1980	624	253	98	3	4	4	0	986
	District 3								District 7							
Excellent	8	39	2	3	0	0	0	52	96	25	11	0	3	0	1	136
Good	735	566	43	47	2	0	1	1394	611	380	145	0	9	0	0	1145
Fair	67	214	5	24	1	0	0	311	20	25	14	0	0	0	0	59
Poor	14	131	2	24	0	0	0	171	1	9	3	1	0	0	0	14
Total	824	950	52	98	3	0	1	1928	728	439	173	1	12	0	1	1354
	District 4								Turnpike							
Excellent	86	75	30	4	0	0	0	195	81	0	0	0	0	0	0	81
Good	651	329	203	9	0	0	1	1193	631	0	0	0	0	0	0	631
Fair	29	55	54	2	0	0	0	140	5	0	0	0	0	0	0	5
Poor	9	4	8	0	0	0	0	21	0	0	0	0	0	0	0	0
Total	775	463	295	15	0	0	1	1549	717	0	0	0	0	0	0	717
									Statewide							
Excellent									776	336	92	13	8	0	22	1247
Good									5892	2834	986	95	41	4	46	9898
Fair									287	505	135	30	1	0	8	966
Poor									52	240	40	27	1	0	0	360
Total									7007	3915	1253	165	51	4	76	12471

NOTE: The number of FDOT bridges includes 151 MDX bridges and 346 CFX bridges.

Table 8

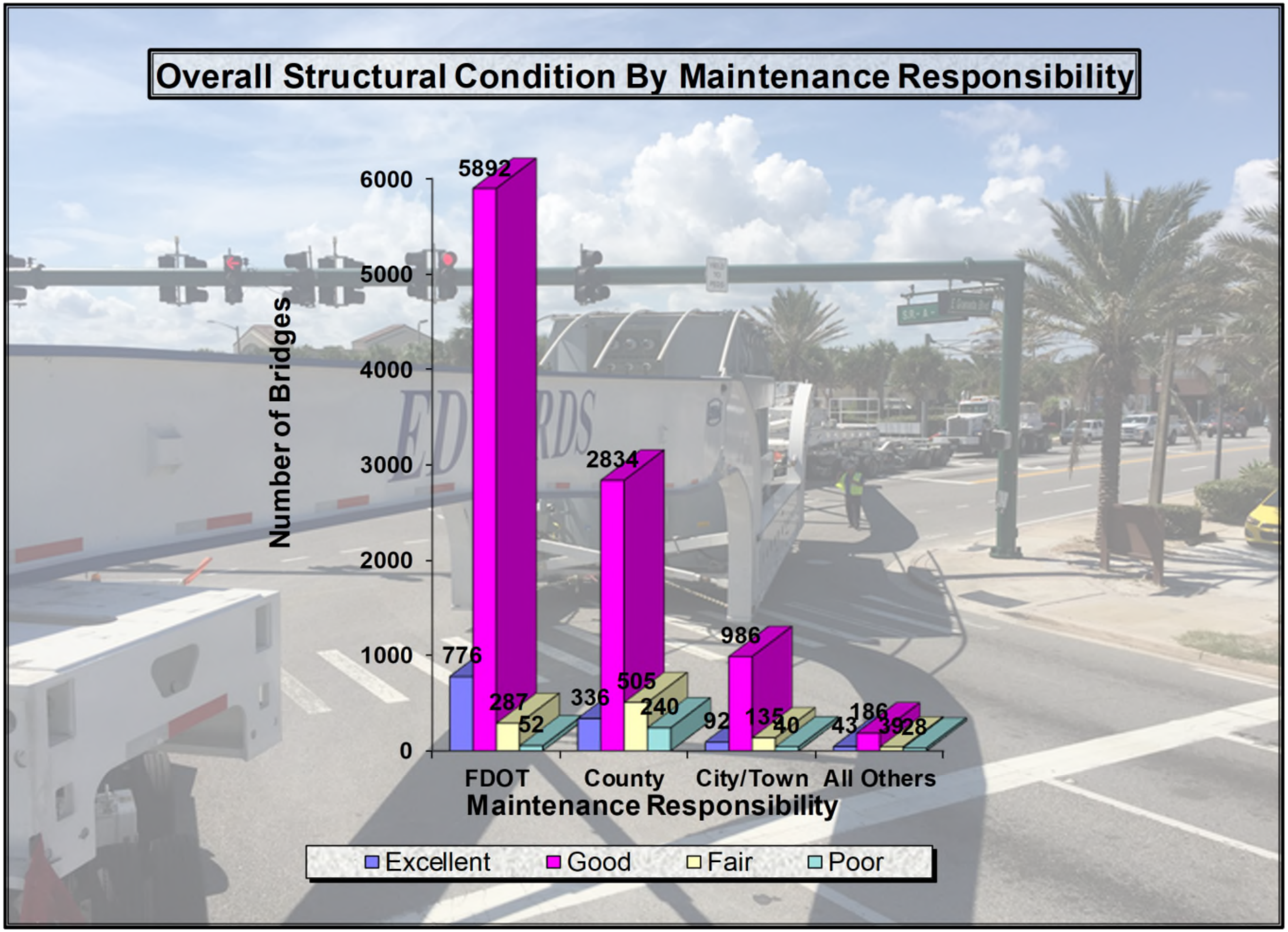

Overall Structural Condition By Maintenance Responsibility
Number of Bridges
0
1000
2000
3000
4000
5000
6000
776
5892
287
52
336
2834
505
240
92
986
135
40
43
186
39
28
FDOT
County
City/Town
All Others
Maintenance Responsibility
Excellent
Good
Fair
Poor

Figure 14

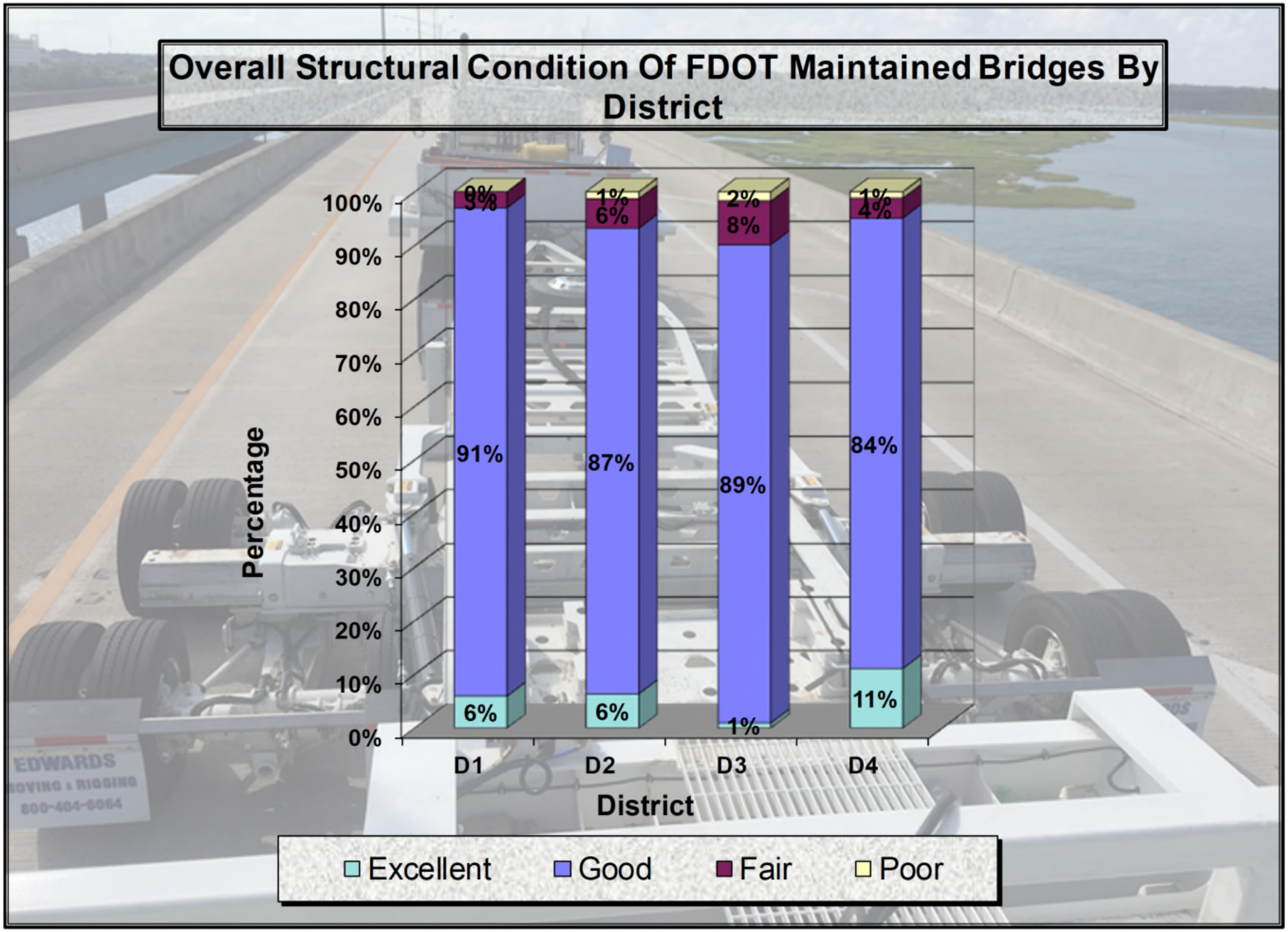

Overall Structural Condition Of FDOT Maintained Bridges By District
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage
0%
3%
91%
6%
1%
6%
87%
6%
2%
8%
89%
1%
1%
4%
84%
11%
D1
D2
D3
D4
District
Excellent
Good
Fair
Poor

