Florida Department of Transportation

Bridge Inventory 2020 Annual Report

July 2020

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 12,529 bridge-structures accounted for in the Florida DOT Bridge Management System. The FDOT has maintenance responsibility for 7,044 of the bridges, or 56.22%. County governments maintain 3,924 bridges (31.32%), city and towns maintain 1,259 bridges (10.05%), with the remaining 302 bridges (2.41%) maintained by others (see Figure 1).

The 7,044 bridges maintained by FDOT are divided by district and shown in Figure 2. District 2 has the most bridges, with 1,281 (18.19%), followed by District 5 (1136 bridges – 16.13%), District 1 (941 bridges – 13.36%), District 3 (829 bridges – 11.77%), District 4 (773 bridges - 10.97%), District 7 (739 bridges – 10.49%), Turnpike District (716 bridges – 10.16%), and District 6 (629 bridges – 8.93%). The number of bridges shown includes the 154 bridges maintained by the Dade County Expressway Authority (MDX) and 349 bridges maintained by the Central Florida Expressway Authority (CFX).

This issue is dedicated to the local residents who most generously allow our professionals to perform their duties.

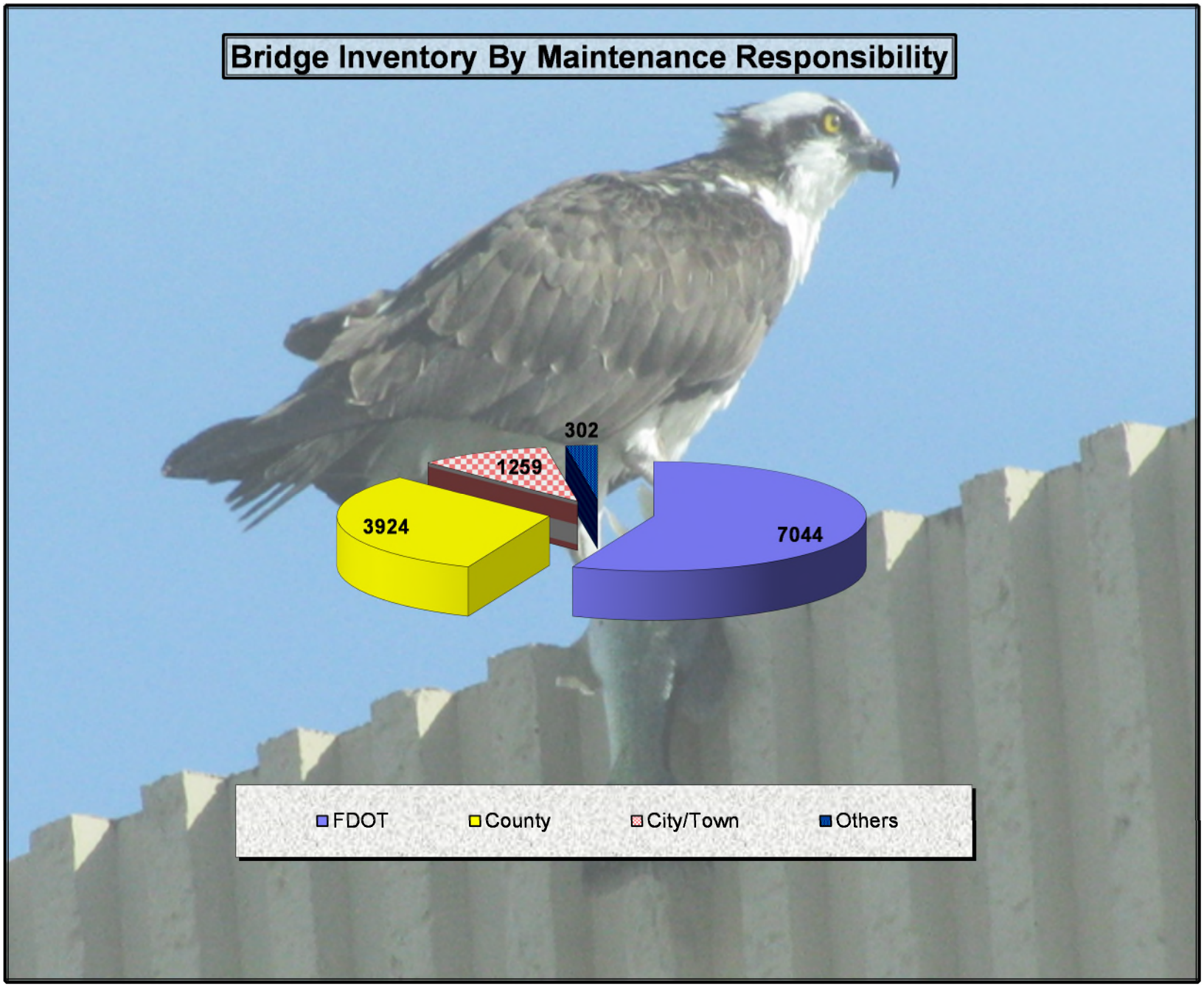

Bridge Inventory By Maintenance Responsibility
302
1259
3924
7044
FDOT
County
City/Town
Others

Figure 1

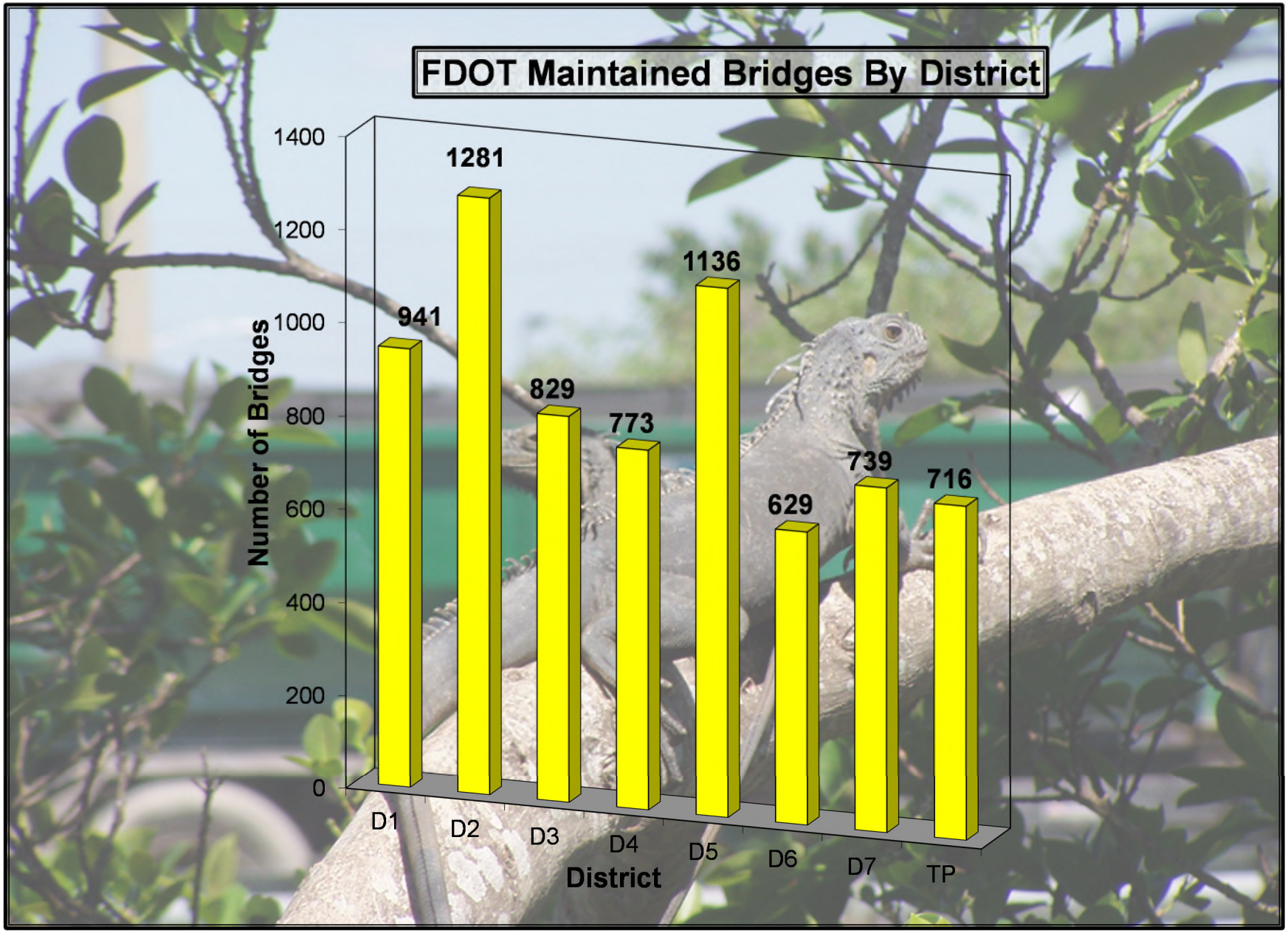


Figure 2

NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 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 7,049 bridges maintained by FDOT, approximately 12.65% were constructed prior to 1960, about 36.70% were constructed in the 1960's and 1970's, with the remaining 50.65% having been built since 1980 (see Figure 3).

Similar results can be seen with the statewide bridge inventory of county government maintained bridges with 16.87% constructed prior to 1960, 32.03% constructed in the 1960's and 1970's, and 51.10% since 1980 (see Figure 4).

The city and town maintained bridges are very similar as well, with 16.12% constructed prior to 1960, 37.49% constructed in the 1960's and 1970's, and 46.39% since 1980 (see Figure 5).

An examination of the distribution of the decade of construction by FDOT District, for the 7,044 FDOT maintained bridges show that the older bridge populations are concentrated in the rural and older urban areas, as one would expect (see Tables 2 & 3). The percentage of District bridge inventories built prior to the 1960's are as follows: District 1 – 21.57%, District 2 – 19.67%, District 3 – 16.28%, District 4 – 5.05%, District 5 – 7.83%, District 6 – 9.38%, District 7 – 9.34%, 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	146	90	42	0	0	4	0	282
1940s	201	129	18	2	0	0	0	350
1950s	544	443	143	11	0	0	0	1141
1960s	1361	767	191	20	6	0	2	2347
1970s	1224	490	281	4	10	0	8	2017
1980s	876	492	214	17	8	0	17	1624
1990s	897	630	157	38	9	0	22	1753
2000s	977	492	131	53	8	0	11	1672
2010s	816	391	82	20	10	0	22	1341
Total	7044	3924	1259	165	51	4	82	12529

Table 1

NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 CFX bridges.

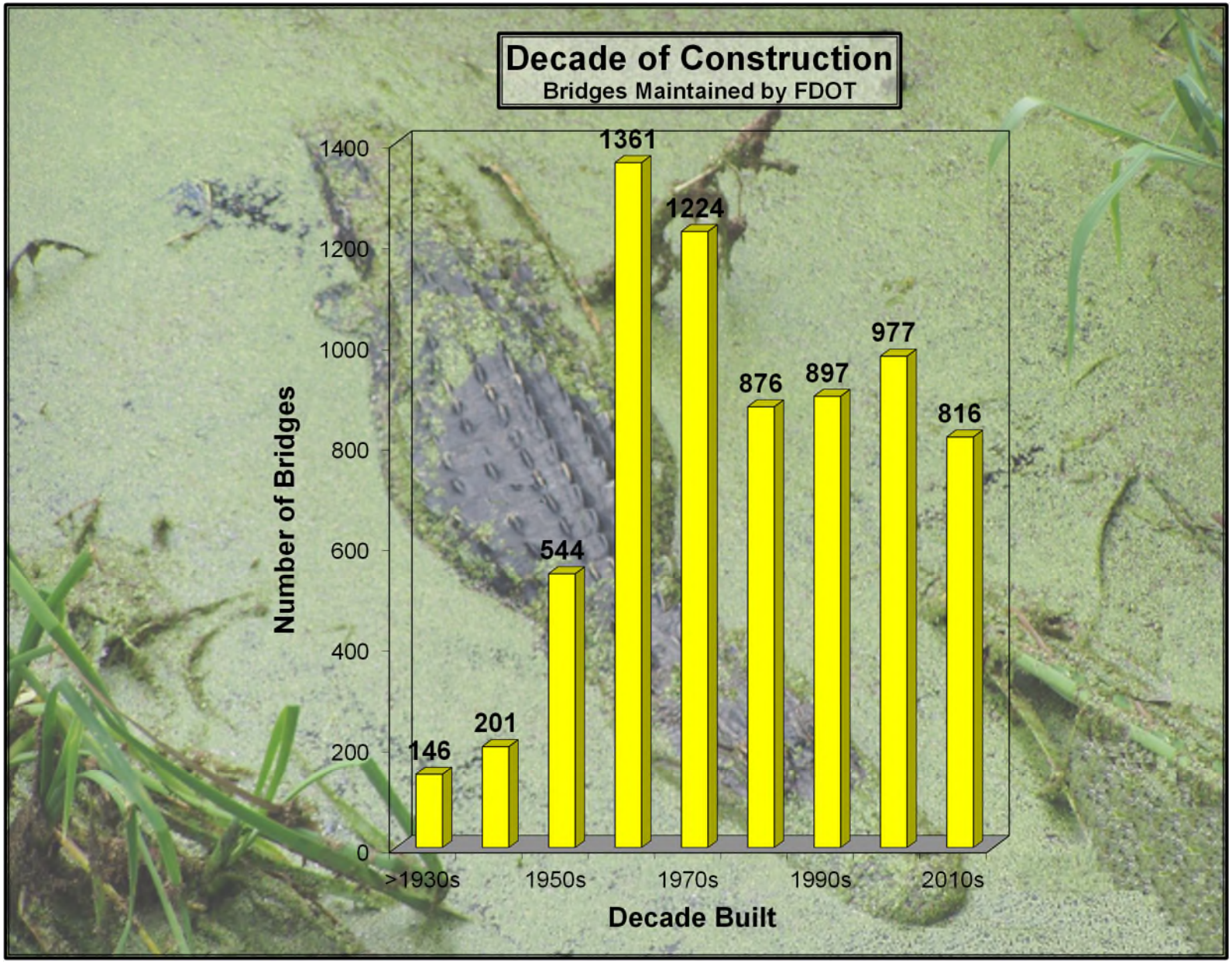


Figure 3

NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 CFX bridges.

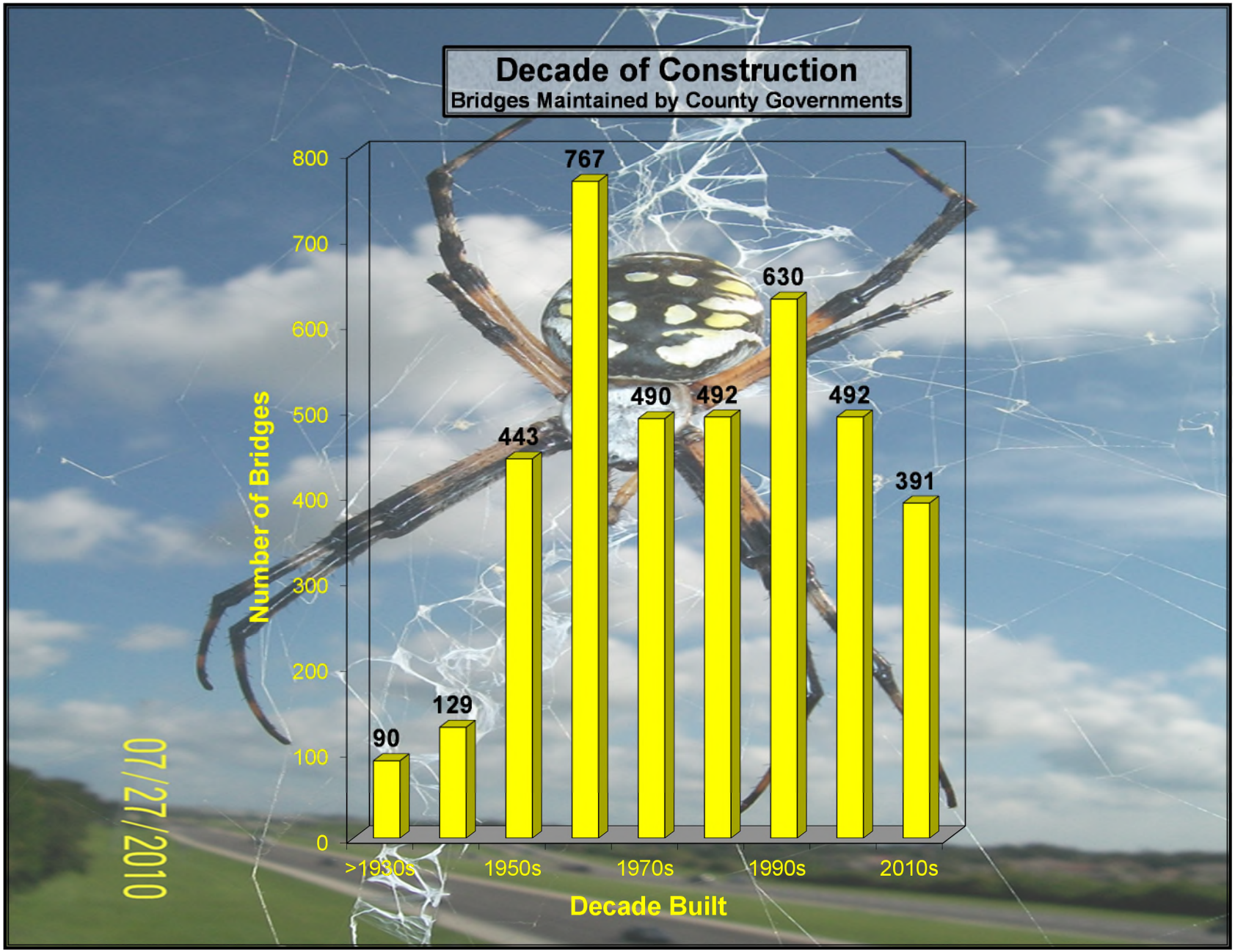


Figure 4

NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 CFX bridges.

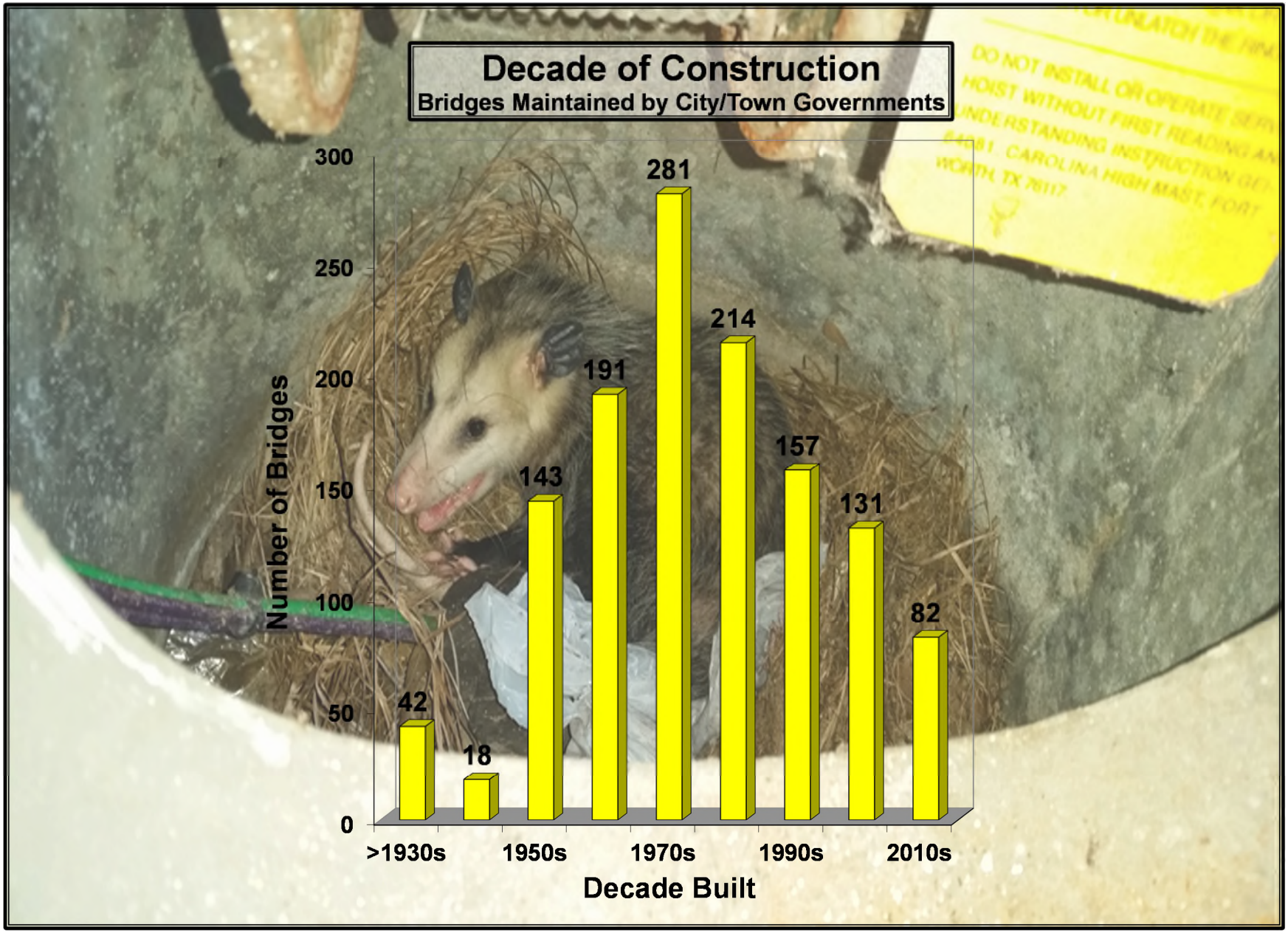


Figure 5

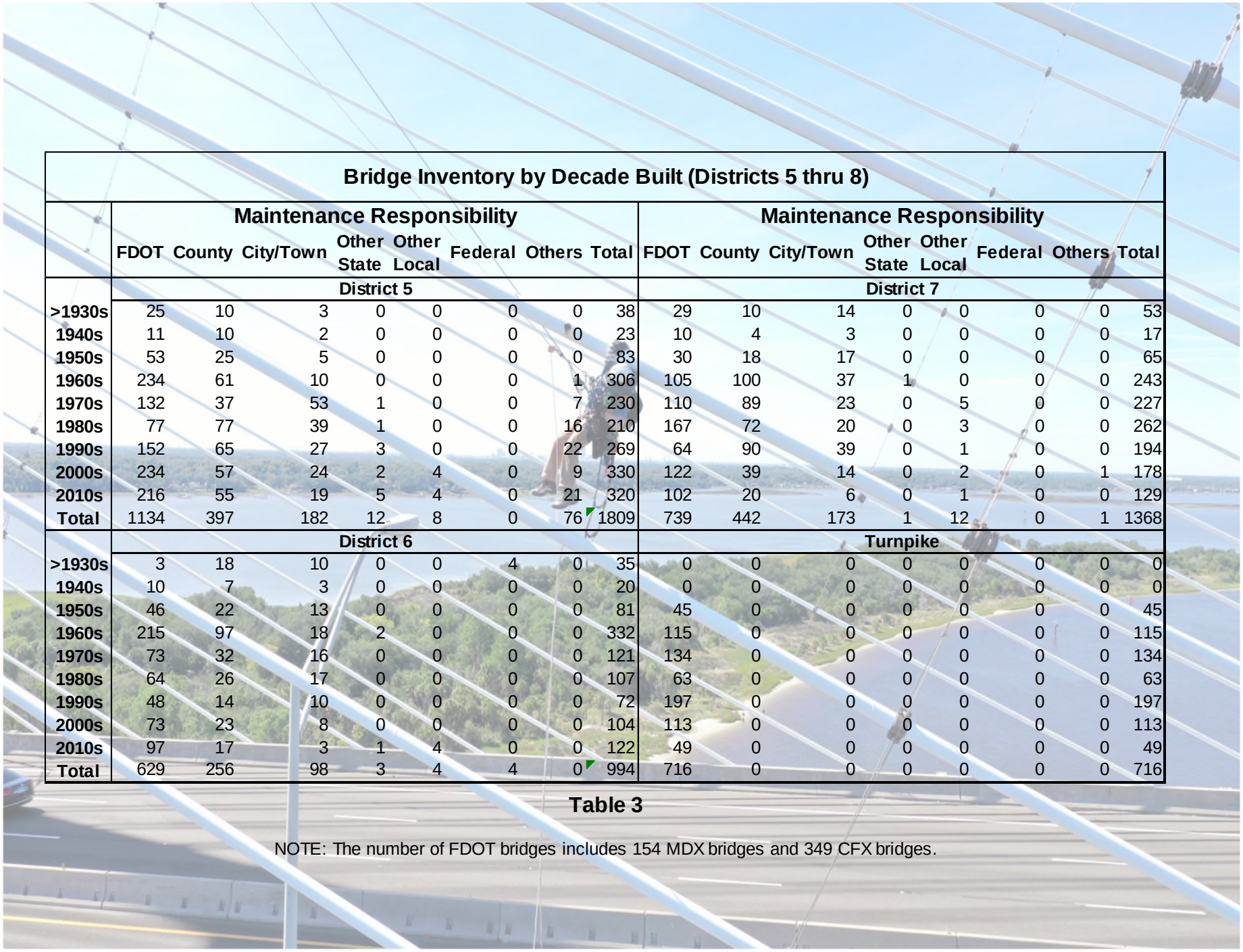
NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 CFX bridges.

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	22	9	5	0	0	0	0	36	10	24	0	0	0	0	0	34
1940s	59	24	1	1	0	0	0	85	51	31	2	1	0	0	0	85
1950s	122	99	13	1	0	0	0	235	74	130	4	0	0	0	0	208
1960s	110	204	36	7	6	0	0	363	101	147	5	5	0	0	0	258
1970s	153	132	84	0	3	0	0	372	284	87	8	3	2	0	0	384
1980s	176	136	48	1	5	0	0	366	58	64	8	14	0	0	1	145
1990s	138	126	26	6	8	0	0	304	103	185	11	26	0	0	0	325
2000s	97	103	20	4	1	0	0	225	68	152	10	41	1	0	0	272
2010s	64	95	14	4	1	0	0	178	80	123	5	8	0	0	0	216
Total	941	928	247	24	24	0	0	2164	829	943	53	98	3	0	1	1927
	District 2								District 4							
>1930s	53	15	4	0	0	0	0	72	4	4	6	0	0	0	0	14
1940s	59	51	3	0	0	0	0	113	1	2	4	0	0	0	0	7
1950s	140	113	32	5	0	0	0	290	34	36	59	5	0	0	0	134
1960s	411	92	31	1	0	0	0	535	70	66	54	4	0	0	1	195
1970s	191	39	31	0	0	0	1	262	147	74	66	0	0	0	0	287
1980s	45	45	28	0	0	0	0	118	226	72	54	1	0	0	0	353
1990s	96	45	27	2	0	0	0	170	99	105	17	1	0	0	0	222
2000s	146	53	37	3	0	0	1	240	124	65	18	3	0	0	0	210
2010s	140	40	15	1	0	0	0	196	68	41	20	1	0	0	1	131
Total	1281	493	208	12	0	0	2	1996	773	465	298	15	0	0	2	1553

Table 2

NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 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	53	25	5	0	0	0	0	83	30	18	17	0	0	0	0	65
1960s	234	61	10	0	0	0	1	306	105	100	37	1	0	0	0	243
1970s	132	37	53	1	0	0	7	230	110	89	23	0	5	0	0	227
1980s	77	77	39	1	0	0	16	210	167	72	20	0	3	0	0	262
1990s	152	65	27	3	0	0	22	269	64	90	39	0	1	0	0	194
2000s	234	57	24	2	4	0	9	330	122	39	14	0	2	0	1	178
2010s	216	55	19	5	4	0	21	320	102	20	6	0	1	0	0	129
Total	1134	397	182	12	8	0	76	1809	739	442	173	1	12	0	1	1368
	District 6								Turnpike							
>1930s	3	18	10	0	0	4	0	35	0	0	0	0	0	0	0	0
1940s	10	7	3	0	0	0	0	20	0	0	0	0	0	0	0	0
1950s	46	22	13	0	0	0	0	81	45	0	0	0	0	0	0	45
1960s	215	97	18	2	0	0	0	332	115	0	0	0	0	0	0	115
1970s	73	32	16	0	0	0	0	121	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	113	0	0	0	0	0	0	113
2010s	97	17	3	1	4	0	0	122	49	0	0	0	0	0	0	49
Total	629	256	98	3	4	4	0	994	716	0	0	0	0	0	0	716

Table 3

NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 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 15.74% of the total inventory. Similarly, slab bridges maintained by counties are 35.83%, and by cities and towns are 53.53%.

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 62.85% of the state maintained inventory, 33.41% of the county bridges, and 24.70% 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 15.84% of the state maintained bridges. County inventories include 27.62% culverts, and city/towns include 19.06% 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 1.26% 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								
	Maintenance Responsibility							
Statewide	FDOT	County	City / Town	Other State	Other Local	Federal	Others	Total
RC Slab	794	641	214	15	9	0	4	1677
PSC Slab	315	765	460	21	14	4	11	1590
RC Beam	106	138	73	3	0	0	0	320
PSC Beam	3656	708	191	19	12	0	54	4640
Steel Beam	664	154	27	34	7	0	6	892
Timber Beam	1	311	20	31	0	0	0	363
RC Box	4	1	0	0	0	0	0	5
PSC Box	151	4	0	0	0	0	0	155
Steel Box	134	9	4	0	0	0	0	147
Truss	3	14	2	30	2	0	0	51
Movable	89	40	7	1	0	0	1	138
Culvert	1116	1084	240	3	6	0	5	2454
Other	11	55	21	8	1	0	1	97
Total	7044	3924	1259	165	51	4	82	12529

Table 4

NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 CFX bridges.