Figure 15

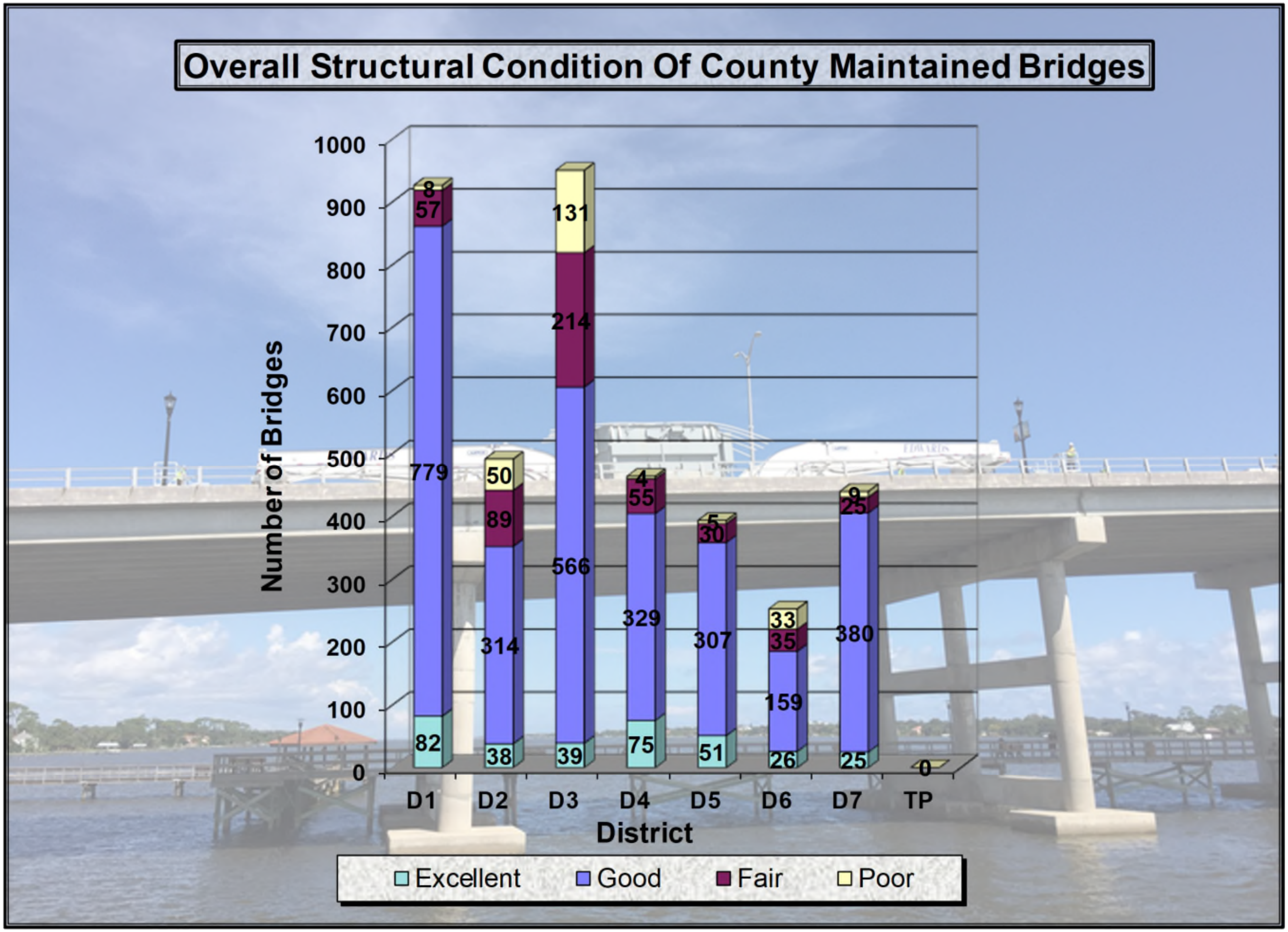
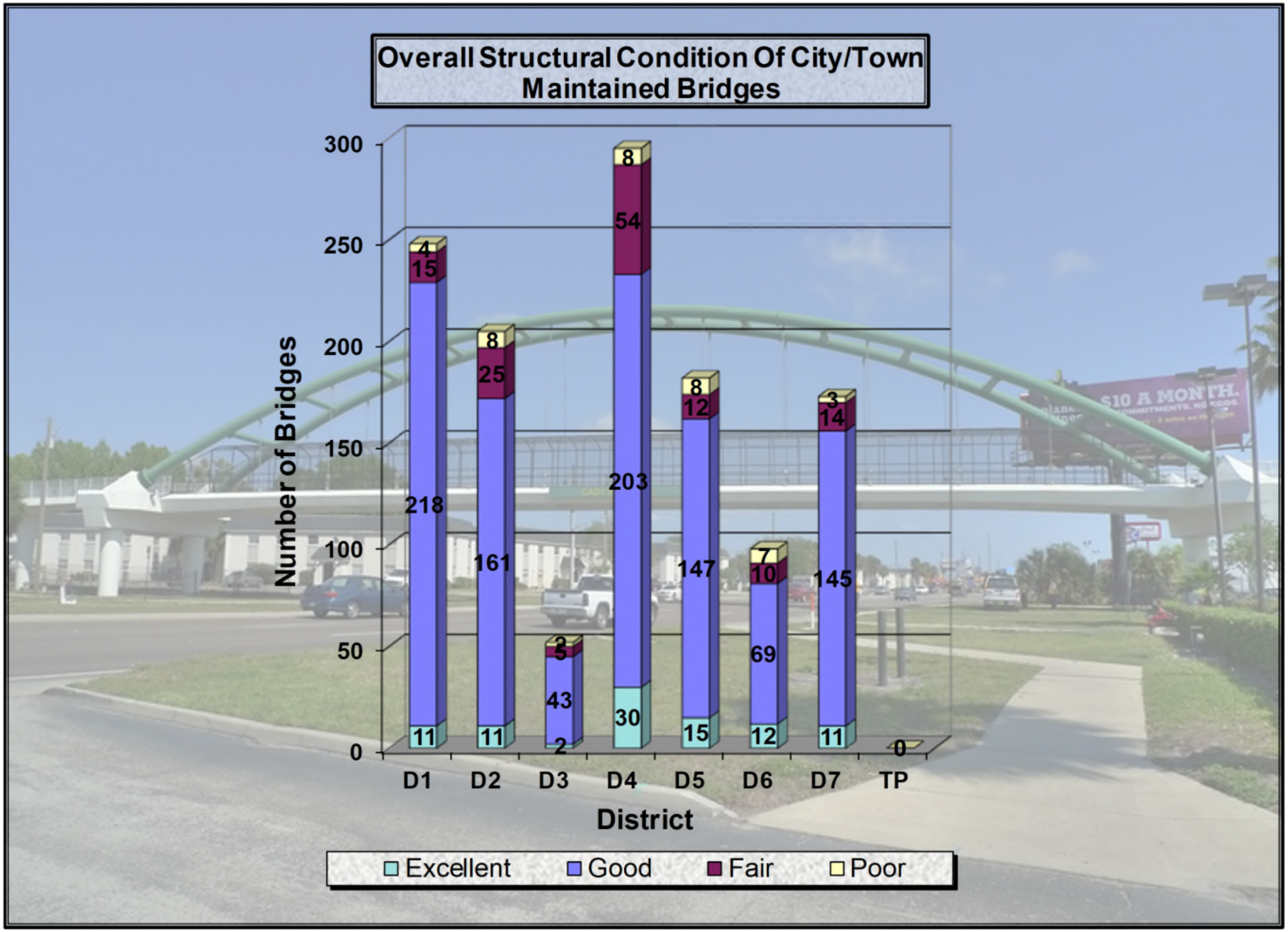

Overall Structural Condition Of County Maintained Bridges
Number of Bridges
1000
900
800
700
600
500
400
300
200
100
0
8
57
779
82
50
89
314
38
131
214
566
39
4
55
329
75
5
30
307
51
33
35
159
26
9
25
380
25
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor

Figure 16



Overall Structural Condition Of City/Town Maintained Bridges
300
250
200
150
100
50
0
Number of Bridges
D1
D2
D3
D4
D5
D6
D7
TP
District
11
218
15
4
11
161
25
8
2
43
5
2
30
203
54
8
15
147
12
8
12
69
10
7
11
145
14
3
0
Excellent
Good
Fair
Poor

Figure 17

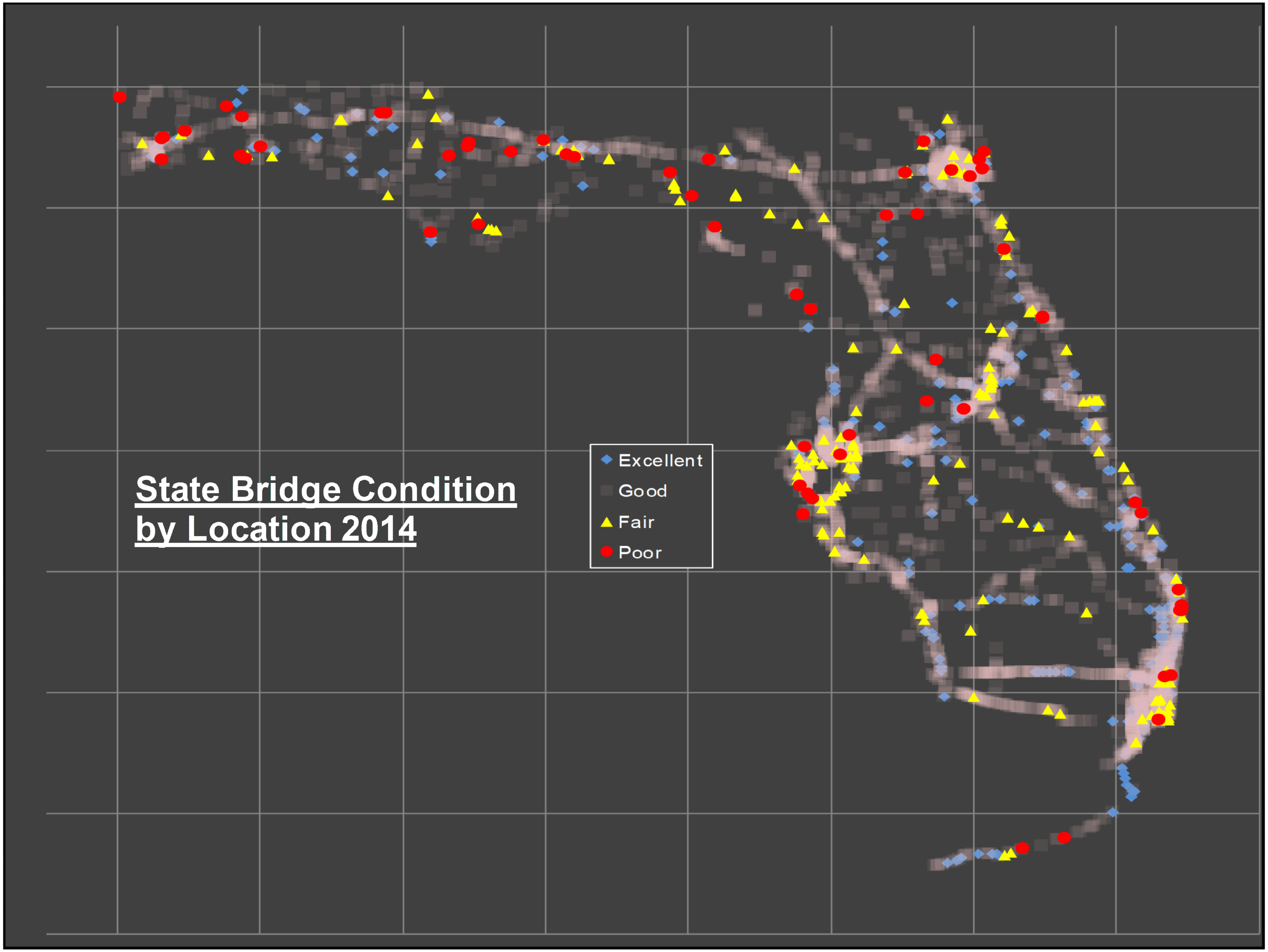

State Bridge Condition
by Location 2014
Excellent
Good
Fair
Poor

Figure 18

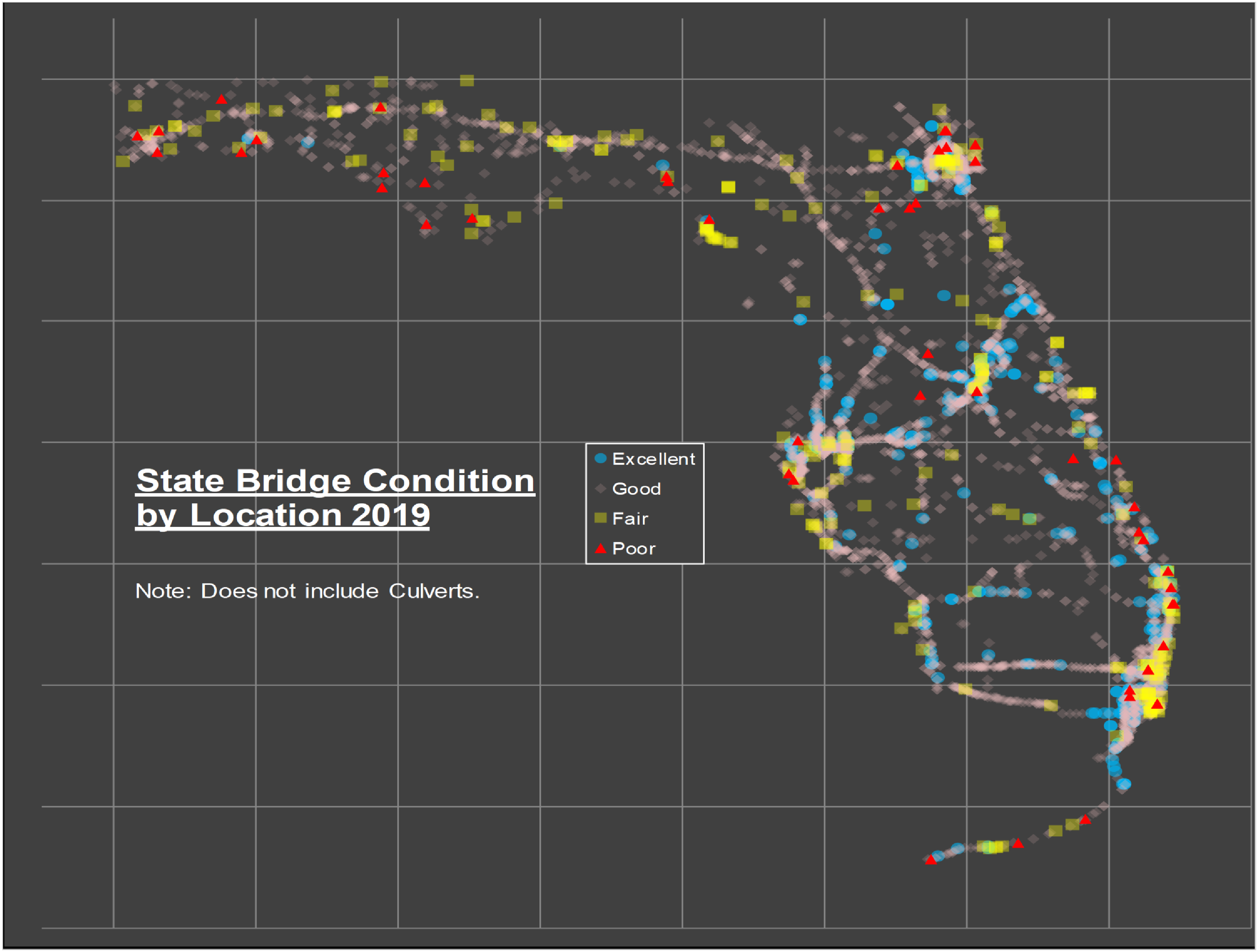

State Bridge Condition by Location 2019
Note: Does not include Culverts.
Excellent
Good
Fair
Poor

Figure 19

FHWA Performance Measures

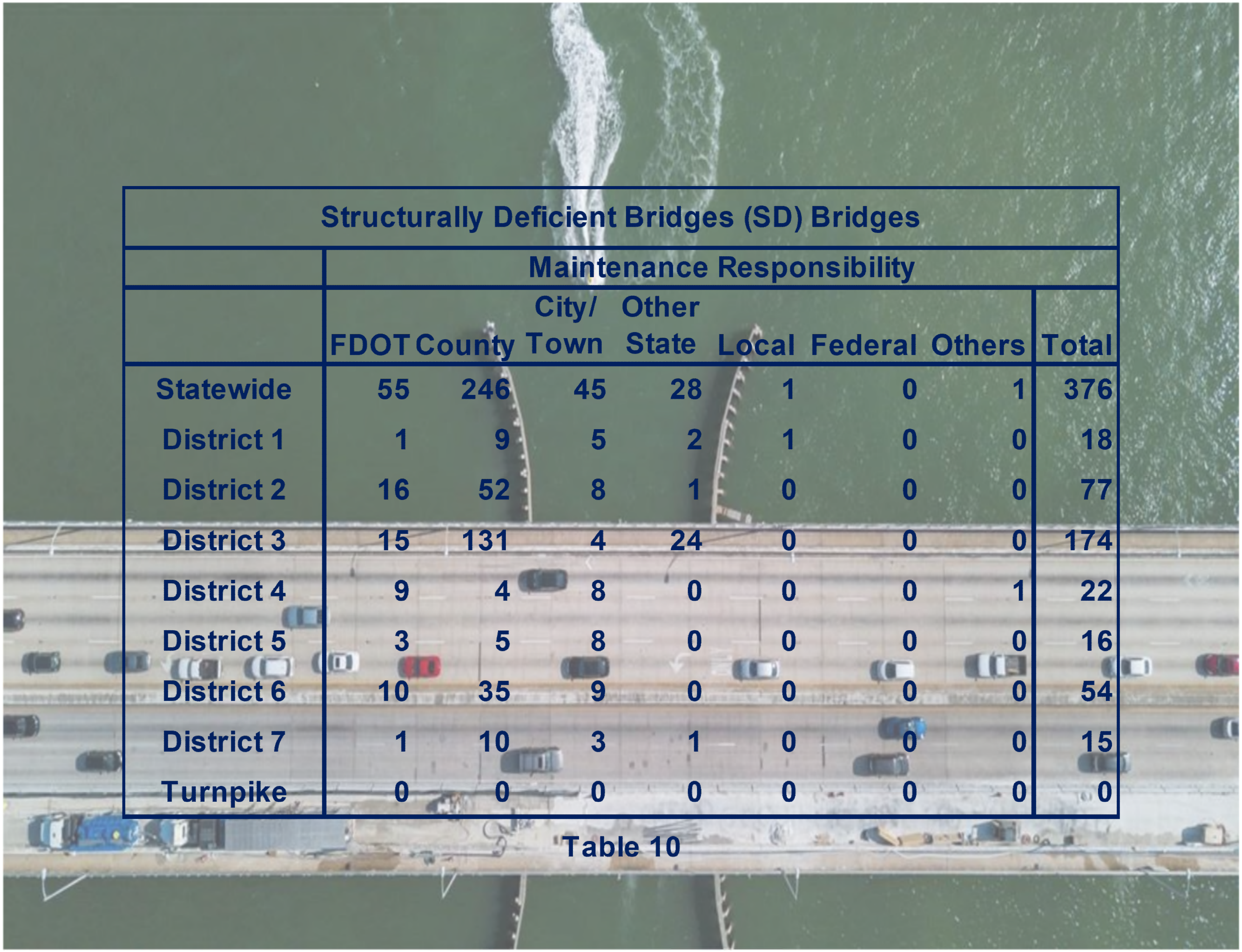
	District 1	District 2	District 3	District 4	District 5	District 6	District 7	Turnpike	Statewide Total
Total Bridge Deck Area on the National Highway System (NHS)	11,987,235	21,056,596	14,308,864	16,218,144	16,760,969	19,513,422	23,252,716	8,987,305	132,085,251
Bridges on the NHS with an Overall Bridge Condition NBI Rating >= 7 (Measured by Square Feet of Deck Area)	9,917,581	10,729,499	5,351,488	13,028,960	11,404,189	12,466,923	18,953,590	6,852,668	88,704,898
Bridges on the NHS with an Overall Bridge Condition NBI Rating <= 4 (Measured by Square Feet of Deck Area)	0	125,397	1,287,269	89,194	1,740	49,257	0	0	1,552,857
Percent of NHS Bridges with Overall Bridge Condition NBI Rating >= 7	82.73%	50.96%	37.40%	80.34%	68.04%	63.89%	81.51%	76.25%	67.16%
Percent of NHS Bridges with Overall Bridge Condition NBI Rating <= 4	0.00%	0.60%	9.00%	0.55%	0.01%	0.25%	0.00%	0.00%	1.18%

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 376 structurally deficient bridges in Florida, with over 65.43% having county maintenance responsibility. Fifty-five (14.63%) 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 74.39% of the County Government maintained structurally deficient bridges are concentrated within District 2 and 3. Over 73.33% of the City/Town maintained structurally deficient bridges are concentrated within Districts 2, 4, 5, and 6.



Structurally Deficient Bridges (SD) Bridges								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Local	Federal	Others	Total
Statewide	55	246	45	28	1	0	1	376
District 1	1	9	5	2	1	0	0	18
District 2	16	52	8	1	0	0	0	77
District 3	15	131	4	24	0	0	0	174
District 4	9	4	8	0	0	0	1	22
District 5	3	5	8	0	0	0	0	16
District 6	10	35	9	0	0	0	0	54
District 7	1	10	3	1	0	0	0	15
Turnpike	0	0	0	0	0	0	0	0

Table 10

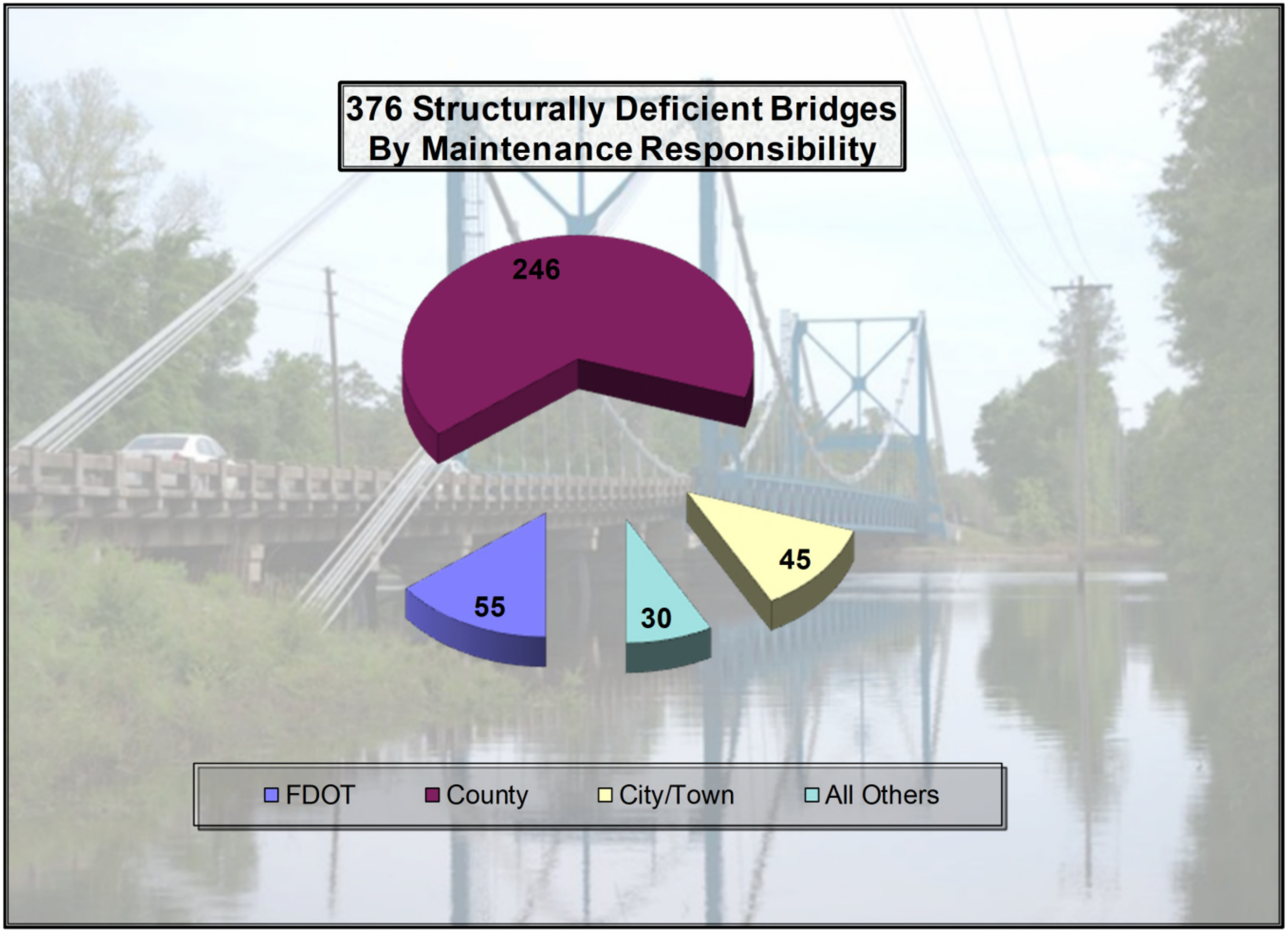

376 Structurally Deficient Bridges
By Maintenance Responsibility
246
55
30
45
FDOT
County
City/Town
All Others

Figure 20

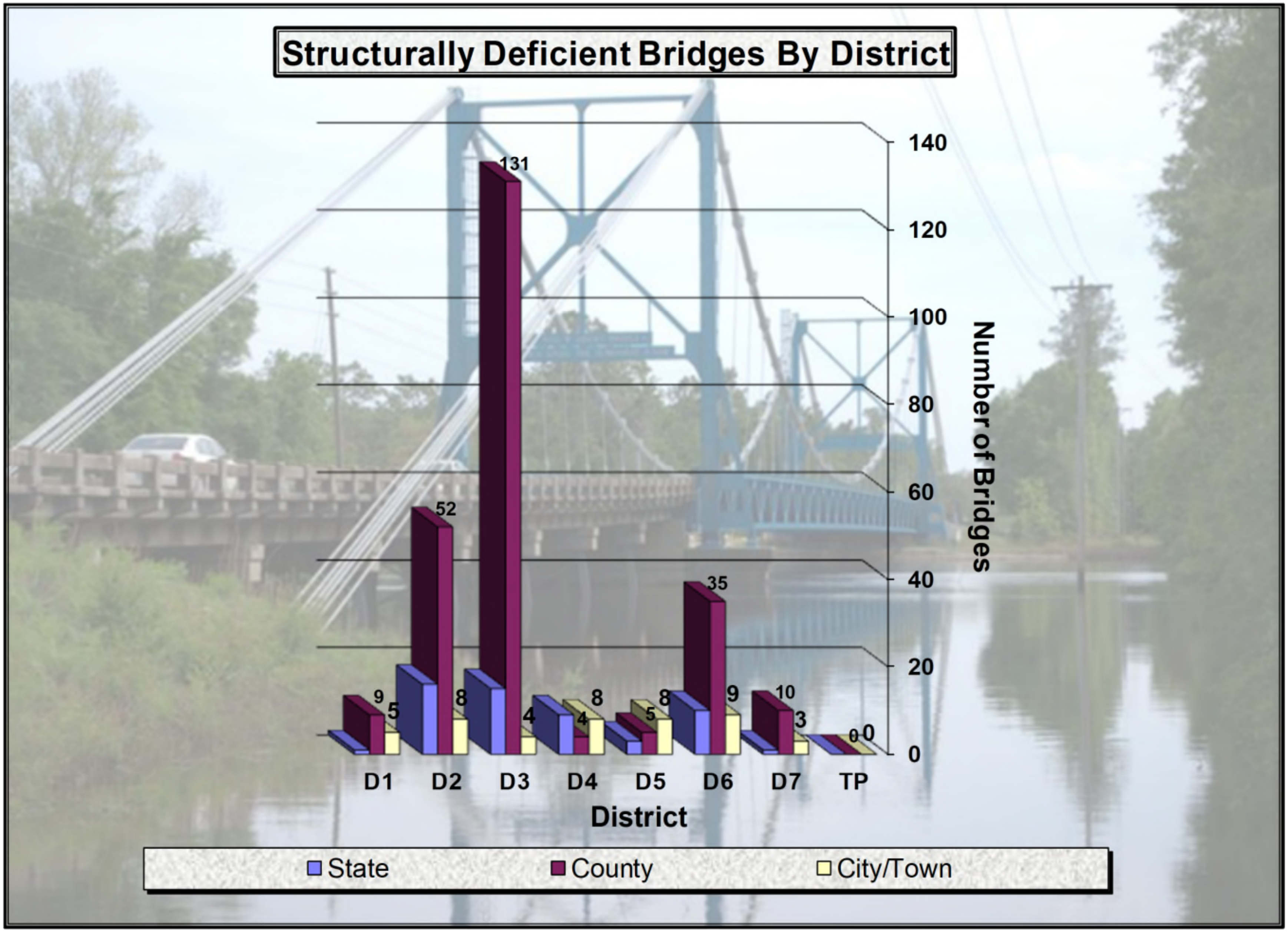

Structurally Deficient Bridges By District
140
120
100
80
60
40
20
0
Number of Bridges
131
52
35
9
5
8
4
4
8
5
8
9
10
3
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
State
County
City/Town

Figure 21

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 650 posted or closed bridges in Florida, with County Governments having maintenance responsibility for over 76.15% of the total. City and Town Governments are responsible for the maintenance of over 18.00% of the total, while the FDOT is responsible for only 10 of the 650 bridges (1.54%). The number of posted County bridges (495 bridges) is much greater than the number of structurally deficient County bridges (246), which indicated that the majority of County bridge posting restrictions are caused by obsolete design, rather than advanced structural deterioration.