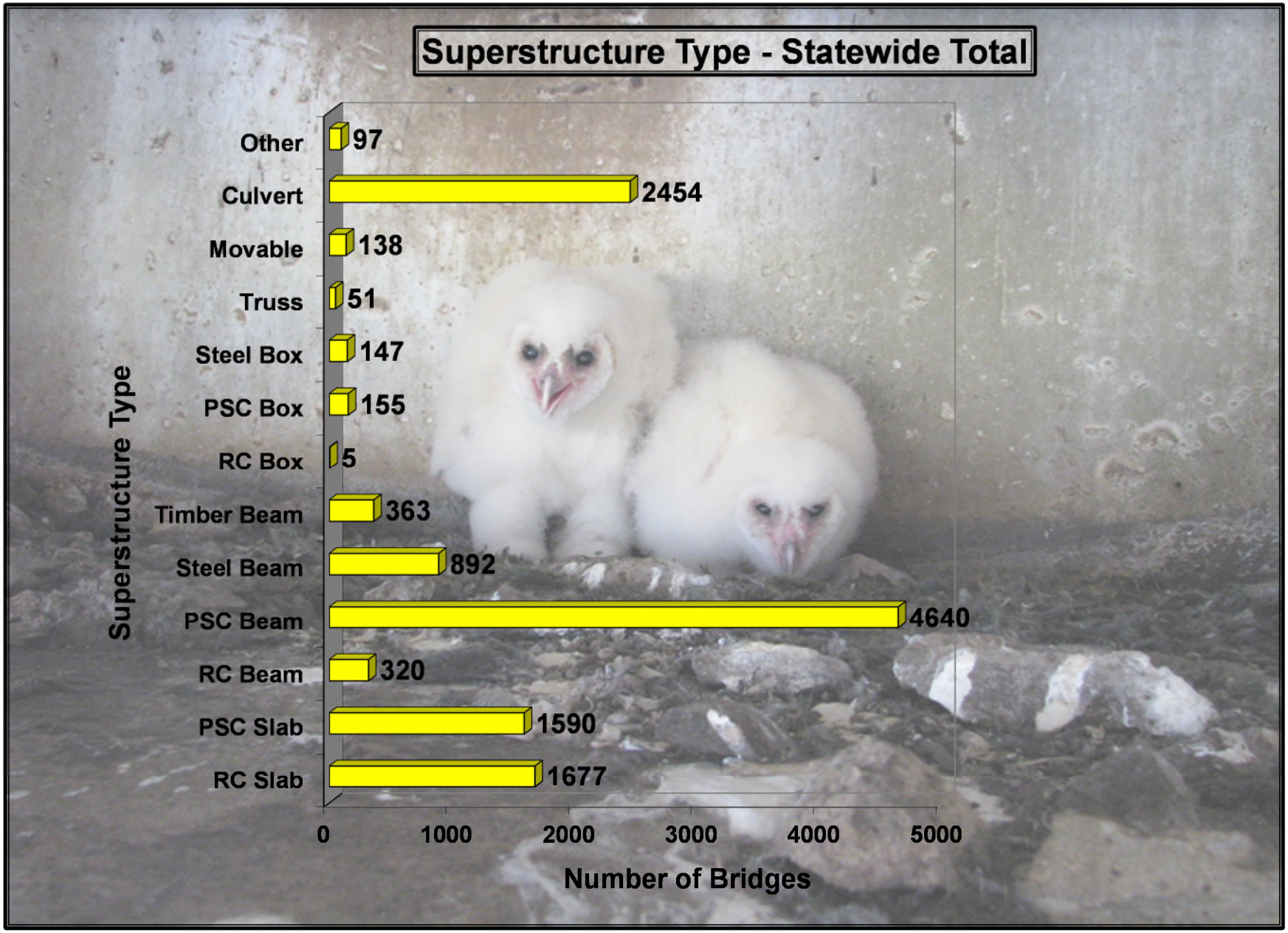

Superstructure Type - Statewide Total
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
97
2454
138
51
147
155
5
363
892
4640
320
1590
1677
0
1000
2000
3000
4000
5000
Number of Bridges

Figure 6

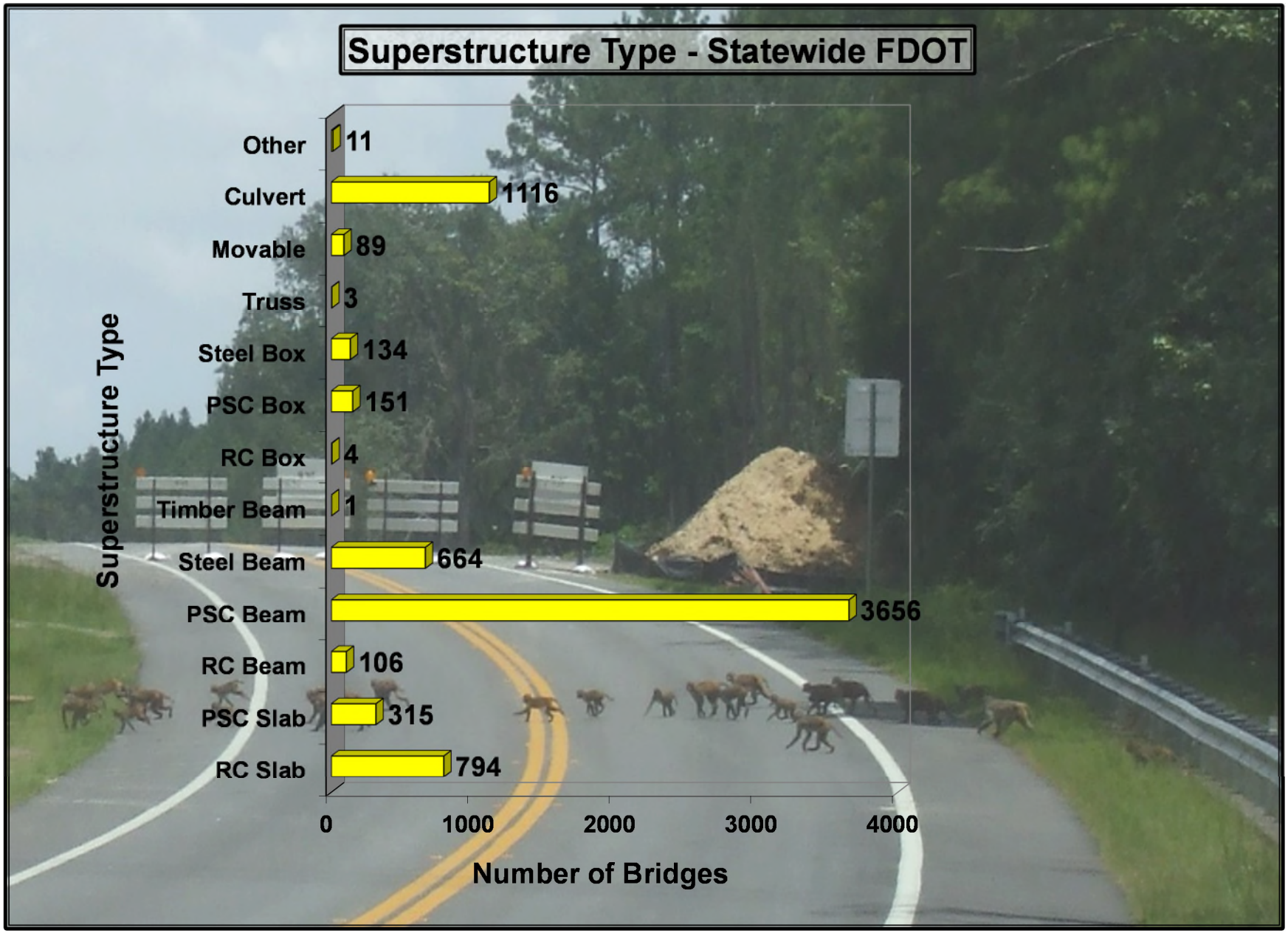

Superstructure Type - Statewide FDOT
Superstructure Type
Other
Culvert
Movable
Truss
Steel Box
PSC Box
RC Box
Timber Beam
Steel Beam
PSC Beam
RC Beam
PSC Slab
RC Slab
11
1116
89
3
134
151
4
1
664
3656
106
315
794
0
1000
2000
3000
4000
Number of Bridges

Figure 7

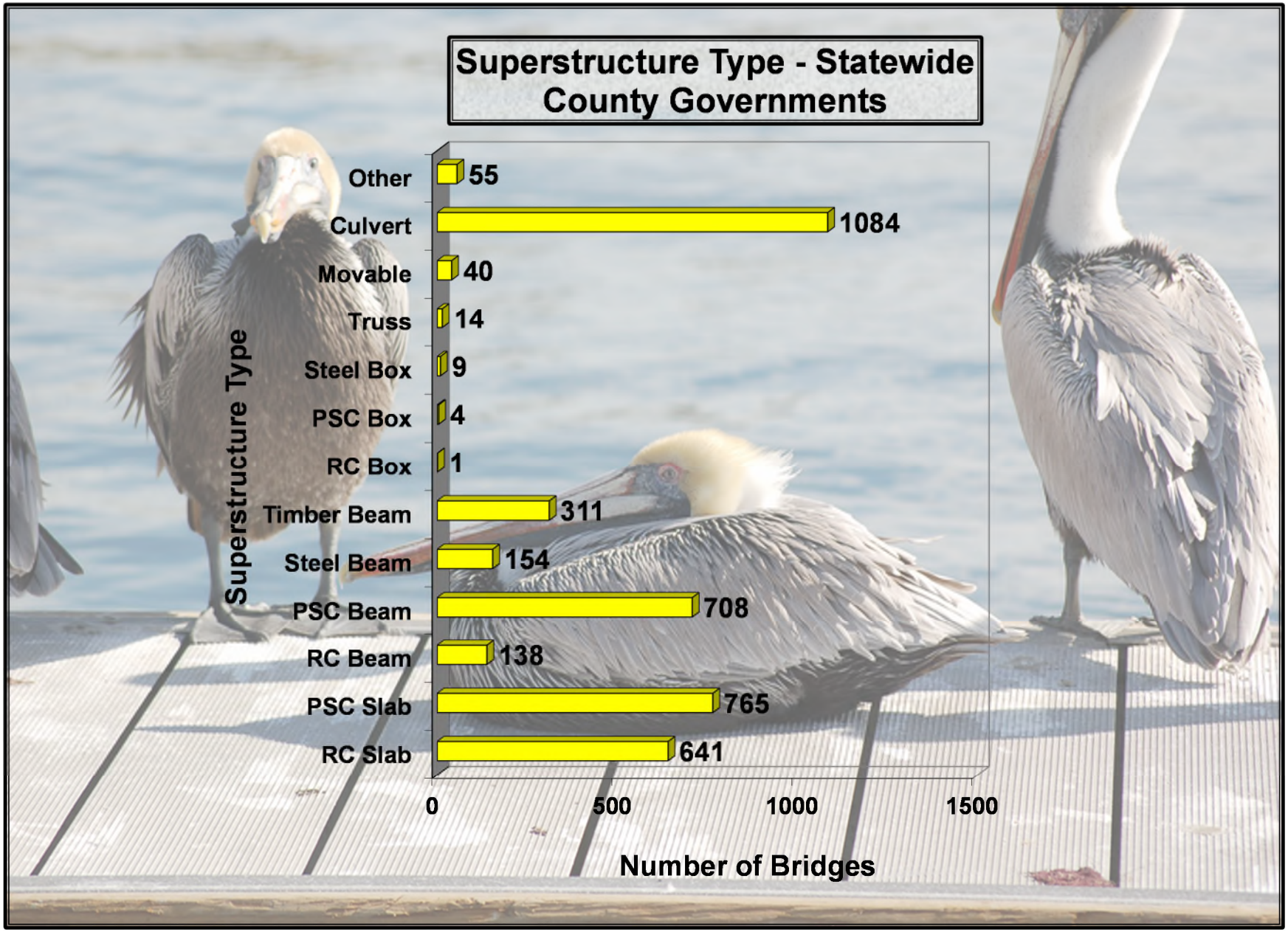

Superstructure Type - Statewide
County Governments
Superstructure Type
Other
55
Culvert
1084
Movable
40
Truss
14
Steel Box
9
PSC Box
4
RC Box
1
Timber Beam
311
Steel Beam
154
PSC Beam
708
RC Beam
138
PSC Slab
765
RC Slab
641
0
500
1000
1500
Number of Bridges

Figure 8

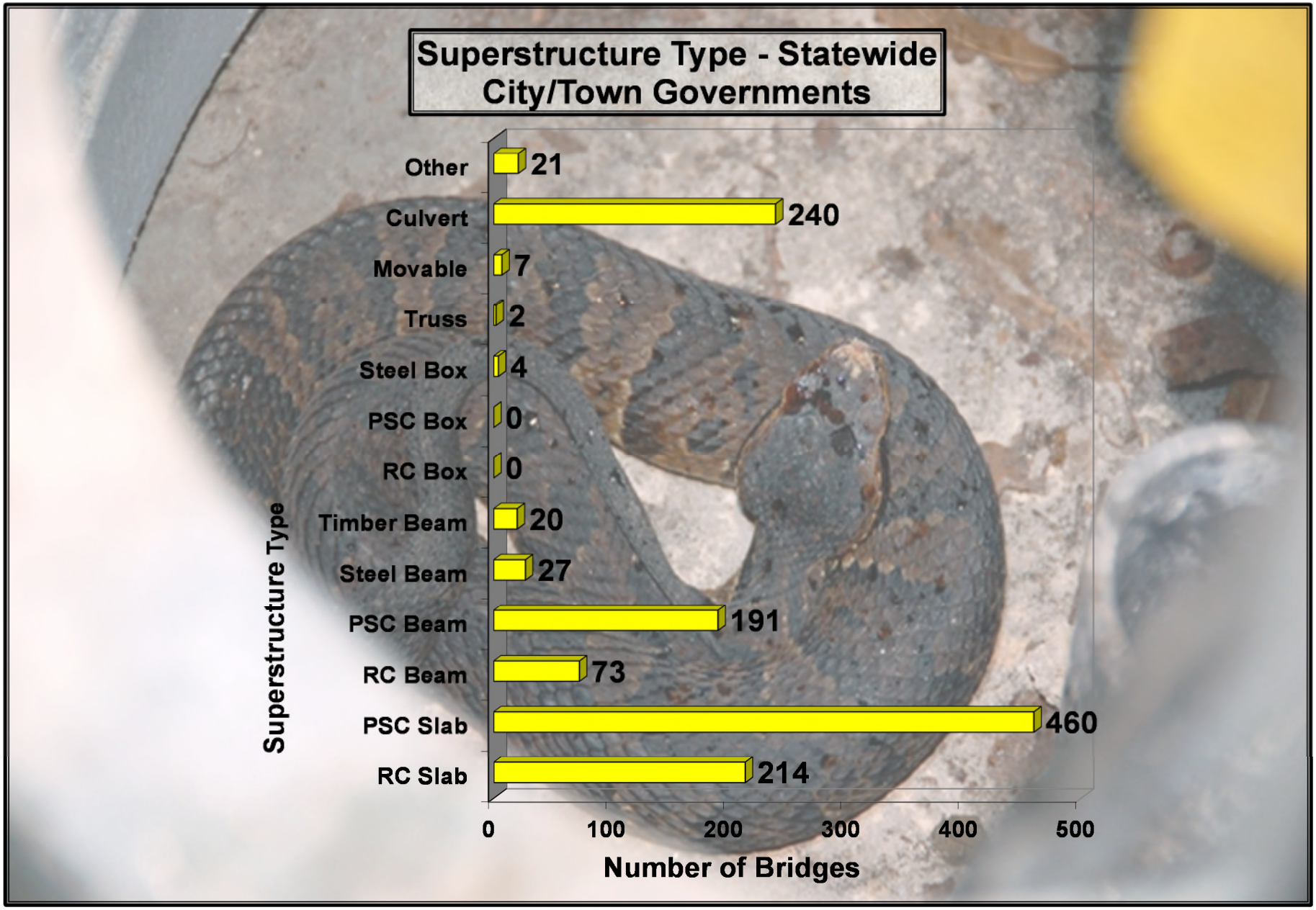

Superstructure Type - Statewide
City/Town Governments
Other
21
Culvert
240
Movable
7
Truss
2
Steel Box
4
PSC Box
0
RC Box
0
Timber Beam
20
Steel Beam
27
PSC Beam
191
RC Beam
73
PSC Slab
460
RC Slab
214
Superstructure Type
0
100
200
300
400
500
Number of Bridges