Of the 10 posted or closed bridges maintained by the FDOT, Districts 4, 7, and Turnpike had none. Three Hundred and Fifty (70.71%) of the posted or closed bridges maintained by County Governments are concentrated within Districts 2 and 3. Sixty-four (53.85%) of the posted or closed bridges maintained by City/Town Governments are concentrated within Districts 2 and 4. Statewide, 63.69% 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	73	15	1	0	0	0	89	0	19	19	3	2	0	0	43
Closed	1	2	1	1	0	0	0	5	1	3	0	0	0	0	0	4
Total	1	75	16	2	0	0	0	94	1	22	19	3	2	0	0	47
	District 2								District 6							
Posted	2	87	32	6	0	0	0	127	0	16	5	0	0	0	0	21
Closed	0	4	1	0	0	0	0	5	3	3	2	0	0	0	0	8
Total	2	91	33	6	0	0	0	132	3	19	7	0	0	0	0	29
	District 3								District 7							
Posted	0	254	5	13	0	0	0	272	0	7	5	0	0	0	0	12
Closed	3	5	2	0	0	0	0	10	0	3	0	0	0	0	0	3
Total	3	259	7	13	0	0	0	282	0	10	5	0	0	0	0	15
	District 4								Turnpike							
Posted	0	19	30	1	0	0	0	50	0	0	0	0	0	0	0	0
Closed	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Total	0	19	30	1	0	0	1	51	0	0	0	0	0	0	0	0
									Statewide							
								Posted	2	475	111	24	2	0	0	614
								Closed	8	20	6	1	0	0	1	36
								Total	10	495	117	25	2	0	1	650

Table 11

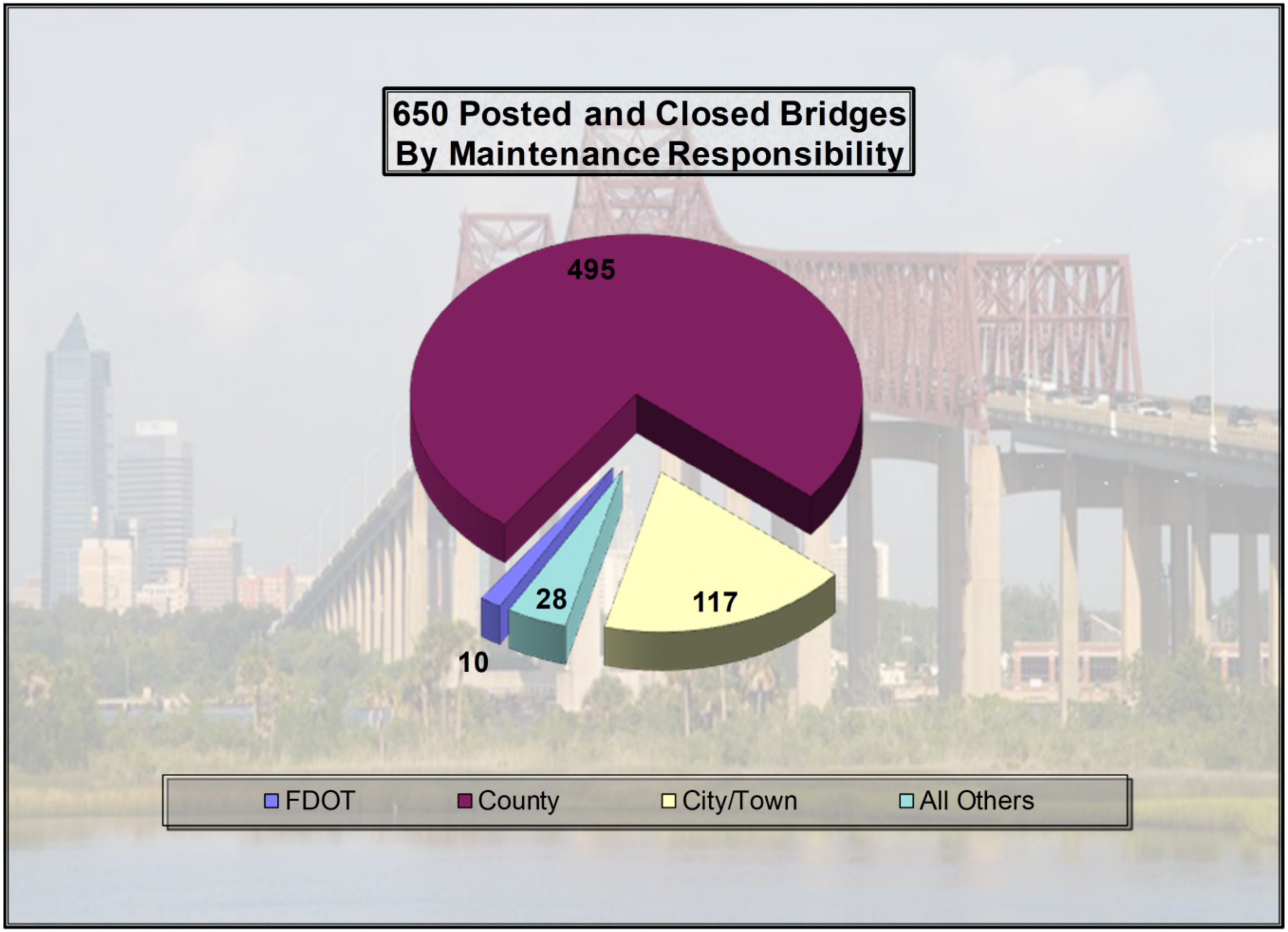

650 Posted and Closed Bridges
By Maintenance Responsibility
495
28
117
10
FDOT
County
City/Town
All Others

Figure 22

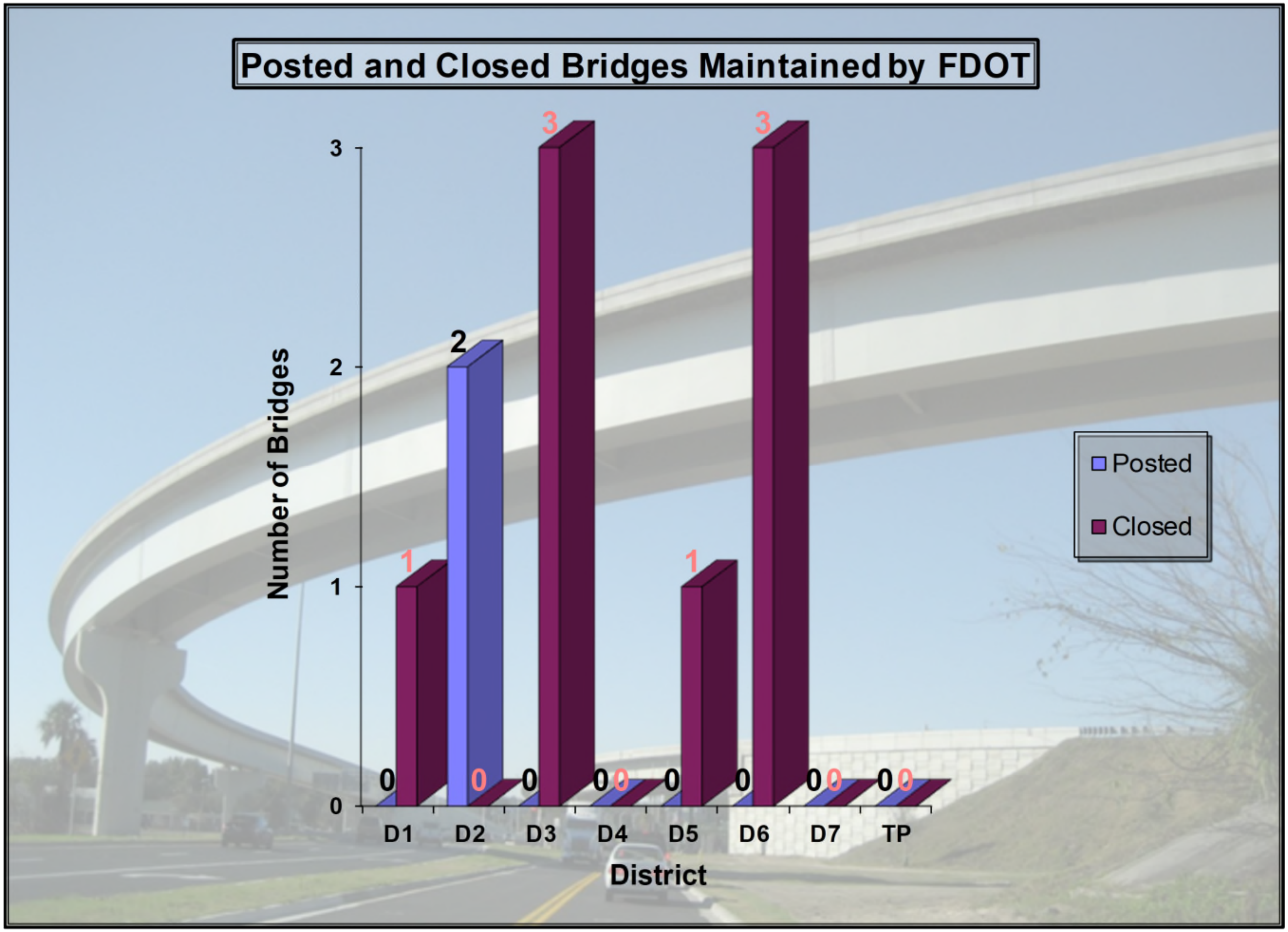

Posted and Closed Bridges Maintained by FDOT
Number of Bridges
District
0
1
2
3
D1
D2
D3
D4
D5
D6
D7
TP
Posted
Closed
0
1
2
0
0
3
0
0
0
1
0
3
0
0
0
0

Figure 23

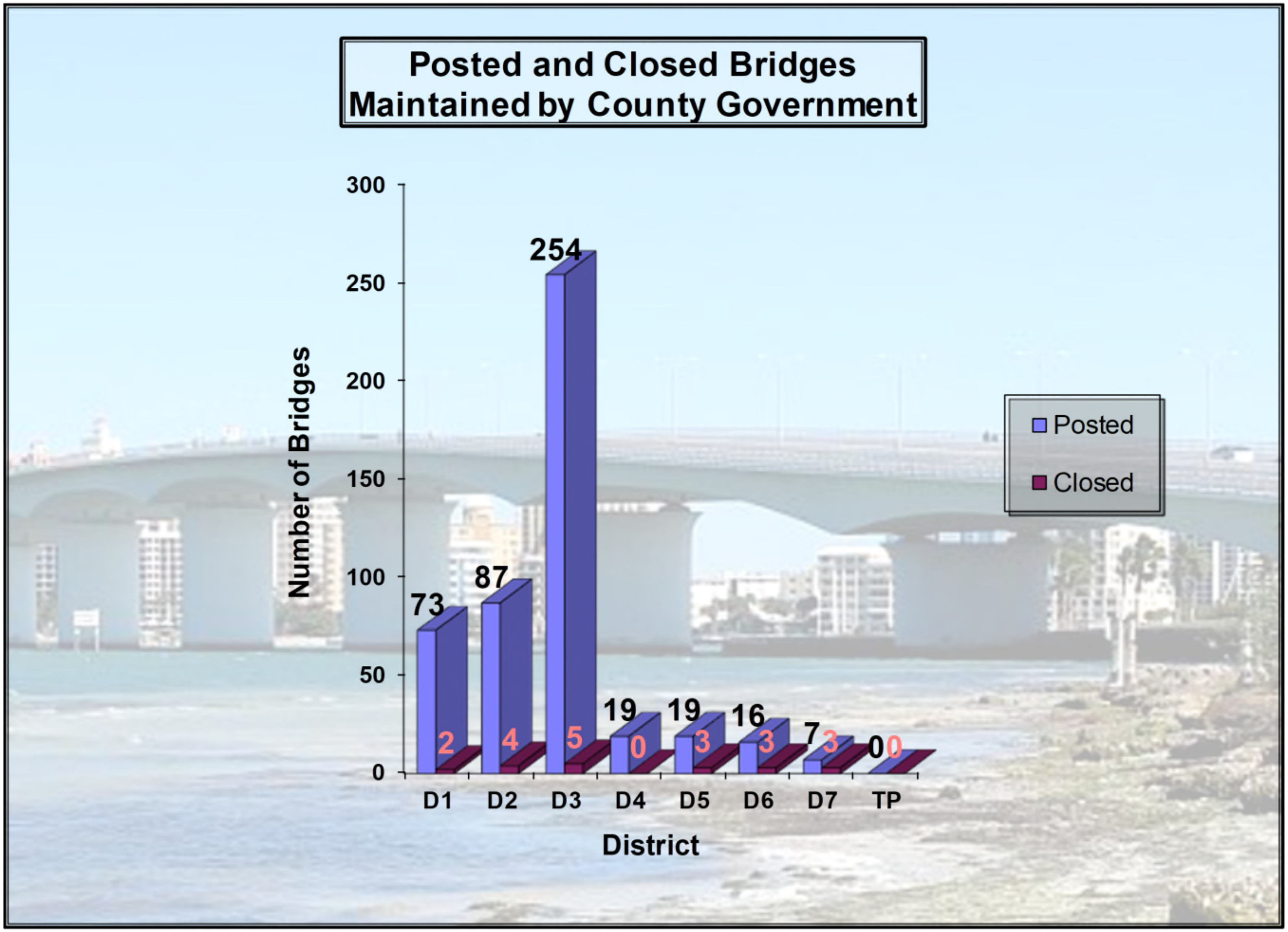

Posted and Closed Bridges
Maintained by County Government
Number of Bridges
300
250
200
150
100
50
0
73
87
254
19
19
16
7
0
2
4
5
0
3
3
3
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 24

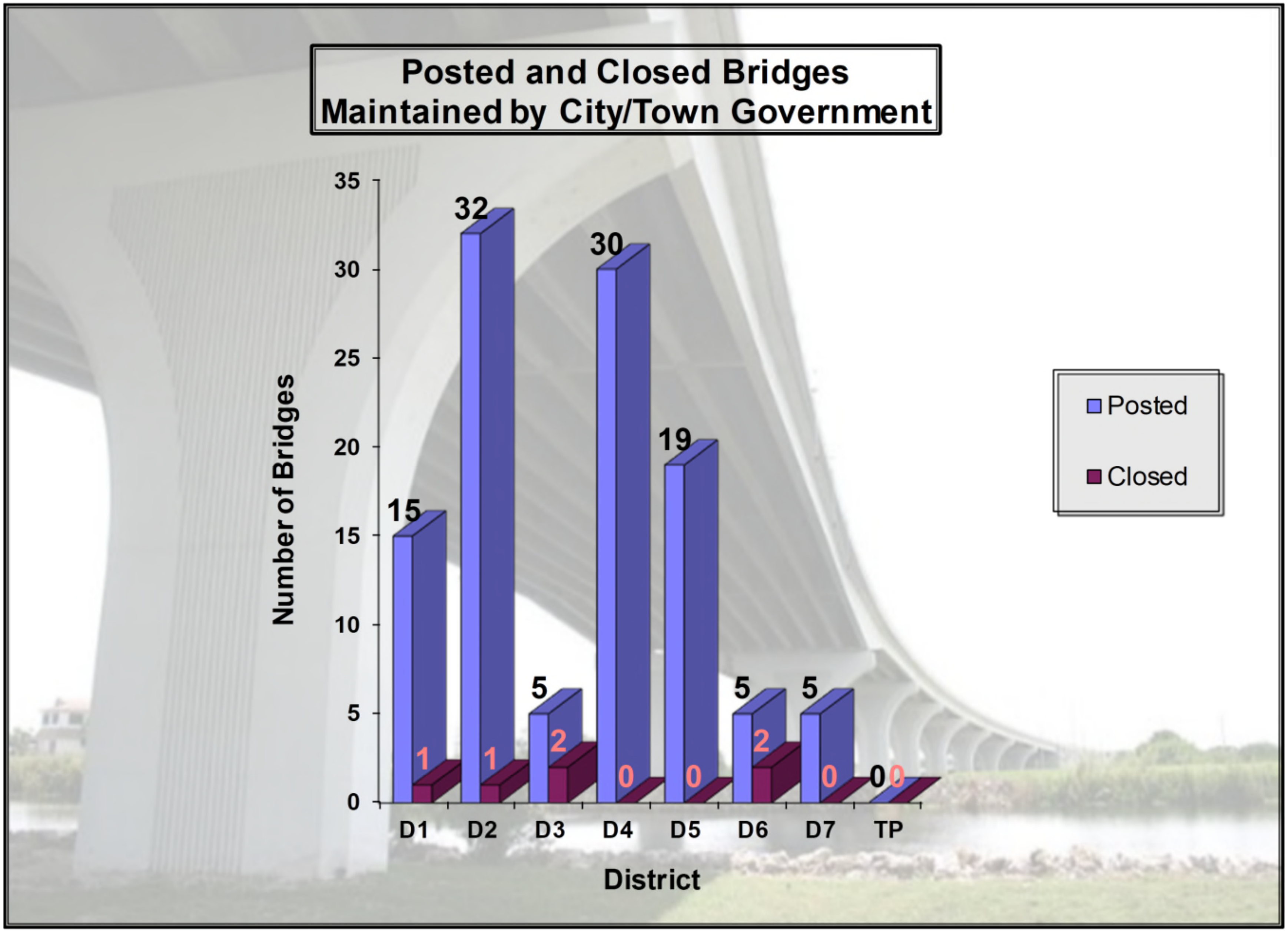
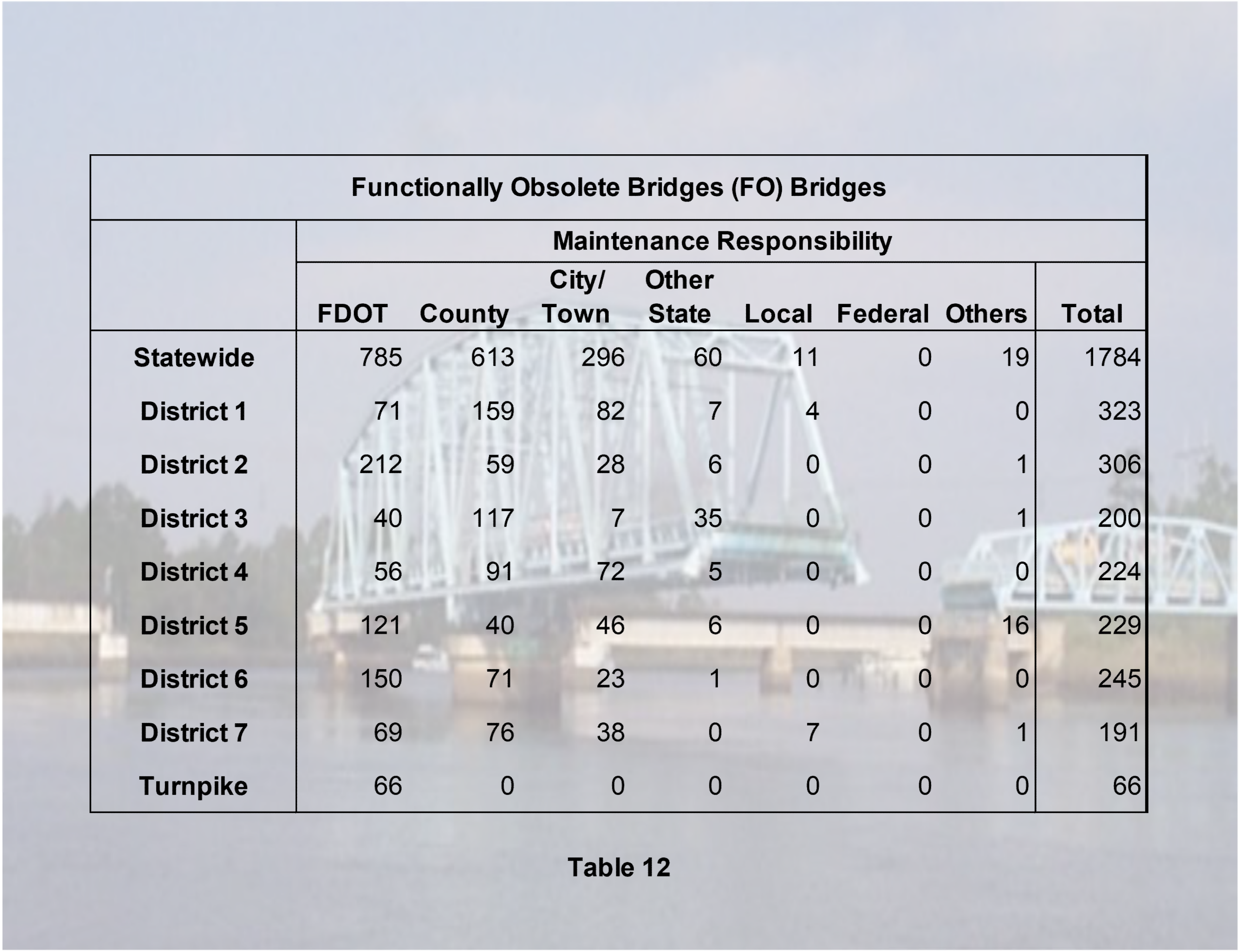

Posted and Closed Bridges
Maintained by City/Town Government
Number of Bridges
35
30
25
20
15
10
5
0
15
1
32
1
5
2
30
0
19
0
5
2
5
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 25

Functionally Obsolete Bridges

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

There are currently 1,784 functionally obsolete bridges in Florida, about 14.31% of the total. The FDOT has maintenance responsibility for over 44.00% of all functionally obsolete bridges (see Figure 26). Refer to Figure 30 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	785	613	296	60	11	0	19	1784
District 1	71	159	82	7	4	0	0	323
District 2	212	59	28	6	0	0	1	306
District 3	40	117	7	35	0	0	1	200
District 4	56	91	72	5	0	0	0	224
District 5	121	40	46	6	0	0	16	229
District 6	150	71	23	1	0	0	0	245
District 7	69	76	38	0	7	0	1	191
Turnpike	66	0	0	0	0	0	0	66

Table 12

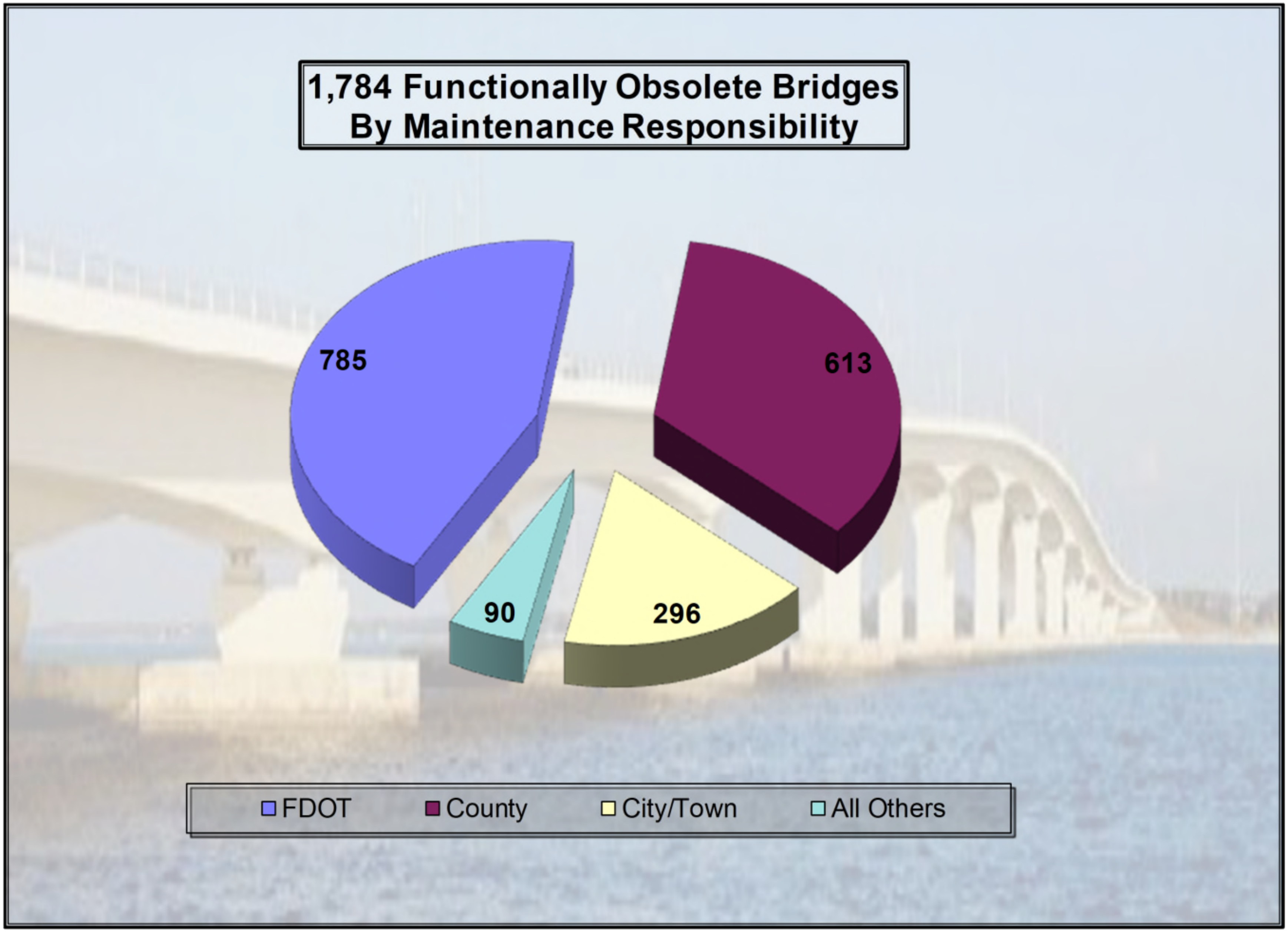

1,784 Functionally Obsolete Bridges
By Maintenance Responsibility
785
613
90
296
FDOT
County
City/Town
All Others