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

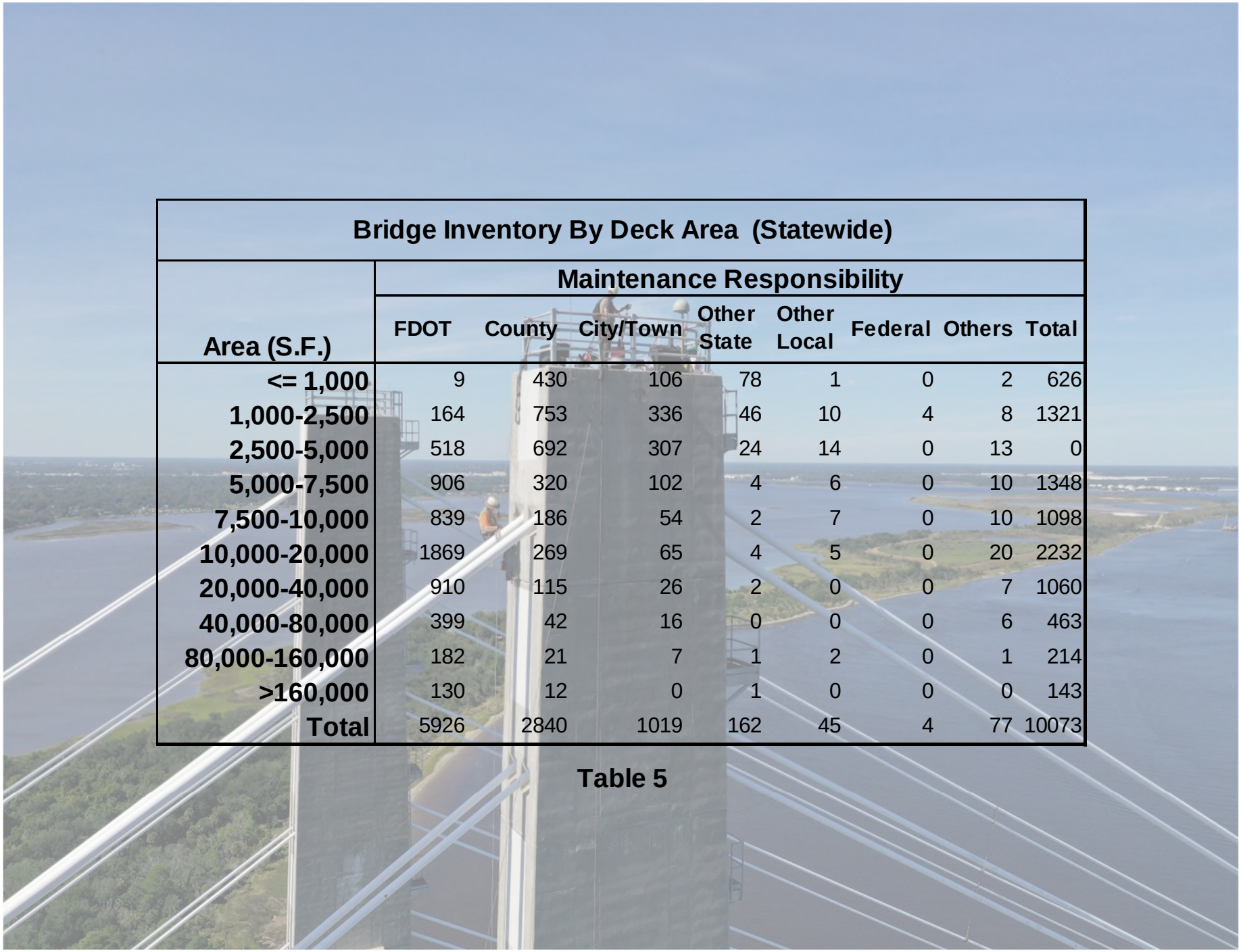
Figure 10 presents the 5,926 FDOT bridges grouped by the deck area ranges (culverts and other miscellaneous structures are not included in this group). The range with the largest number of bridges is the 10,000 to 20,000 square foot range, with 1,869 bridges, 31.54% of the total. 11.66% of the FDOT bridges fall into the 0 to 5,000 square foot range; 29.45% are in the 5,000 to 10,000 square foot range; and 27.35% 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 66.02% of their bridges under 5,000 square feet; with 17.82% between 5,000 and 10,000 square feet; 9.47% between 10,000 to 20,000 square feet; and only 6.69% over 20,000 square feet (see Figure 11). The results for the City/Town and Others groups are similar; with 73.50% of these bridges less than 5,000 square feet (see Figures 12 & 13).

FDOT Bridges by District

Tables 6 and 7 present the statewide data sorted by district. For example, 21.77% 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 8.76% of District 4 bridges are less than 5,000 square feet, while 39.08% 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	430	106	78	1	0	2	626
1,000-2,500	164	753	336	46	10	4	8	1321
2,500-5,000	518	692	307	24	14	0	13	0
5,000-7,500	906	320	102	4	6	0	10	1348
7,500-10,000	839	186	54	2	7	0	10	1098
10,000-20,000	1869	269	65	4	5	0	20	2232
20,000-40,000	910	115	26	2	0	0	7	1060
40,000-80,000	399	42	16	0	0	0	6	463
80,000-160,000	182	21	7	1	2	0	1	214
>160,000	130	12	0	1	0	0	0	143
Total	5926	2840	1019	162	45	4	77	10073

Table 5

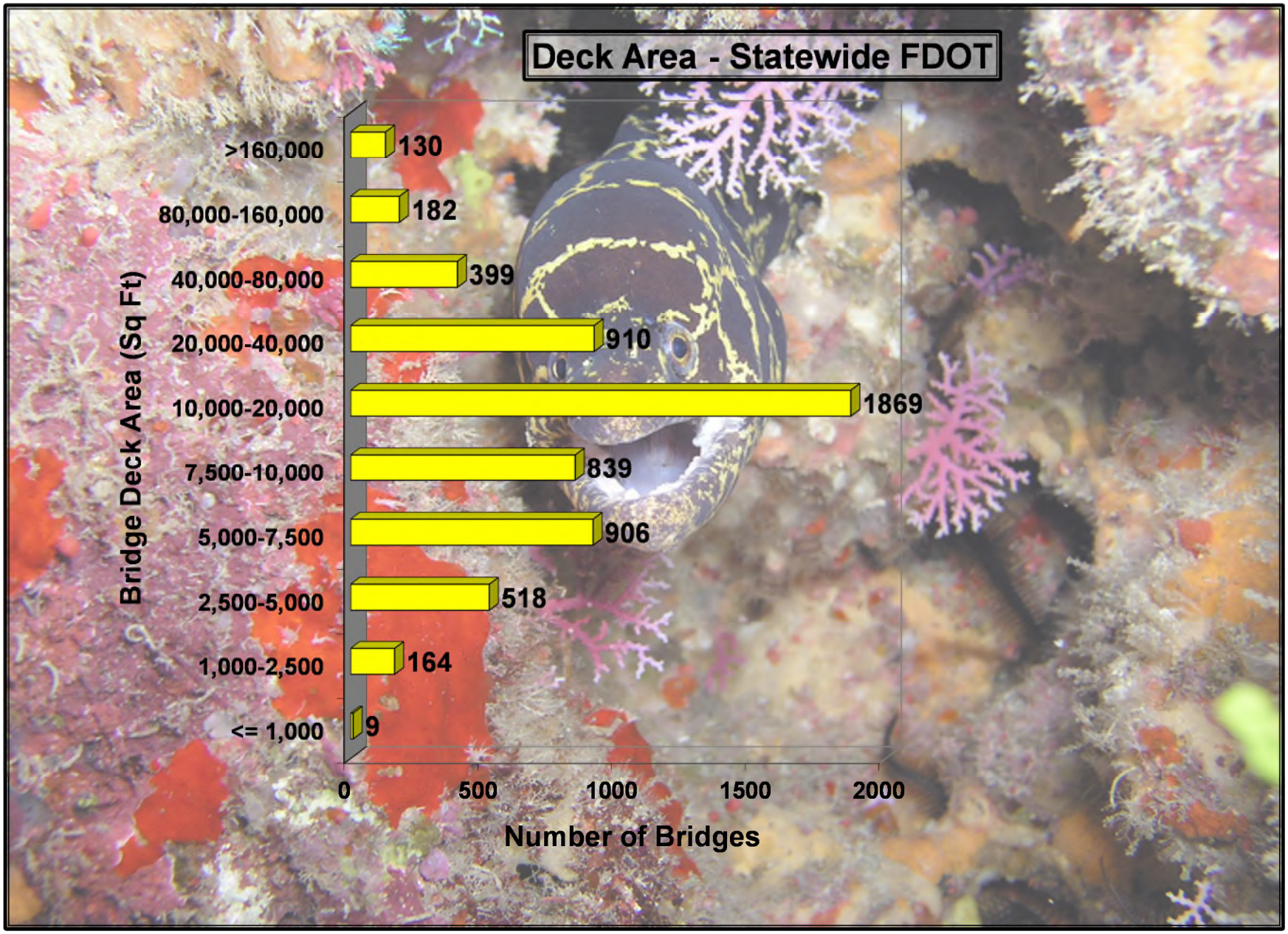

Deck Area - Statewide FDOT
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
130
182
399
910
1869
839
906
518
164
9
0
500
1000
1500
2000
Number of Bridges

Figure 10

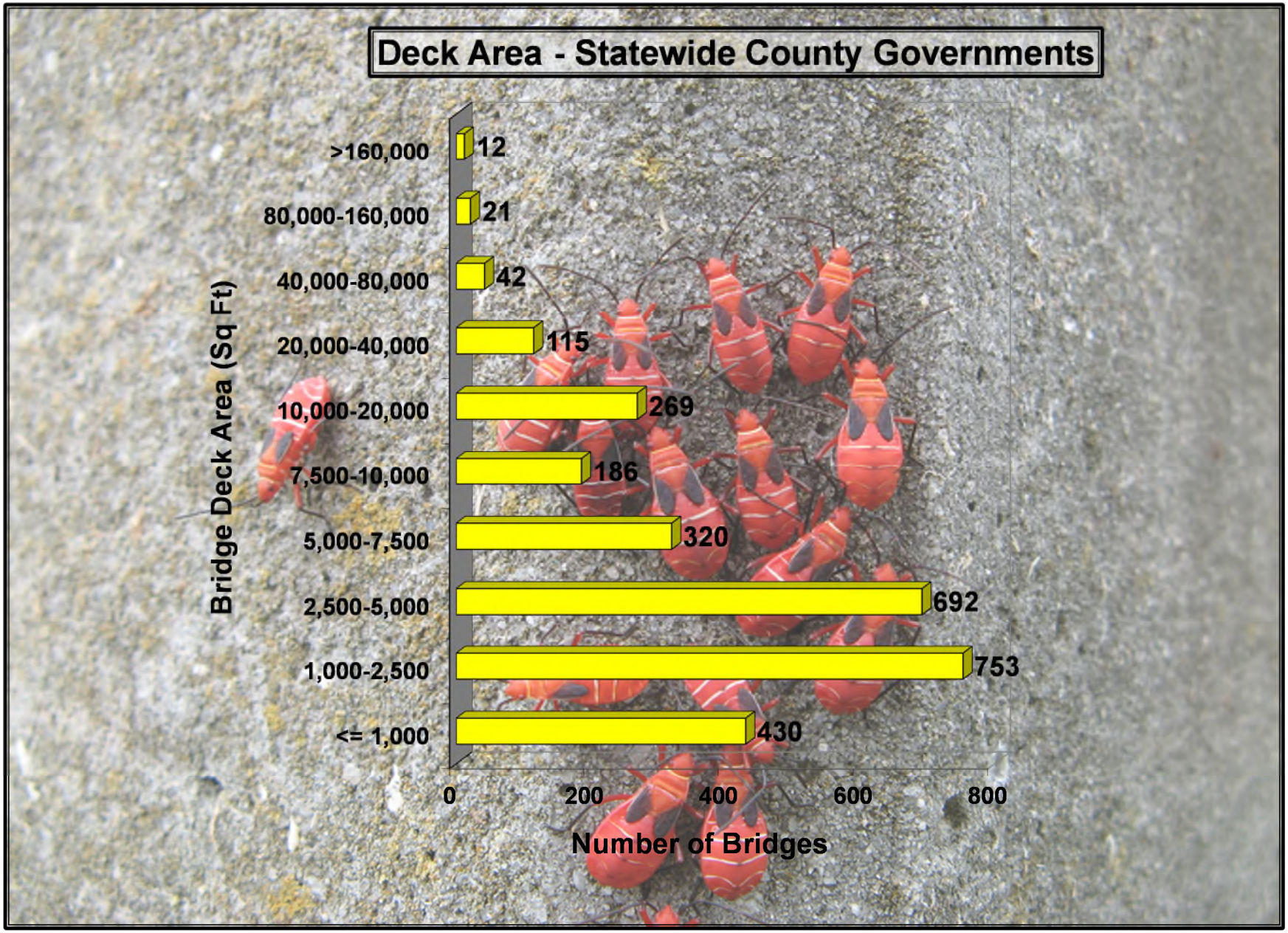

Deck Area - Statewide County Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
12
21
42
115
269
186
320
692
753
430
0
200
400
600
800
Number of Bridges