Figure 26

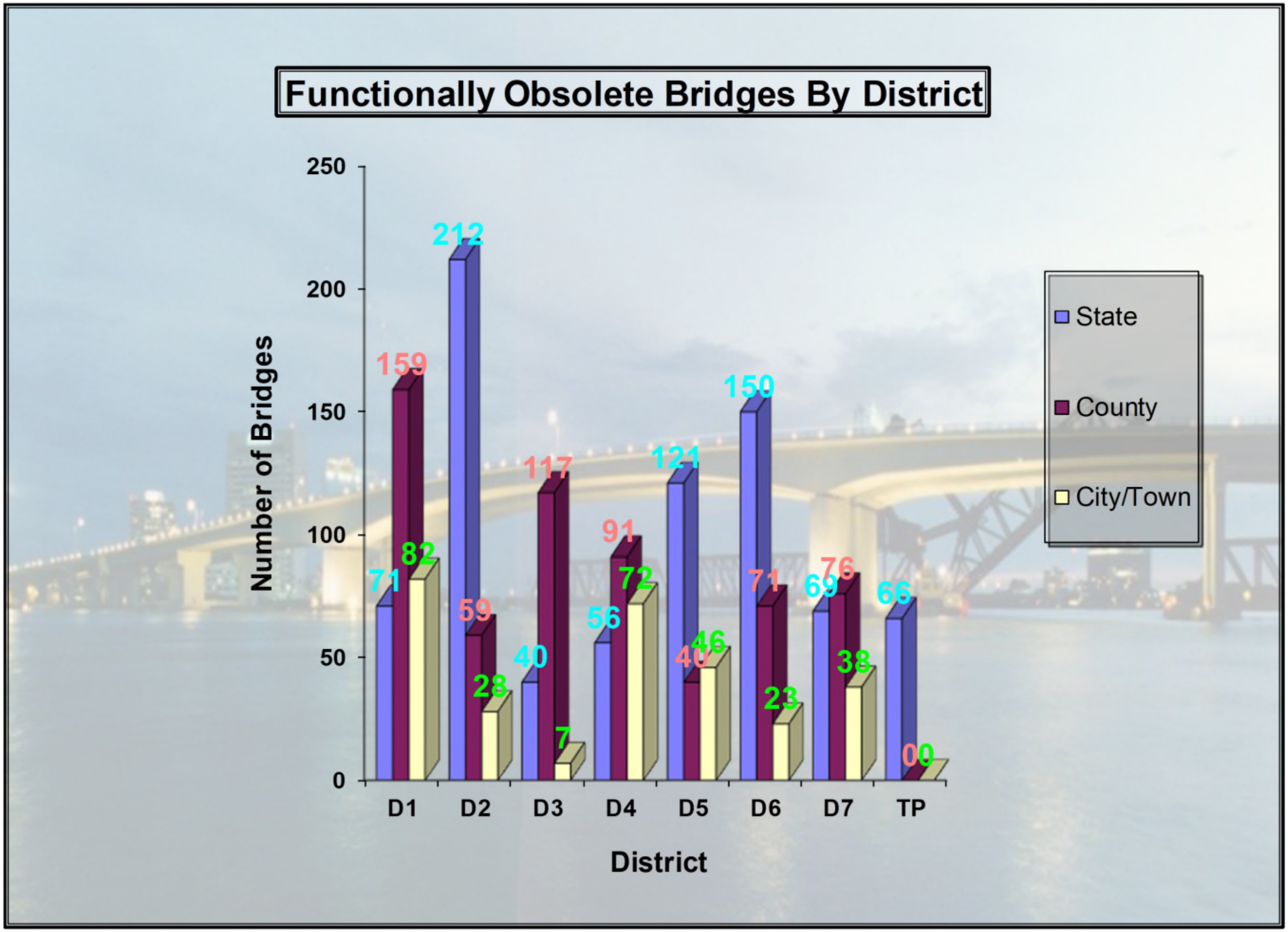

Functionally Obsolete Bridges By District
250
200
150
100
50
0
Number of Bridges
71
159
82
212
59
28
40
117
7
56
91
72
121
40
46
150
71
23
69
76
38
66
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
State
County
City/Town

Figure 30

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	52,001	234,895	523,282	688,575	648,740	695,281	1,681,999	1,121,842	468,877	6,115,491
P/C Slab	39,593	0	62,929	855,106	739,580	704,205	337,756	23,259	105,176	2,867,604
R/C Beam	220,913	190,218	530,066	0	0	0	11,260	31,399	925,457	1,909,314
P/C Beam	21,054	0	3,303,946	12,209,183	16,278,299	15,464,107	12,647,642	15,498,146	8,763,449	84,185,825
Steel Beam	452,369	185,796	2,016,704	4,767,326	7,666,094	2,857,827	3,218,393	3,652,931	1,385,995	26,203,435
Timber Beam	0	0	0	986	0	0	0	0	0	986
R/C Box	0	0	0	40,831	51,600	0	0	0	0	92,431
P/C Box	0	0	0	0	0	0	0	294,359	24,075	318,433
Steel Box	0	0	0	0	94,340	1,336,804	1,529,161	1,373,837	597,418	4,931,560
Truss	223,224	0	428,255	250,860	0	0	0	0	0	902,340
Movable	203,612	87,839	698,331	544,007	659,422	371,782	403,682	564,073	236,253	3,769,001
Culvert	82,886	125,120	323,991	623,116	359,906	145,667	165,486	187,304	89,614	2,103,089
Other	13,937	20,048	133,130	0	0	6,703,130	2,918,134	4,694,663	1,128,204	15,611,245
Total	1,309,589	843,915	8,020,634	19,979,989	26,497,980	28,278,803	23,071,078	27,441,814	13,724,519	149,168,320

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	6,240	28,463	63,409	91,221	93,391	100,939	247,712	161,151	62,821	855,346
P/C Slab	5,939	0	9,439	128,266	110,937	105,631	50,663	3,489	15,776	430,141
R/C Beam	20,987	18,071	50,356	0	0	0	1,070	2,983	94,633	188,099
P/C Beam	2,211	0	346,914	1,283,793	1,713,371	1,632,395	1,380,335	1,673,484	927,905	8,960,409
Steel Beam	50,342	22,089	235,720	599,126	916,103	361,690	404,601	455,251	174,624	3,219,546
Timber Beam	0	0	0	94	0	0	0	0	0	94
R/C Box	0	0	0	6,125	7,740	0	0	0	0	13,865
P/C Box	0	0	0	0	0	0	22,847	42,682	3,491	69,020
Steel Box	0	0	0	0	14,151	200,521	229,374	206,076	89,613	739,734
Truss	39,064	0	74,945	43,901	0	0	0	0	0	157,909
Movable	76,176	26,894	234,327	220,423	164,865	120,854	143,910	177,399	65,155	1,230,003
Culvert	7,874	11,886	30,779	59,196	34,191	13,838	15,721	17,794	8,513	199,793
Other	2,091	3,007	19,970	0	0	1,005,469	437,720	704,199	169,231	2,341,687
Total	210,924	110,411	1,065,858	2,432,144	3,054,749	3,541,337	2,933,953	3,444,507	1,611,762	18,405,645

Table 14

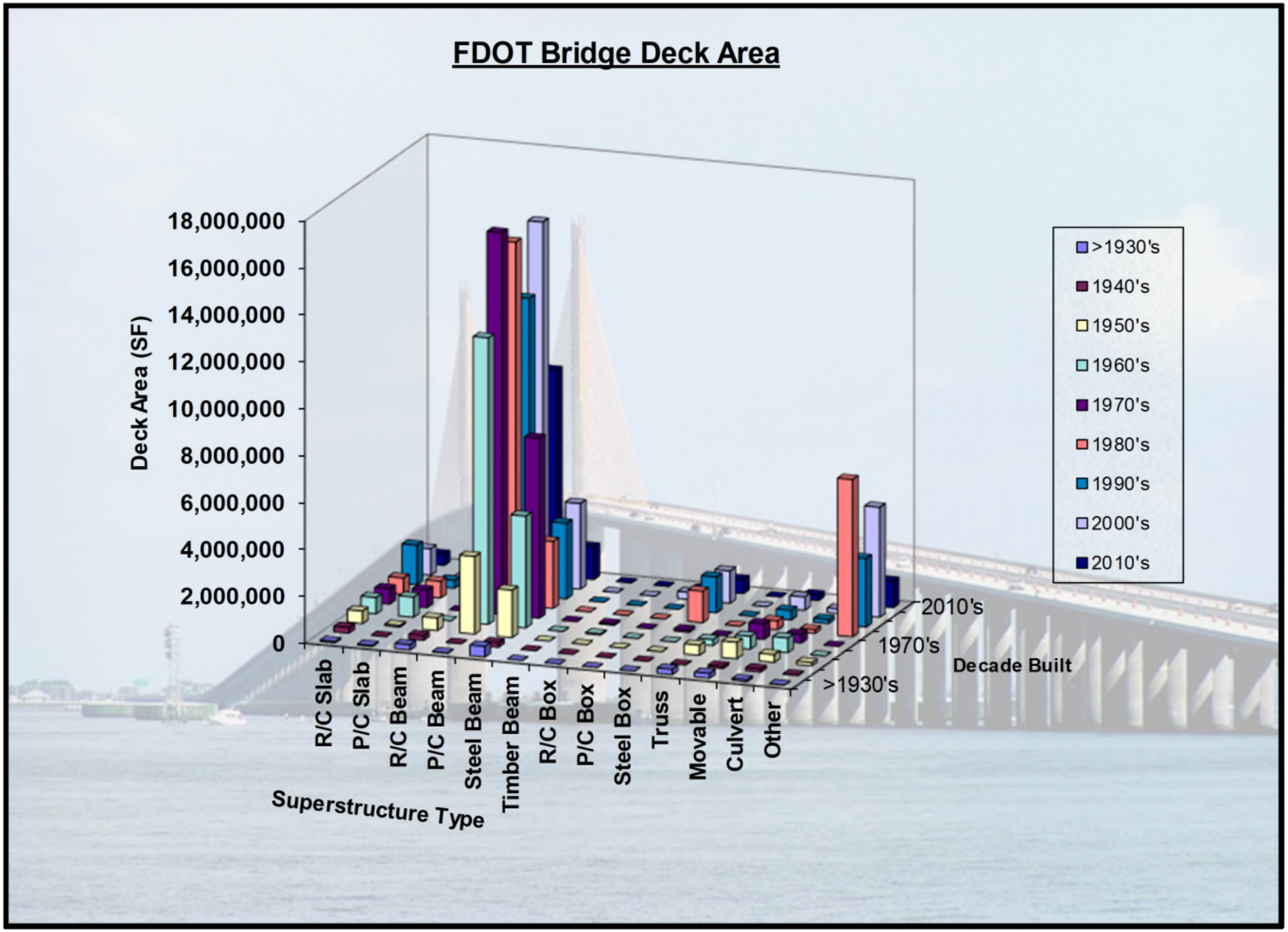

FDOT Bridge Deck Area
Deck Area (SF)
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Superstructure Type
2010's
1970's
>1930's
Decade Built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