Figure 11

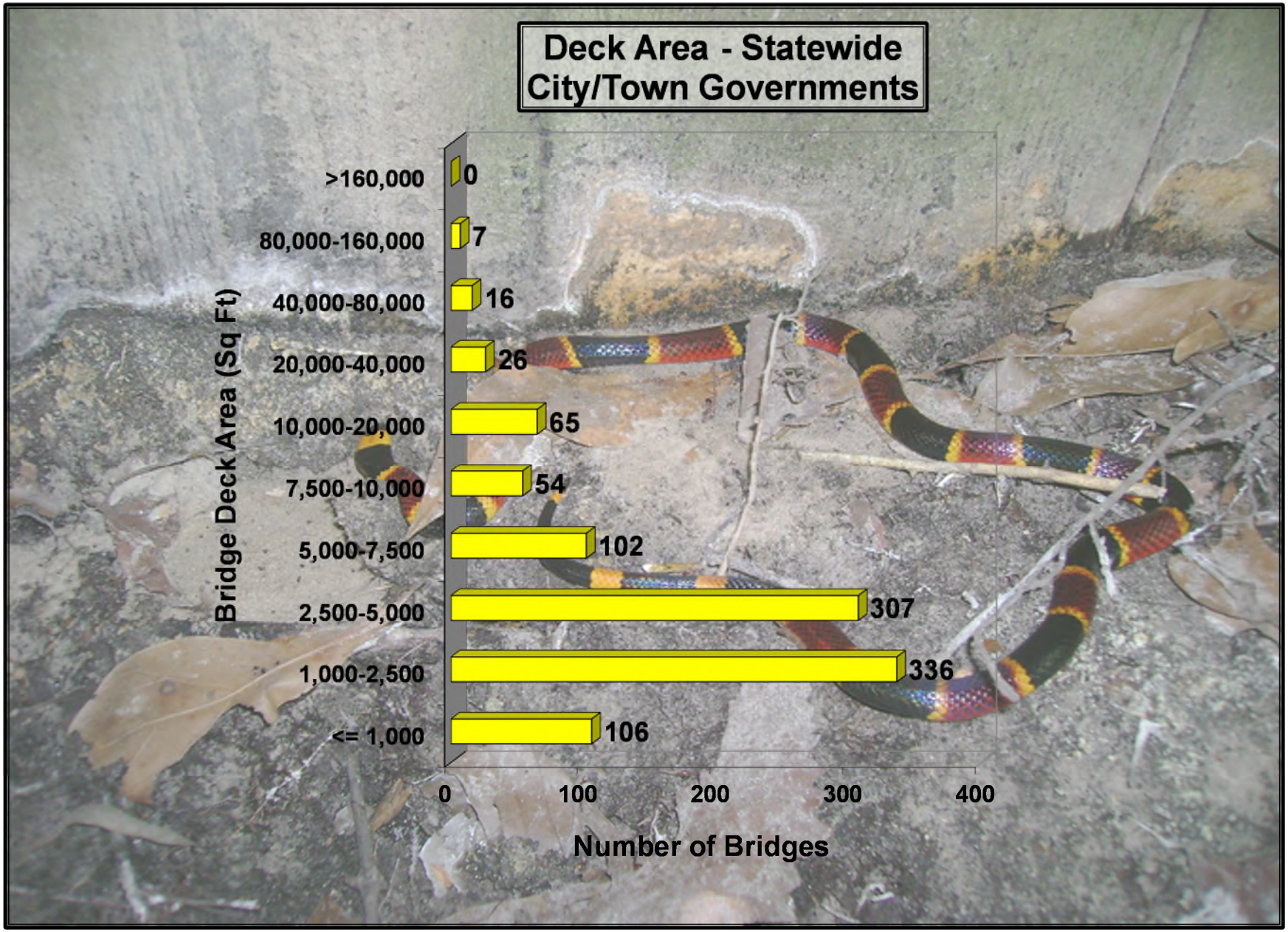

Deck Area - Statewide
City/Town Governments
Bridge Deck Area (Sq Ft)
>160,000
80,000-160,000
40,000-80,000
20,000-40,000
10,000-20,000
7,500-10,000
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
0
7
16
26
65
54
102
307
336
106
0
100
200
300
400
Number of Bridges

Figure 12

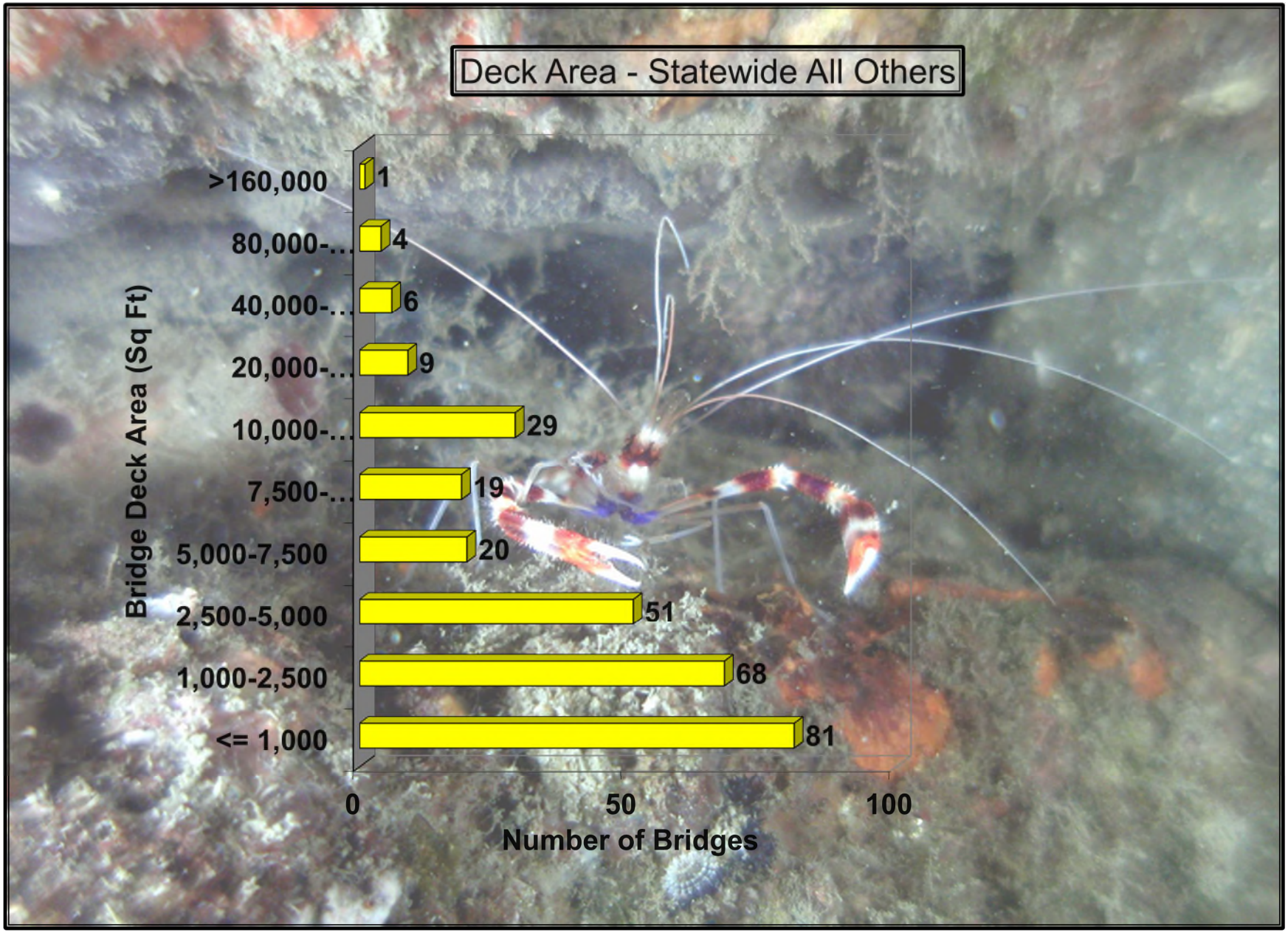

Deck Area - Statewide All Others
Bridge Deck Area (Sq Ft)
>160,000
80,000-...
40,000-...
20,000-...
10,000-...
7,500-...
5,000-7,500
2,500-5,000
1,000-2,500
<= 1,000
1
4
6
9
29
19
20
51
68
81
0
50
100
Number of Bridges

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	90	24	0	0	0	0	119	0	203	6	61	1	0	0	271
1,000-2,500	77	193	58	9	6	0	0	343	9	219	12	26	0	0	0	266
2,500-5,000	73	178	74	7	12	0	0	344	54	139	11	7	0	0	0	211
5,000-7,500	145	56	25	2	4	0	0	232	100	59	2	0	0	0	0	161
7,500-10,000	93	36	11	0	0	0	0	140	99	26	1	2	0	0	0	128
10,000-20,000	204	52	8	2	1	0	0	267	186	28	2	0	0	0	0	216
20,000-40,000	62	20	0	2	0	0	0	84	75	15	1	0	0	0	0	91
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	639	200	23	23	0	0	1597	604	695	38	96	3	0	0	1436
	District 2								District 4							
<= 1,000	3	49	11	10	0	0	0	73	0	9	34	0	0	0	1	44
1,000-2,500	23	52	53	1	0	0	0	129	18	95	105	6	0	0	0	224
2,500-5,000	88	71	33	1	0	0	0	193	47	136	102	7	0	0	0	292
5,000-7,500	161	27	16	0	0	0	0	204	74	69	20	2	0	0	0	165
7,500-10,000	164	13	13	0	0	0	0	190	65	42	8	0	0	0	0	115
10,000-20,000	306	17	12	0	0	0	2	337	248	50	14	0	0	0	0	312
20,000-40,000	125	9	6	0	0	0	0	140	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	1	86
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	2	0	0	0	0	0	19
Total	988	242	149	12	0	0	2	1393	742	444	289	15	0	0	2	1492

Bridge Inventory By Deck Area (Districts 5 Thru 8)

	Maintenance Responsibility								Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total	FDOT	County	City/ Town	Other State	Other Local	Federal	Others	Total
	District 5								District 7							
<= 1,000	0	21	11	7	0	0	1	40	1	43	16	0	0	0	0	60
1,000-2,500	12	55	41	2	2	0	8	120	16	68	38	0	2	0	0	124
2,500-5,000	97	59	26	2	1	0	13	198	23	51	25	0	0	0	0	99
5,000-7,500	154	32	19	0	0	0	10	215	65	42	10	0	0	0	0	117
7,500-10,000	161	24	10	0	0	0	10	205	86	29	4	0	7	0	0	126
10,000-20,000	314	52	18	1	2	0	18	405	208	42	6	0	1	0	0	257
20,000-40,000	140	18	5	0	0	0	7	170	123	14	6	0	0	0	0	143
40,000-80,000	47	7	5	0	0	0	5	64	71	9	2	0	0	0	0	82
80,000-160,000	33	1	2	0	0	0	1	37	24	3	2	1	0	0	0	30
>160,000	13	0	0	0	0	0	0	13	16	3	0	0	0	0	0	19
Total	971	269	137	12	5	0	73	1467	633	304	109	1	10	0	0	1057
	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	3	0	0	0	0	0	0	3
2,500-5,000	64	58	36	0	1	0	0	159	72	0	0	0	0	0	0	72
5,000-7,500	73	35	10	0	2	0	0	120	134	0	0	0	0	0	0	134
7,500-10,000	58	16	7	0	0	0	0	81	113	0	0	0	0	0	0	113
10,000-20,000	180	28	5	1	1	0	0	215	223	0	0	0	0	0	0	223
20,000-40,000	126	11	4	0	0	0	0	141	81	0	0	0	0	0	0	81
40,000-80,000	70	5	2	0	0	0	0	77	18	0	0	0	0	0	0	18
80,000-160,000	29	4	0	0	0	0	0	33	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	626	247	97	3	4	4	0	981	650	0	0	0	0	0	0	650

Table 7

Overall Structural Condition

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

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

Figure 14 shows, for each of the maintenance responsibility groups, the percentage of bridges in excellent, good, fair, and poor condition. Approximately 94.92% of the FDOT maintained bridges are in excellent or good condition. However, the number drops to 79.36% for County bridges, 82.29% for City/Town bridges, and 75.83% 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 2020.

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	52	71	11	2	0	0	0	136	223	48	15	2	4	0	13	305
Good	866	778	205	19	24	0	0	1892	868	303	146	9	4	0	56	1386
Fair	23	66	17	2	0	0	0	108	42	40	15	1	0	0	7	105
Poor	0	13	14	1	0	0	0	28	3	6	6	0	0	0	0	15
Total	941	928	247	24	24	0	0	2164	1136	397	182	12	8	0	76	1811
	District 2								District 6							
Excellent	92	41	14	0	0	0	1	148	166	25	12	1	4	0	0	208
Good	1094	311	158	7	0	0	1	1571	424	141	65	1	0	4	0	635
Fair	78	90	27	4	0	0	0	199	30	41	11	1	0	0	0	83
Poor	17	51	9	1	0	0	0	78	9	49	10	0	0	0	0	68
Total	1281	493	208	12	0	0	2	1996	629	256	98	3	4	4	0	994
	District 3								District 7							
Excellent	9	36	3	3	0	0	0	51	94	24	11	0	3	0	1	133
Good	730	547	42	45	0	0	1	1365	624	389	137	0	9	0	0	1159
Fair	76	232	6	25	3	0	0	342	20	20	21	0	0	0	0	61
Poor	14	128	2	25	0	0	0	169	1	9	4	1	0	0	0	15
Total	829	943	53	98	3	0	1	1927	739	442	173	1	12	0	1	1368
	District 4								Turnpike							
Excellent	77	76	29	4	0	0	0	186	79	0	0	0	0	0	0	79
Good	658	324	188	9	0	0	2	1181	630	0	0	0	0	0	0	630
Fair	31	57	69	2	0	0	0	159	7	0	0	0	0	0	0	7
Poor	7	8	12	0	0	0	0	27	0	0	0	0	0	0	0	0
Total	773	465	298	15	0	0	2	1553	716	0	0	0	0	0	0	716
									Statewide							
Excellent	792	321	95	12	11	0	15	1246								
Good	5894	2793	941	90	37	4	60	9819								
Fair	307	546	166	35	3	0	7	1064								
Poor	51	264	57	28	0	0	0	400								
Total	7044	3924	1259	165	51	4	82	12529								

NOTE: The number of FDOT bridges includes 154 MDX bridges and 349 CFX bridges.