Figure 28

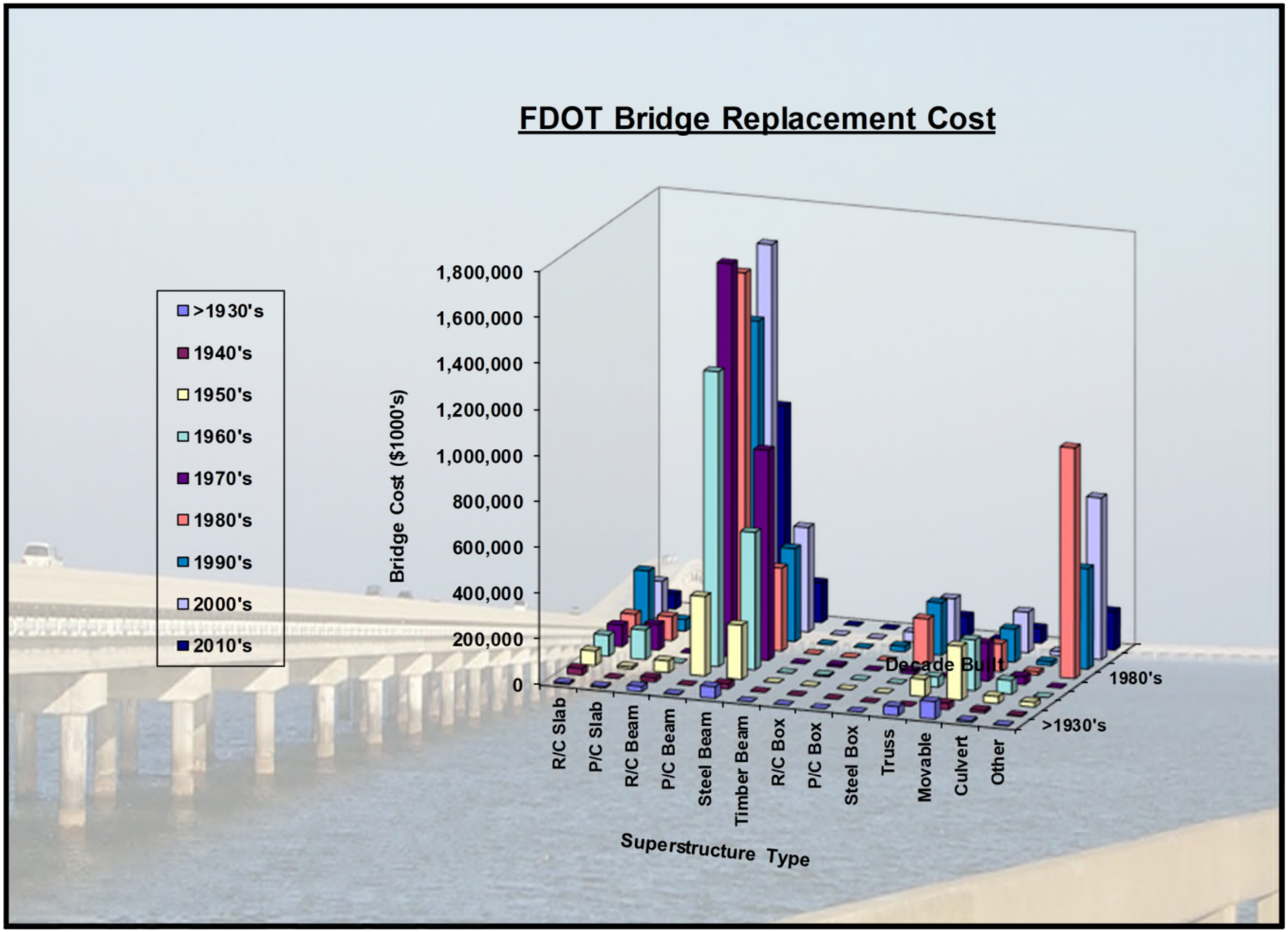
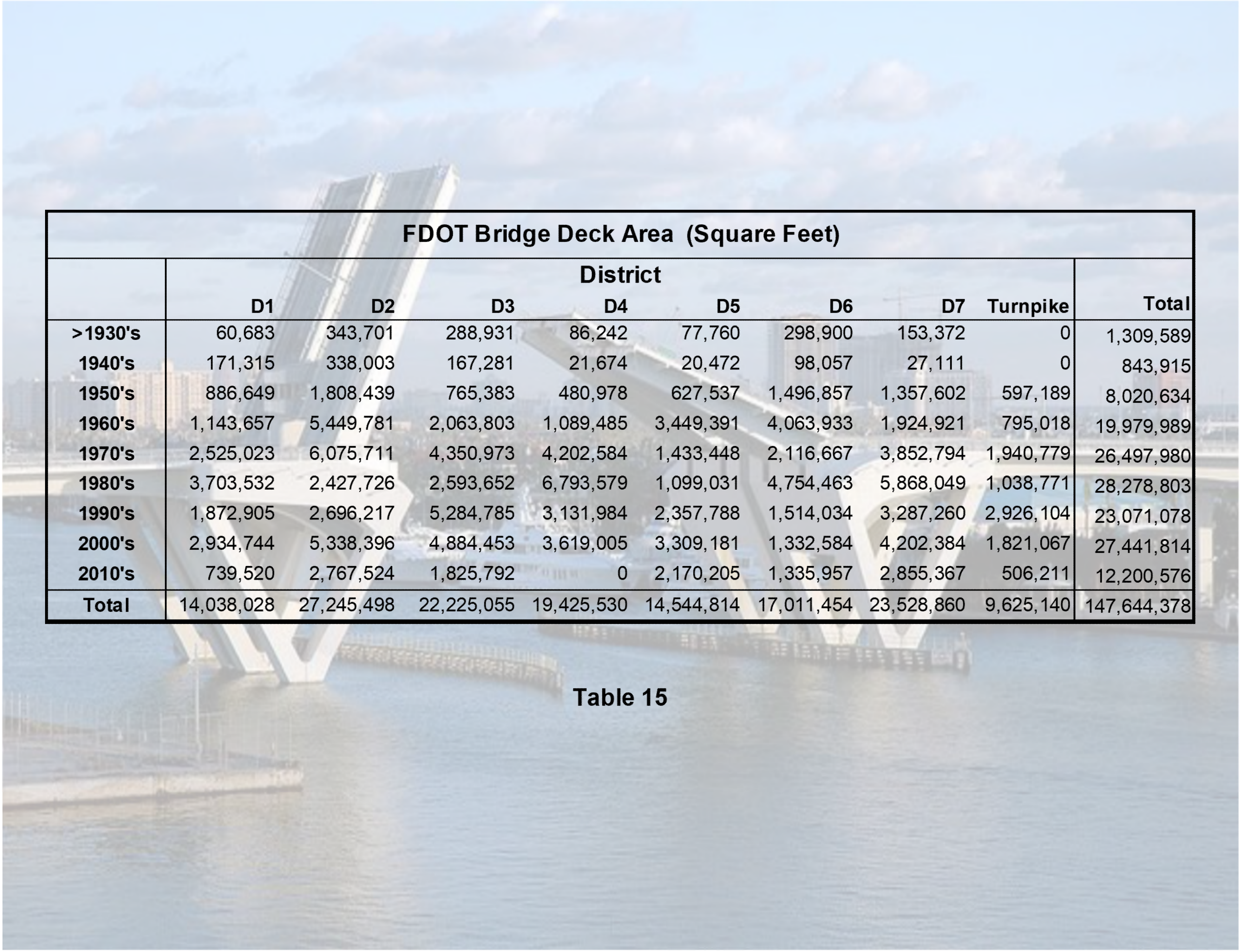

FDOT Bridge Replacement Cost
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Bridge Cost ($1000's)
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert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

Figure 29



FDOT Bridge Deck Area (Square Feet)									
	District								
	D1	D2	D3	D4	D5	D6	D7	Turnpike	Total
>1930's	60,683	343,701	288,931	86,242	77,760	298,900	153,372	0	1,309,589
1940's	171,315	338,003	167,281	21,674	20,472	98,057	27,111	0	843,915
1950's	886,649	1,808,439	765,383	480,978	627,537	1,496,857	1,357,602	597,189	8,020,634
1960's	1,143,657	5,449,781	2,063,803	1,089,485	3,449,391	4,063,933	1,924,921	795,018	19,979,989
1970's	2,525,023	6,075,711	4,350,973	4,202,584	1,433,448	2,116,667	3,852,794	1,940,779	26,497,980
1980's	3,703,532	2,427,726	2,593,652	6,793,579	1,099,031	4,754,463	5,868,049	1,038,771	28,278,803
1990's	1,872,905	2,696,217	5,284,785	3,131,984	2,357,788	1,514,034	3,287,260	2,926,104	23,071,078
2000's	2,934,744	5,338,396	4,884,453	3,619,005	3,309,181	1,332,584	4,202,384	1,821,067	27,441,814
2010's	739,520	2,767,524	1,825,792	0	2,170,205	1,335,957	2,855,367	506,211	12,200,576
Total	14,038,028	27,245,498	22,225,055	19,425,530	14,544,814	17,011,454	23,528,860	9,625,140	147,644,378

Table 15

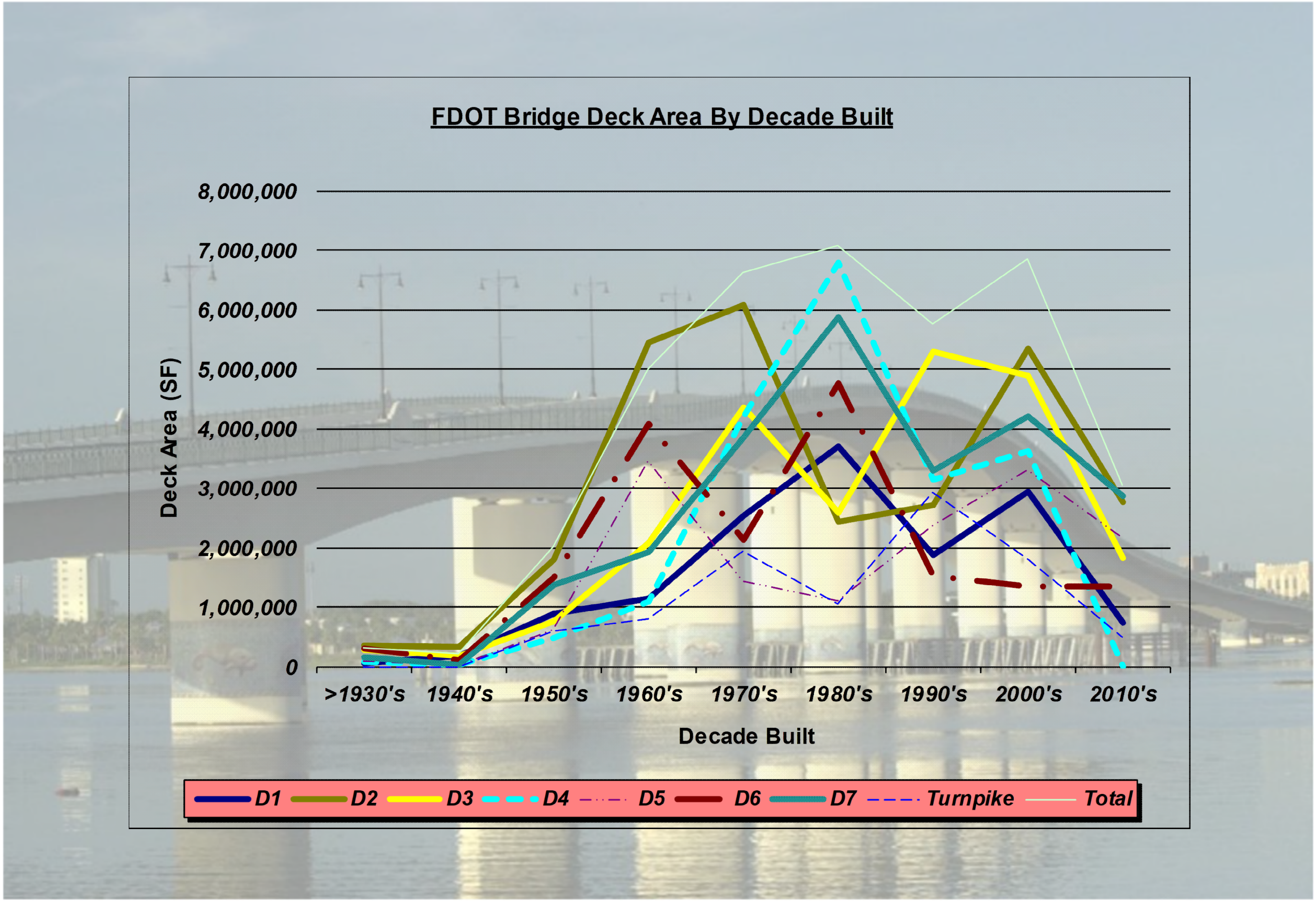
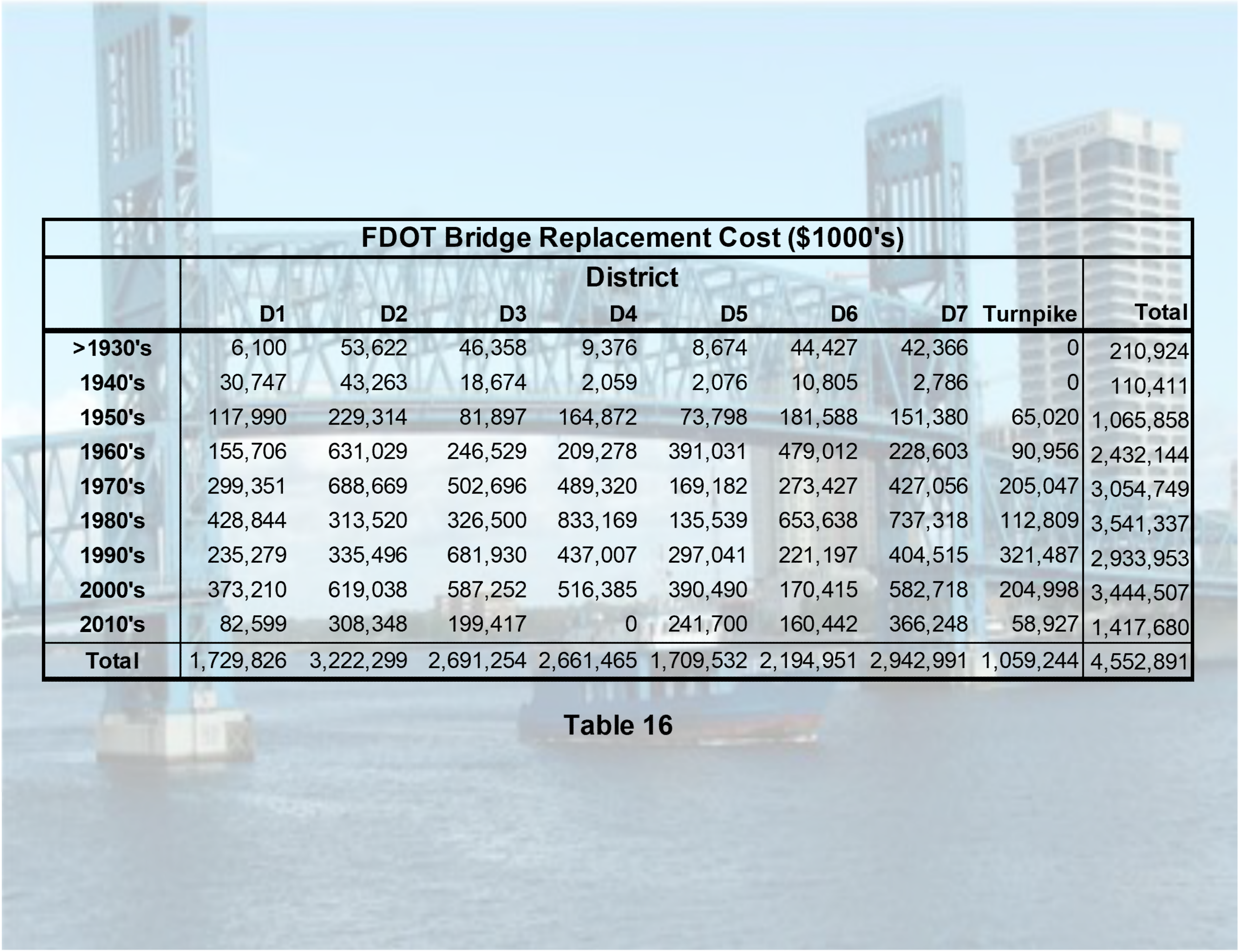