Table 8

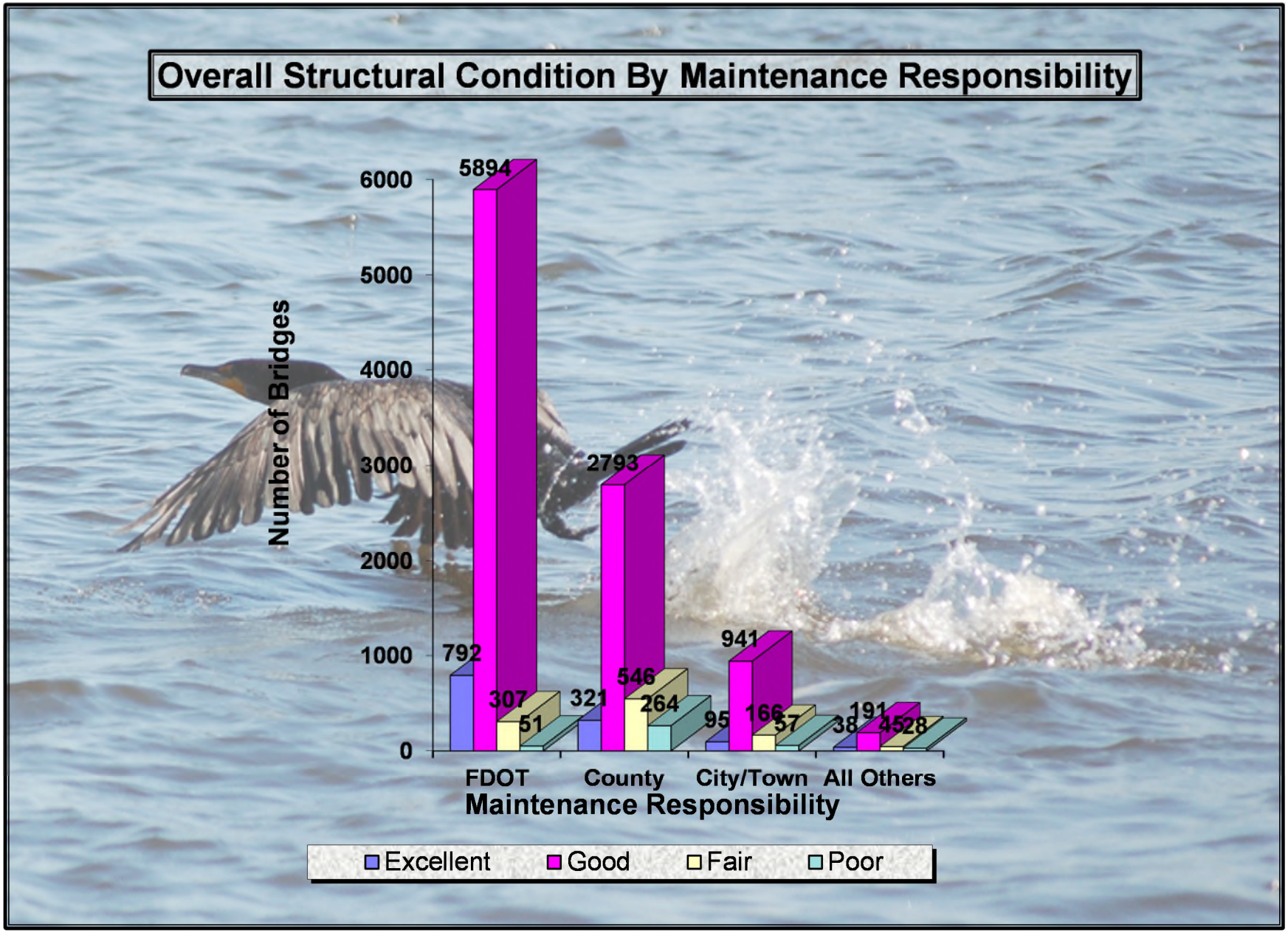

Overall Structural Condition By Maintenance Responsibility
Number of Bridges
6000
5000
4000
3000
2000
1000
0
5894
792
307
51
2793
321
546
264
941
95
166
57
191
38
45
28
FDOT
County
City/Town
All Others
Maintenance Responsibility
Excellent
Good
Fair
Poor

Figure 14

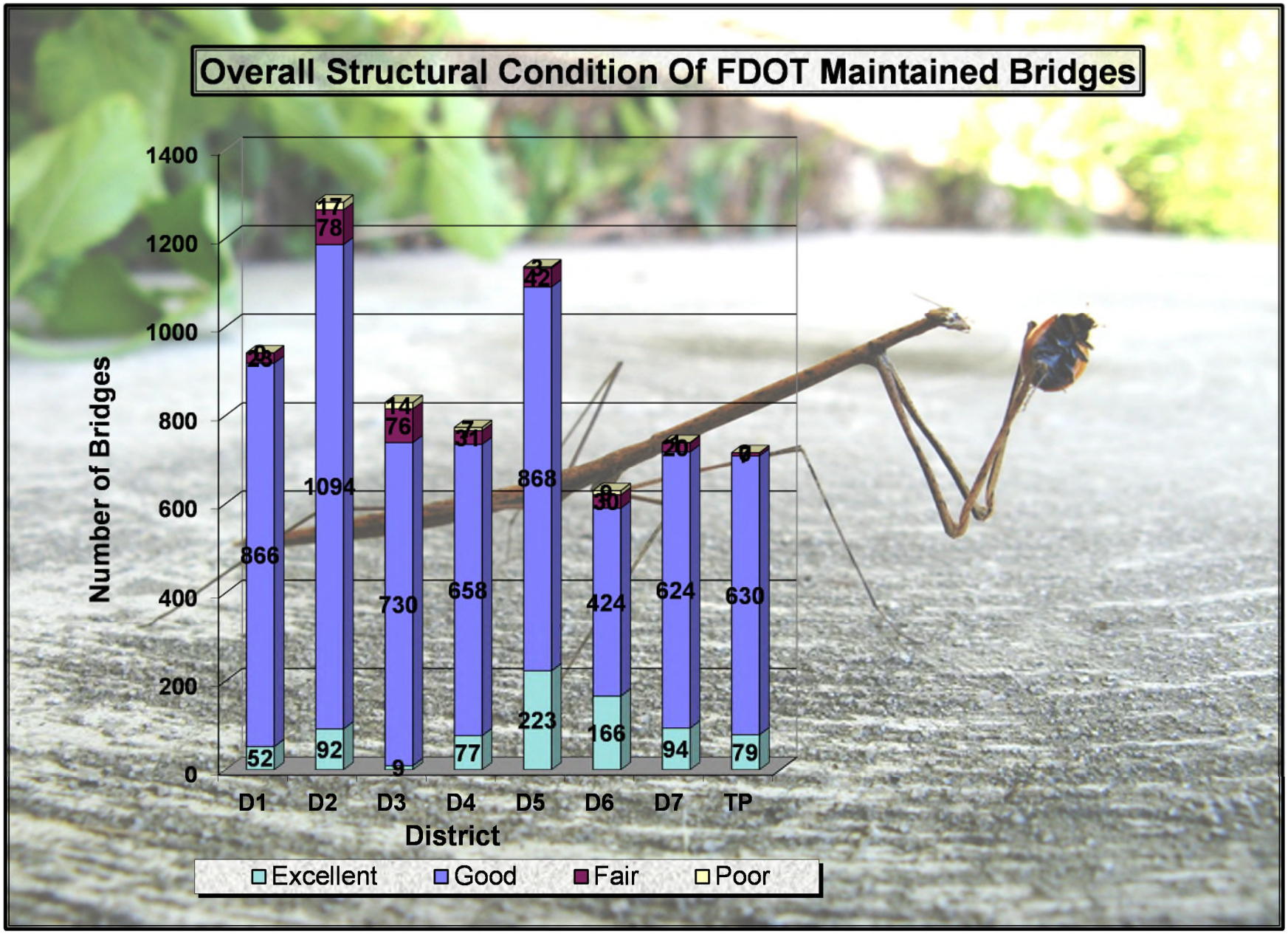

Overall Structural Condition Of FDOT Maintained Bridges
Number of Bridges
1400
1200
1000
800
600
400
200
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
52
866
92
1094
78
17
9
730
76
14
77
658
31
7
223
868
42
166
424
30
94
624
20
79
630

Figure 15

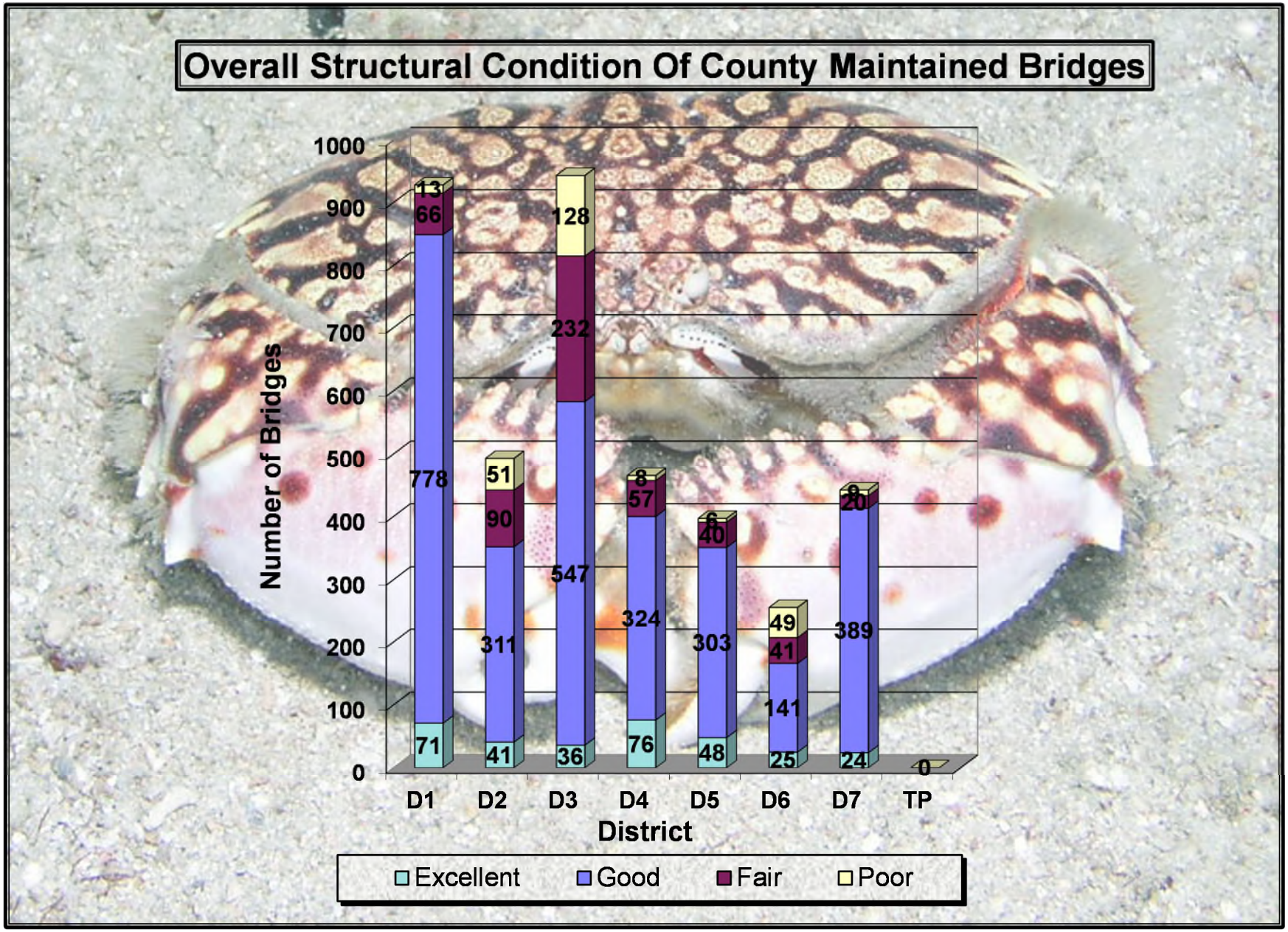

Overall Structural Condition Of County Maintained Bridges
Number of Bridges
1000
900
800
700
600
500
400
300
200
100
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
71
778
66
13
41
311
90
51
36
547
232
128
76
324
57
8
48
303
40
6
25
141
41
49
24
389
20
0

Figure 16

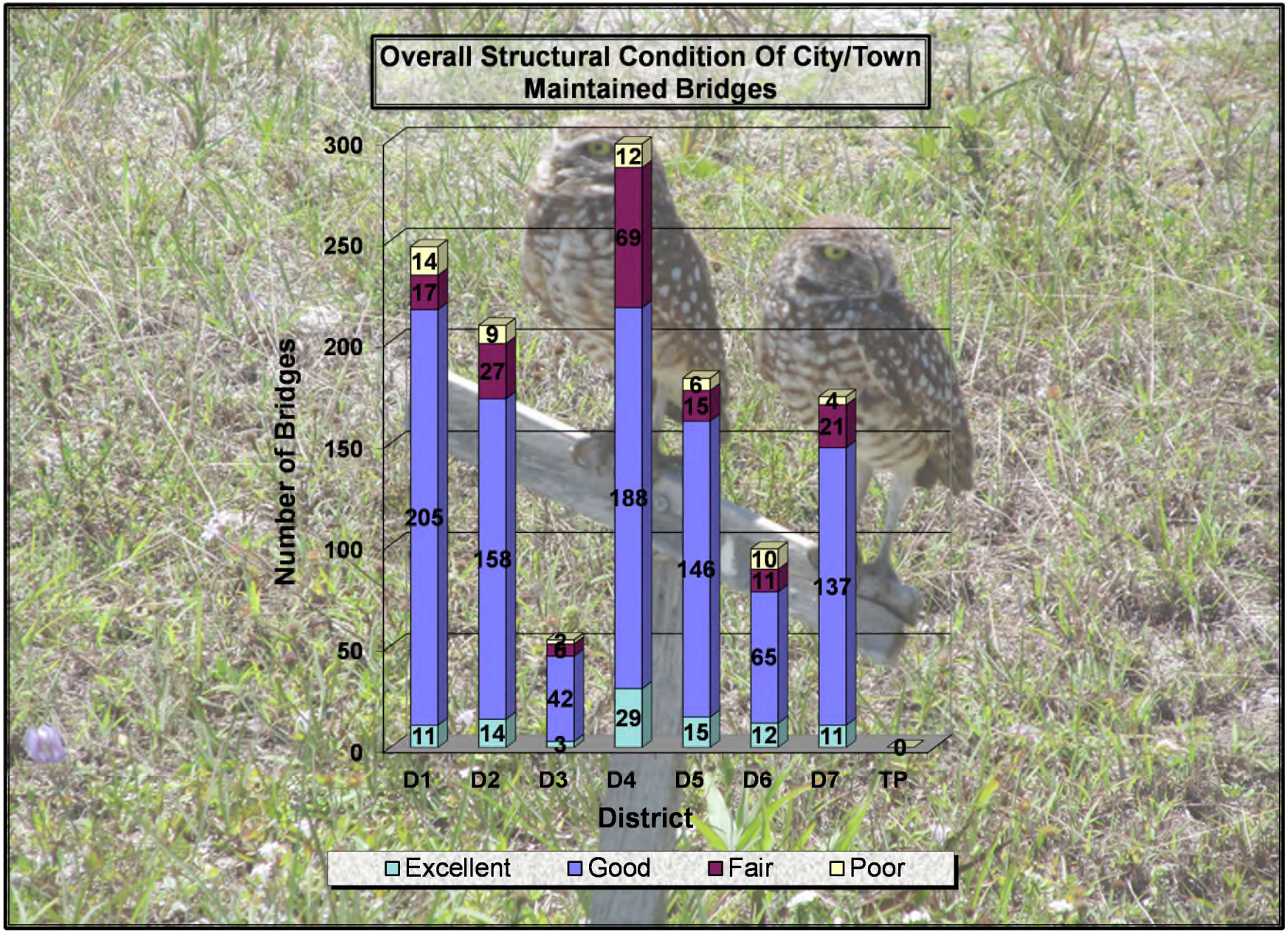

Overall Structural Condition Of City/Town Maintained Bridges
Number of Bridges
300
250
200
150
100
50
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Excellent
Good
Fair
Poor
205
17
14
11
158
27
9
14
42
6
3
3
29
188
69
12
146
15
6
15
65
11
10
12
137
21
4
11
0