FDOT Bridge Deck Area By Decade Built
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Deck Area (SF)
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
Turnpike
Total

Figure 30



FDOT Bridge Replacement Cost ($1000's)									
	District								
	D1	D2	D3	D4	D5	D6	D7	Turnpike	Total
>1930's	6,100	53,622	46,358	9,376	8,674	44,427	42,366	0	210,924
1940's	30,747	43,263	18,674	2,059	2,076	10,805	2,786	0	110,411
1950's	117,990	229,314	81,897	164,872	73,798	181,588	151,380	65,020	1,065,858
1960's	155,706	631,029	246,529	209,278	391,031	479,012	228,603	90,956	2,432,144
1970's	299,351	688,669	502,696	489,320	169,182	273,427	427,056	205,047	3,054,749
1980's	428,844	313,520	326,500	833,169	135,539	653,638	737,318	112,809	3,541,337
1990's	235,279	335,496	681,930	437,007	297,041	221,197	404,515	321,487	2,933,953
2000's	373,210	619,038	587,252	516,385	390,490	170,415	582,718	204,998	3,444,507
2010's	82,599	308,348	199,417	0	241,700	160,442	366,248	58,927	1,417,680
Total	1,729,826	3,222,299	2,691,254	2,661,465	1,709,532	2,194,951	2,942,991	1,059,244	4,552,891

Table 16

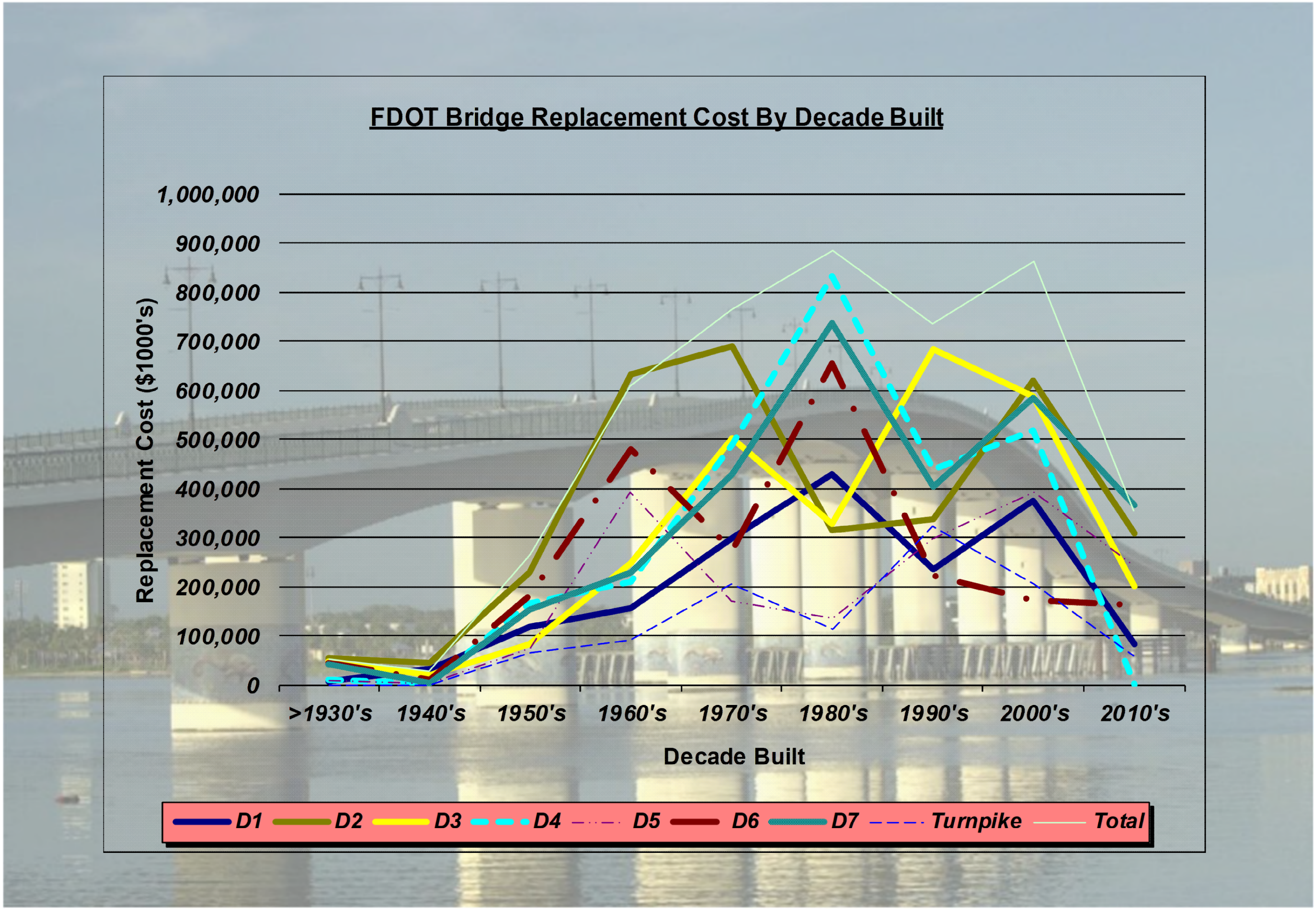

FDOT Bridge Replacement Cost By Decade Built
Replacement Cost ($1000's)
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
Turnpike
Total

Figure 31

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

District	Deck Area (SF)		Bridge Cost ($1000's)	
	WC	NWC	WC	NWC
1	10,262,567	3,373,682	1,304,993	386,665
2	17,556,279	9,156,781	2,101,439	1,070,279
3	18,446,476	3,461,742	2,241,711	419,444
4	10,262,661	10,628,063	1,591,617	1,258,350
5	8,234,421	5,976,092	1,015,460	662,313
6	10,837,117	6,170,711	1,496,250	698,357
7	13,431,535	9,797,455	1,733,901	1,180,602
Turnpike	3,683,957	5,785,693	404,912	639,561
Total	92,715,012	54,350,220	11,890,281	6,315,571

Table 17

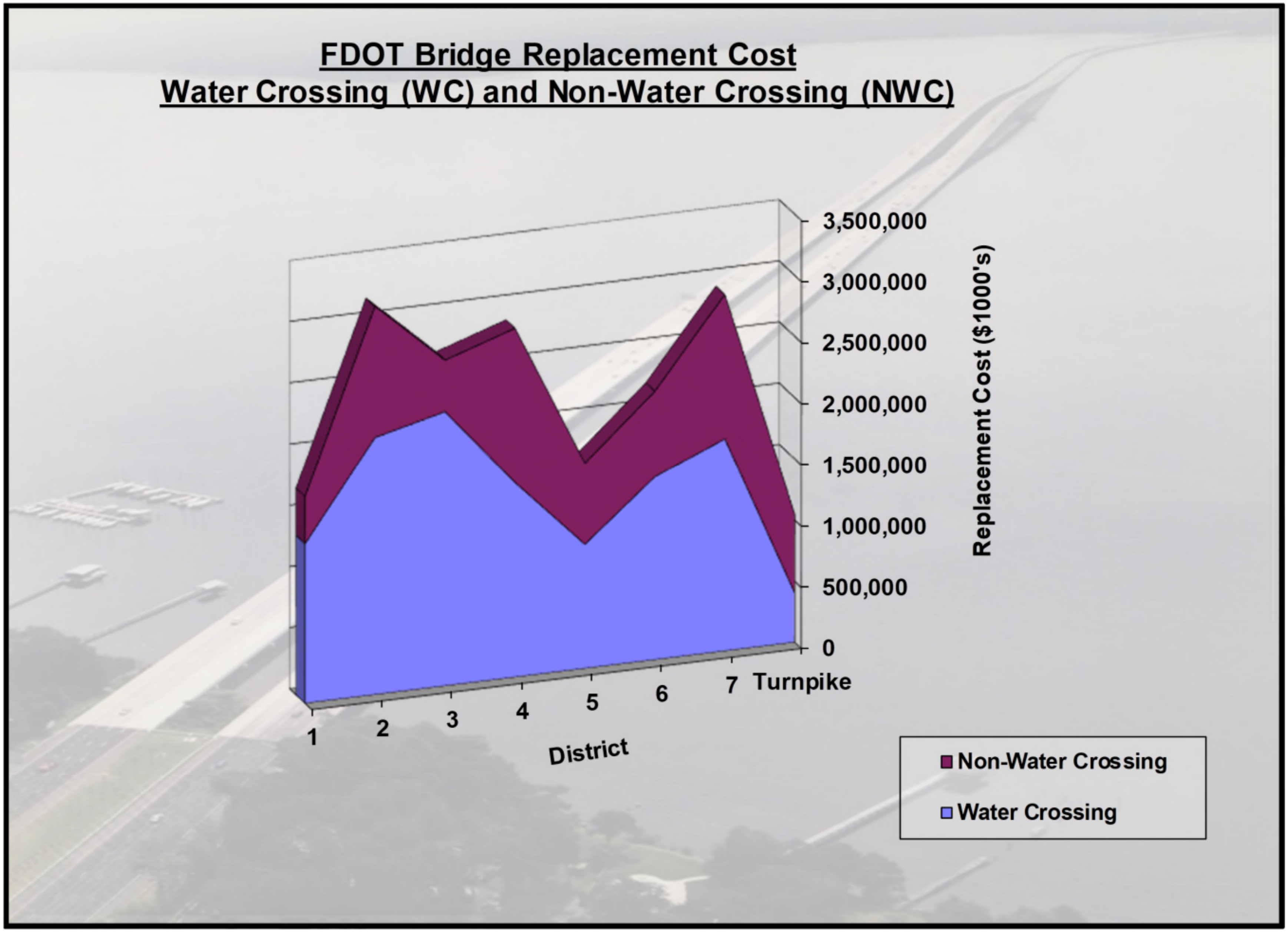

FDOT Bridge Replacement Cost
Water Crossing (WC) and Non-Water Crossing (NWC)
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Replacement Cost ($1000's)
1
2
3
4
5
6
7
Turnpike
District
Non-Water Crossing
Water Crossing

Figure 32

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 12,471 bridges accounted for in Florida. The FDOT has maintenance responsibility for 7,007 of the bridges, or 56.19%. County governments maintain 3,915 bridges (31.39%), city and towns maintain 1,253 bridges (10.05%), with the remaining 296 bridges (2.37%) maintained by others. 14.43% of all bridges currently in service in Florida were constructed prior to 1960; 35.42% were constructed in the 1960's and 1970's, while the remaining 50.16% have been built since 1980. This distribution is relatively consistent for the three maintenance groups (FDOT, Counties, and City/Towns) used in this report. Bridges do not last forever. Through aggressive preventive maintenance, the strategy is to leverage advances in material science, design practices, and construction methods to extend the useful life of the bridges, thereby minimizing the need to replace a large number of bridges within a short time period. The challenge is to determine the most cost effective mix of preventive maintenance, routine maintenance, repair, rehabilitation, replacement, and other actions over the life of the bridges.

Florida's bridges are generally in good condition, with those maintained by the FDOT in better condition than those maintained by local governments or others. The most serious threat to bridges in Florida is the corrosion of steel reinforced concrete substructures in coastal regions. Much has been learned in recent years about corrosion in marine environments, affecting material specifications and design practices that helps new bridges built today. However, the older bridges in the coastal regions are beginning to require careful evaluation and extensive corrective actions. On-going research will continue to provide useful information to help meet this challenge. Other challenges include: confronting the increasingly extensive environmental and public health issues related to protective coatings for steel bridges with lead based paint; completing the statewide bridge scour evaluation program to identify scour critical bridges (bridges that could fail during floods) and to provide scour countermeasures as corrective action where required; to stay on top of movable bridge maintenance and rehabilitation; and to improve preventive maintenance on the large population (35.42% 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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