Figure 17

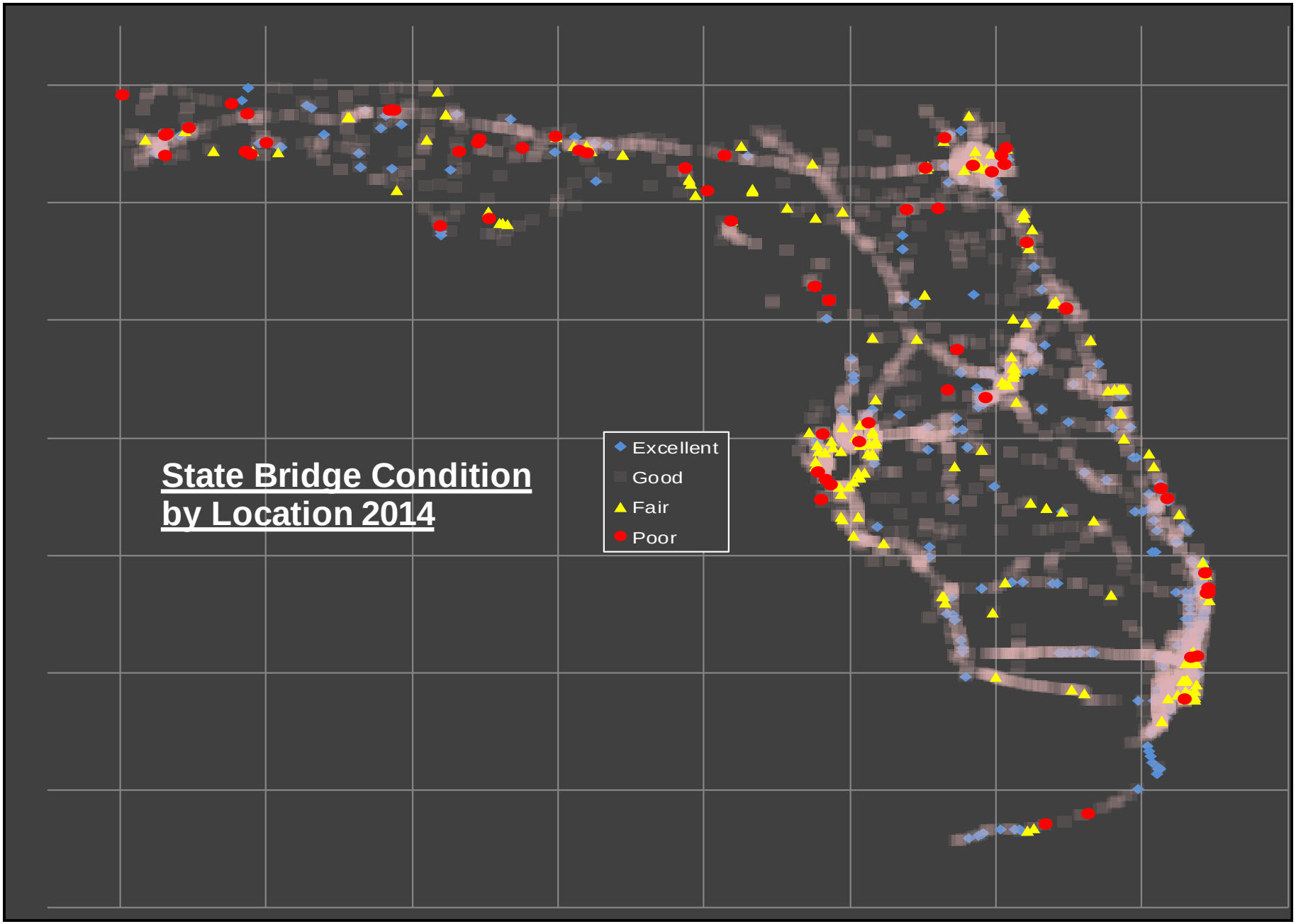

State Bridge Condition
by Location 2014
Excellent
Good
Fair
Poor

Figure 18

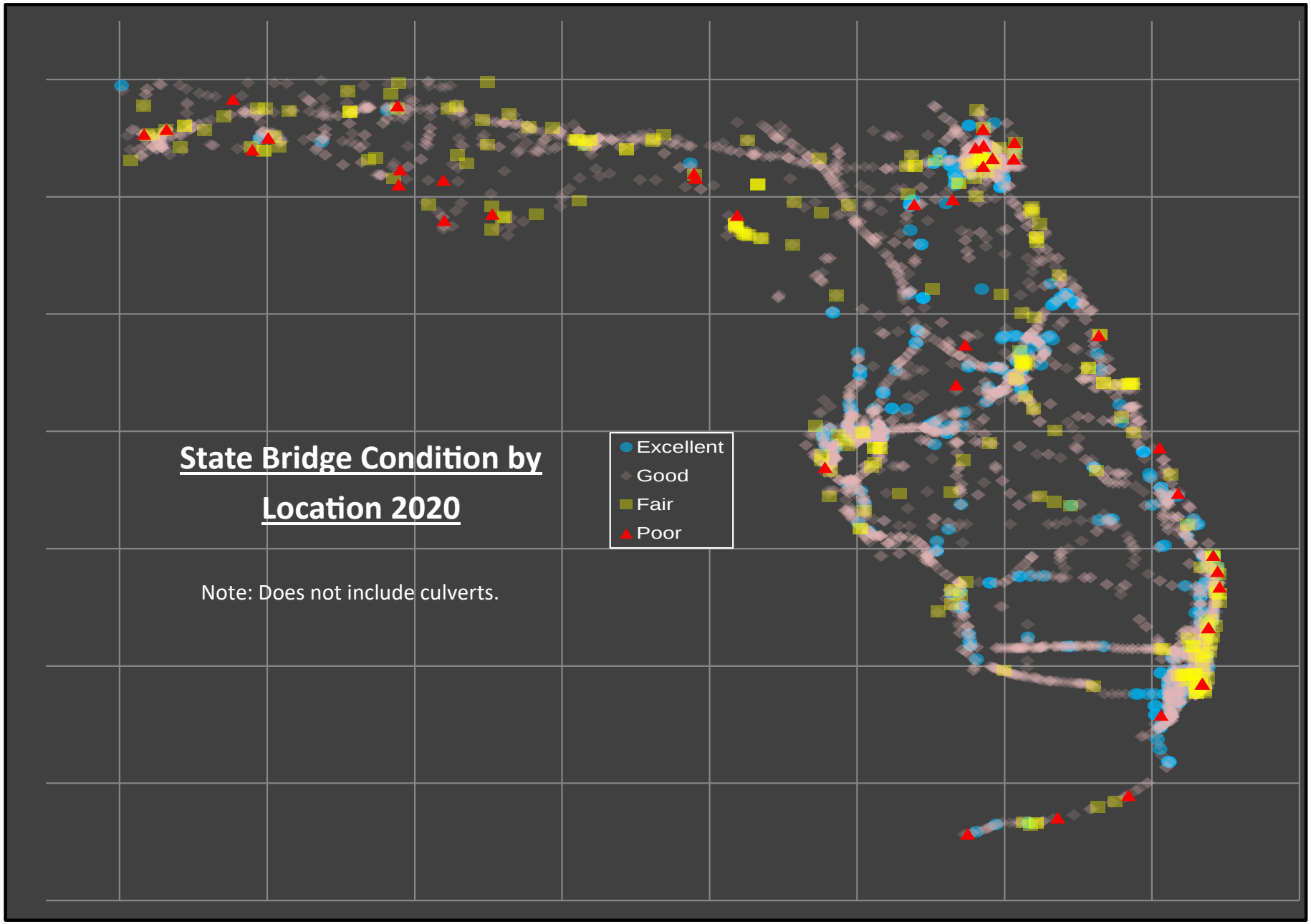
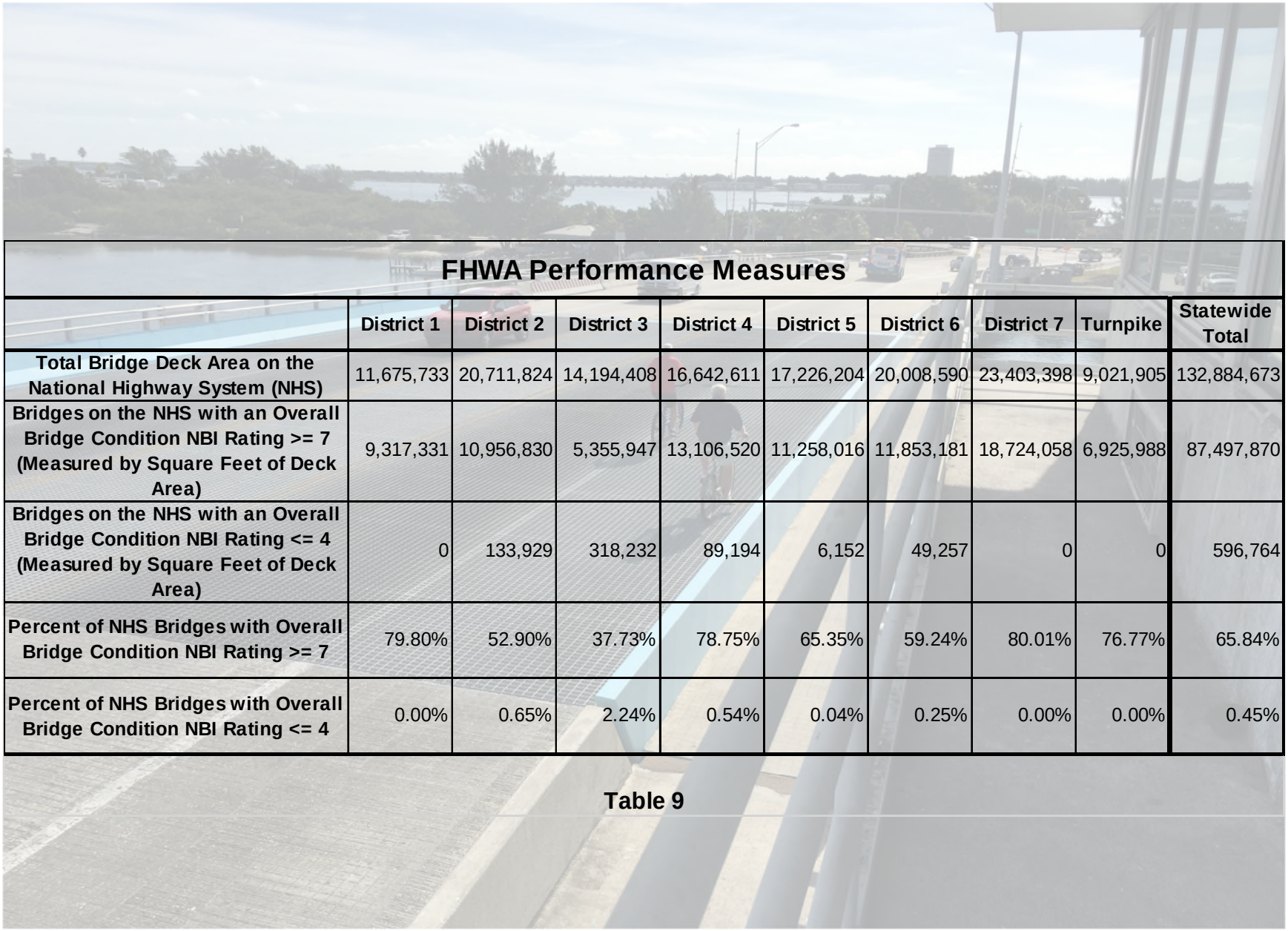

State Bridge Condition by Location 2020
Note: Does not include culverts.
Excellent
Good
Fair
Poor

Figure 19

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).



FHWA Performance Measures

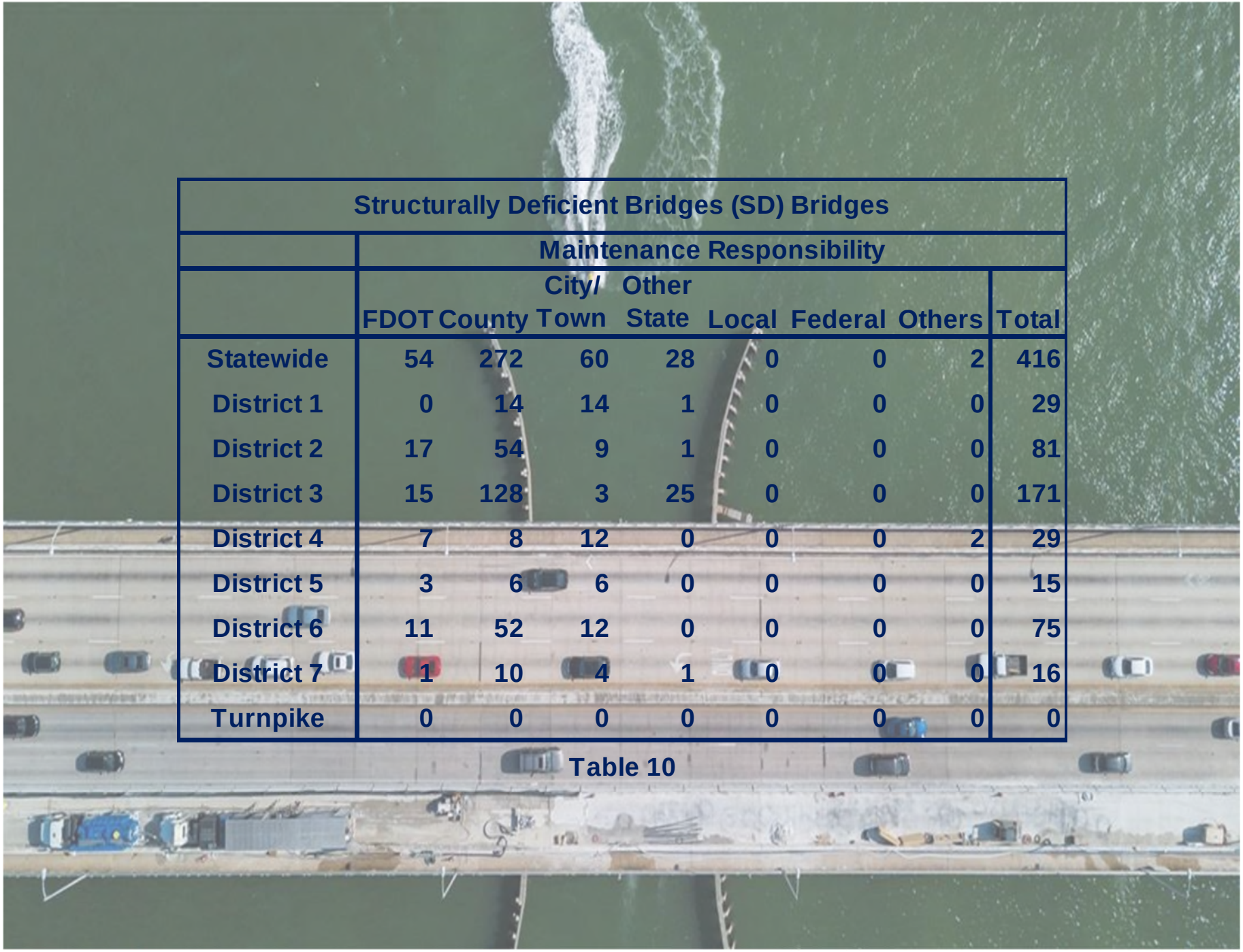
	District 1	District 2	District 3	District 4	District 5	District 6	District 7	Turnpike	Statewide Total
Total Bridge Deck Area on the National Highway System (NHS)	11,675,733	20,711,824	14,194,408	16,642,611	17,226,204	20,008,590	23,403,398	9,021,905	132,884,673
Bridges on the NHS with an Overall Bridge Condition NBI Rating >= 7 (Measured by Square Feet of Deck Area)	9,317,331	10,956,830	5,355,947	13,106,520	11,258,016	11,853,181	18,724,058	6,925,988	87,497,870
Bridges on the NHS with an Overall Bridge Condition NBI Rating <= 4 (Measured by Square Feet of Deck Area)	0	133,929	318,232	89,194	6,152	49,257	0	0	596,764
Percent of NHS Bridges with Overall Bridge Condition NBI Rating >= 7	79.80%	52.90%	37.73%	78.75%	65.35%	59.24%	80.01%	76.77%	65.84%
Percent of NHS Bridges with Overall Bridge Condition NBI Rating <= 4	0.00%	0.65%	2.24%	0.54%	0.04%	0.25%	0.00%	0.00%	0.45%

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 416 structurally deficient bridges in Florida, with over 65.38% having county maintenance responsibility. Fifty-five (12.98%) 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 66.91% of the County Government maintained structurally deficient bridges are concentrated within District 2 and 3. Over 63.33% of the City/Town maintained structurally deficient bridges are concentrated within Districts 1, 4, and 6.



Structurally Deficient Bridges (SD) Bridges								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Local	Federal	Others	Total
Statewide	54	272	60	28	0	0	2	416
District 1	0	14	14	1	0	0	0	29
District 2	17	54	9	1	0	0	0	81
District 3	15	128	3	25	0	0	0	171
District 4	7	8	12	0	0	0	2	29
District 5	3	6	6	0	0	0	0	15
District 6	11	52	12	0	0	0	0	75
District 7	1	10	4	1	0	0	0	16
Turnpike	0	0	0	0	0	0	0	0

Table 10

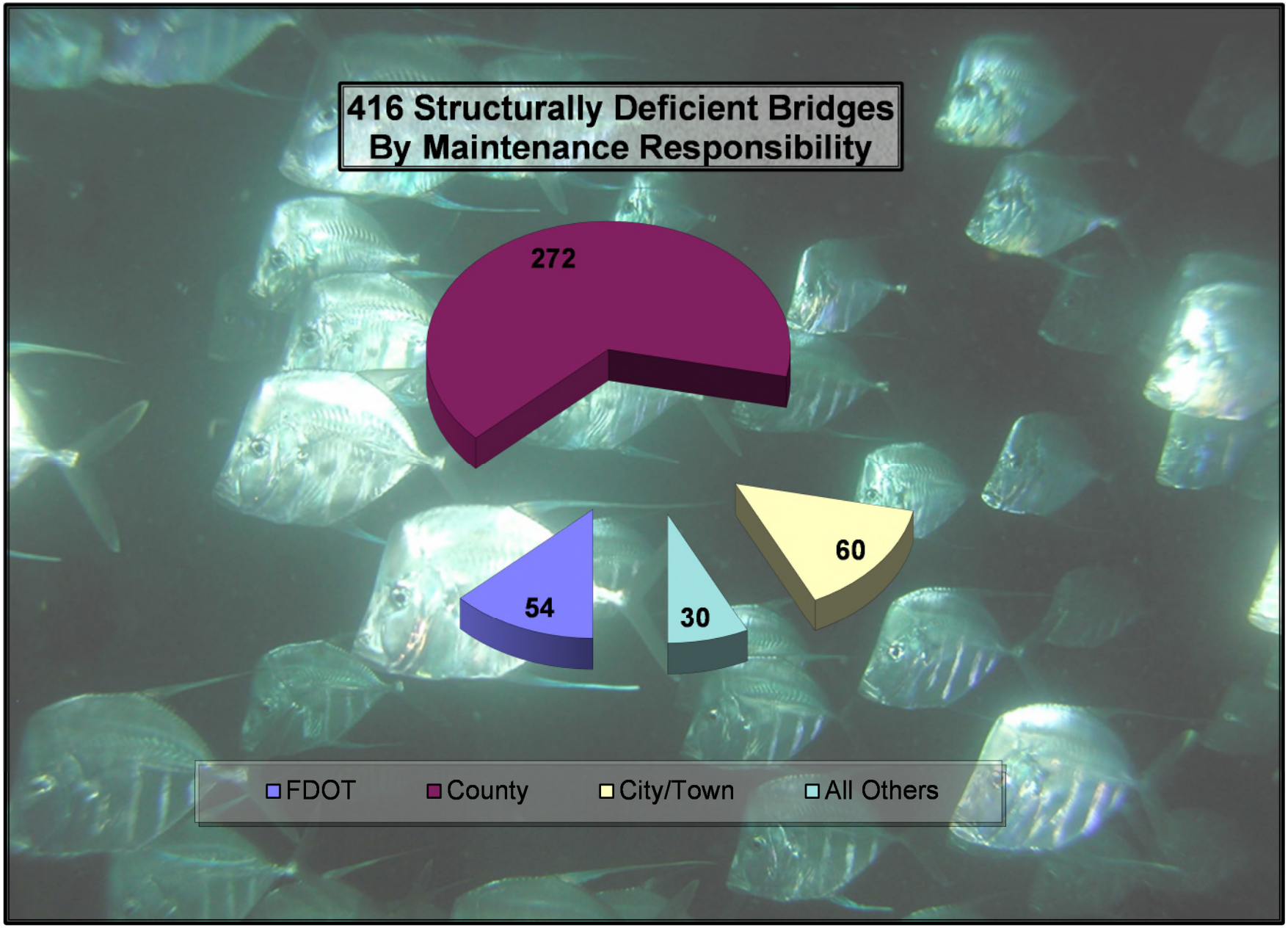

416 Structurally Deficient Bridges
By Maintenance Responsibility
272
60
54
30
FDOT
County
City/Town
All Others

Figure 20

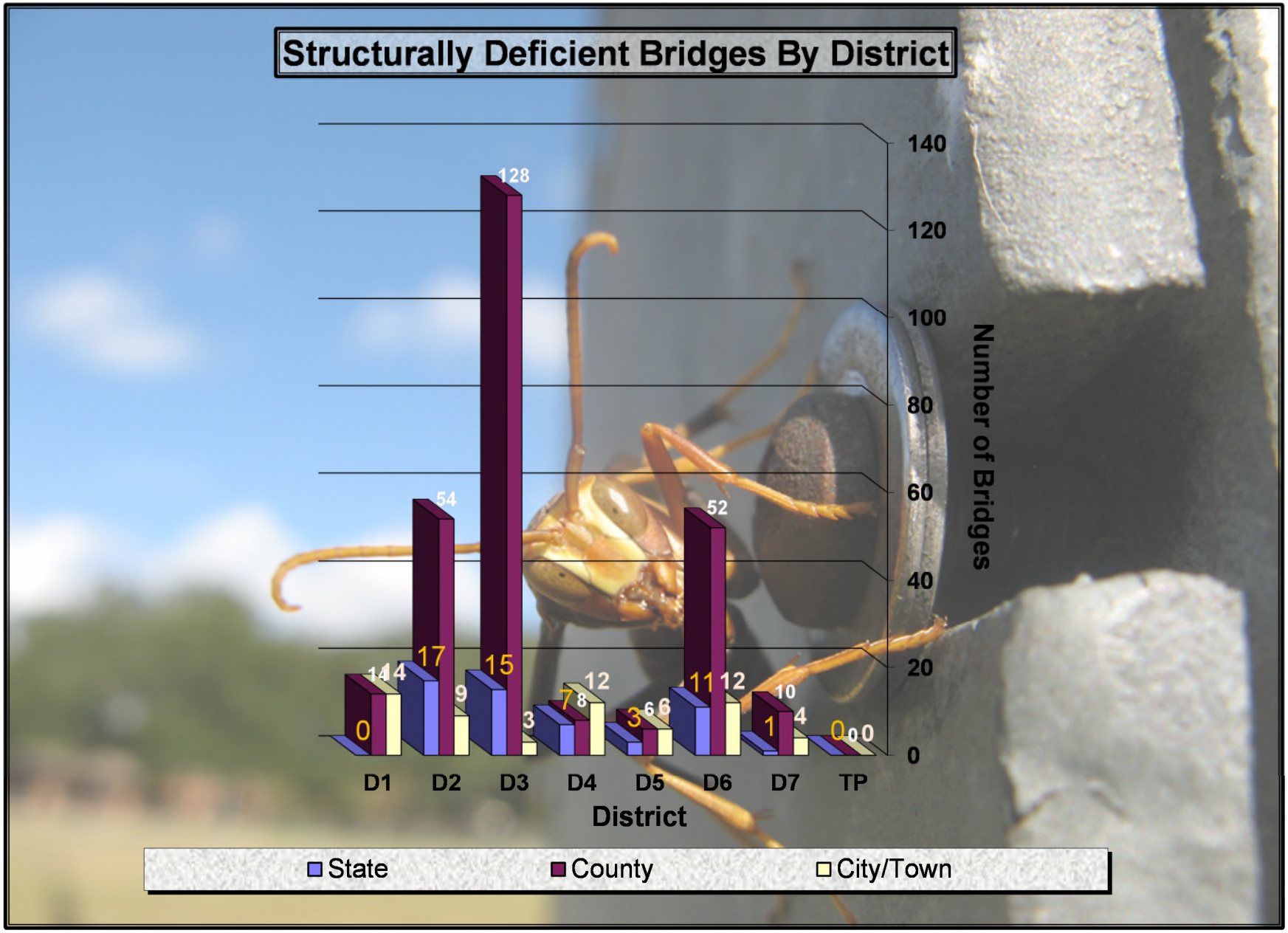

Structurally Deficient Bridges By District
140
120
100
80
60
40
20
0
Number of Bridges
128
54
52
17
15
14
14
12
12
11
10
9
7
8
6
6
4
3
3
1
0
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
State
County
City/Town

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 641 posted or closed bridges in Florida, with County Governments having maintenance responsibility for over 73.63% of the total. City and Town Governments are responsible for the maintenance of over 18.10% of the total, while the FDOT is responsible for only 16 of the 641 bridges (2.50%). The number of posted County bridges (472 bridges) is much greater than the number of structurally deficient County bridges (272), which indicated that the majority of County bridge posting restrictions are caused by obsolete design, rather than advanced structural deterioration.

Of the 16 posted or closed bridges maintained by the FDOT, Districts 4, 7, and Turnpike had none. Three Hundred and Thirty-Four (70.76%) of the posted or closed bridges maintained by County Governments are concentrated within Districts 2 and 3. Sixty-two (53.45%) of the posted or closed bridges maintained by City/Town Governments are concentrated within Districts 2 and 4. Statewide, 63.34% 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	70	15	0	0	0	0	85	1	16	18	6	2	0	0	43
Closed	1	2	3	1	0	0	0	7	3	1	0	0	0	0	0	4
Total	1	72	18	1	0	0	0	92	4	17	18	6	2	0	0	47
	District 2								District 6							
Posted	3	85	31	7	0	0	0	126	0	18	5	0	0	0	0	23
Closed	0	5	1	0	0	0	0	6	3	4	2	0	0	0	0	9
Total	3	90	32	7	0	0	0	132	3	22	7	0	0	0	0	32
	District 3								District 7							
Posted	0	241	5	13	0	0	0	259	0	6	5	0	0	0	0	11
Closed	5	3	1	6	0	0	0	15	0	2	0	0	0	0	0	2
Total	5	244	6	19	0	0	0	274	0	8	5	0	0	0	0	13
	District 4								Turnpike							
Posted	0	18	30	1	0	0	0	49	0	0	0	0	0	0	0	0
Closed	0	1	0	0	0	0	1	2	0	0	0	0	0	0	0	0
Total	0	19	30	1	0	0	1	51	0	0	0	0	0	0	0	0
									Statewide							
Posted									4	454	109	27	2	0	0	596
Closed									12	18	7	7	0	0	1	45
Total									16	472	116	34	2	0	1	641

Table 11

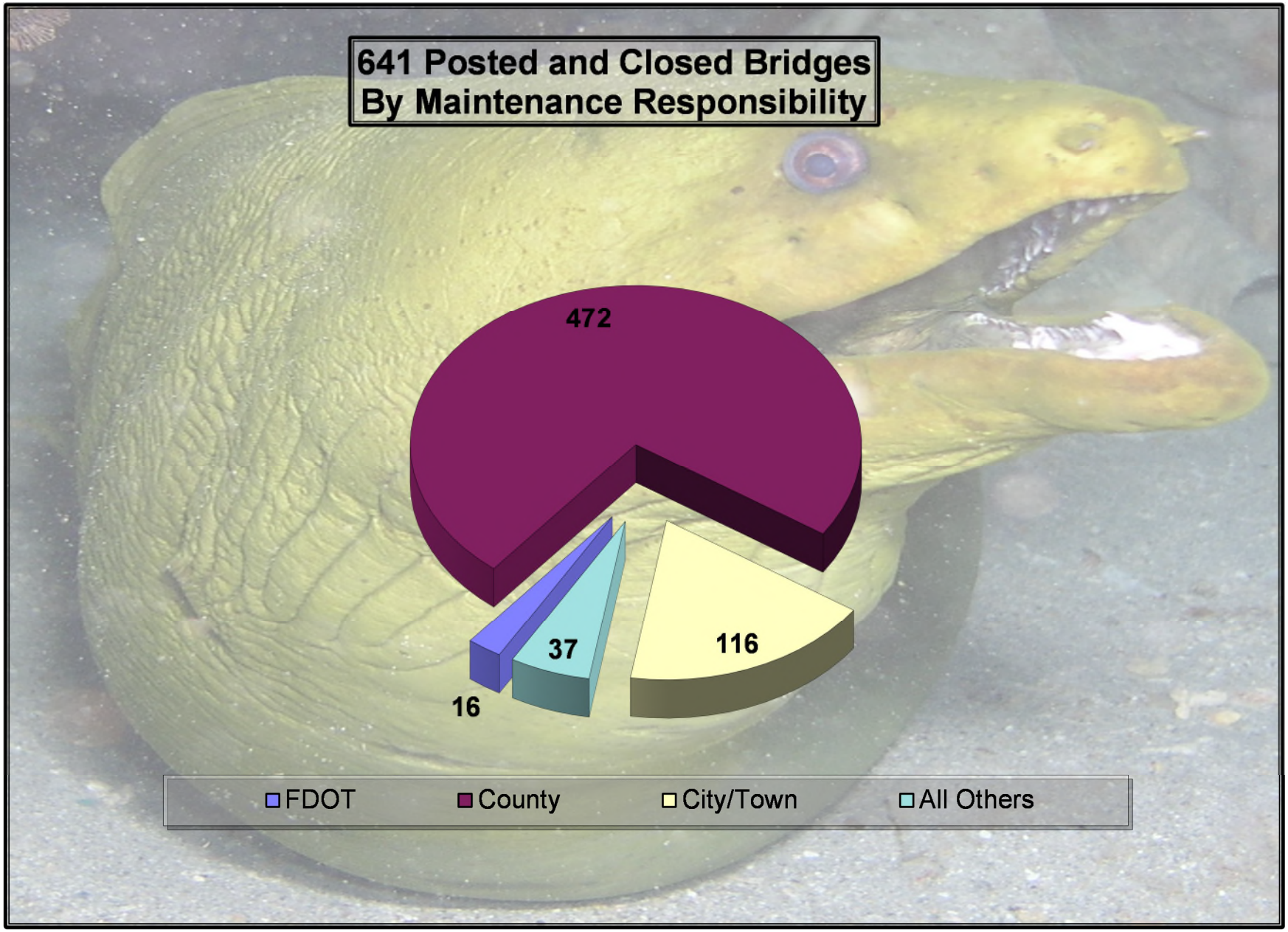

641 Posted and Closed Bridges
By Maintenance Responsibility
472
37
116
16
FDOT
County
City/Town
All Others

Figure 22

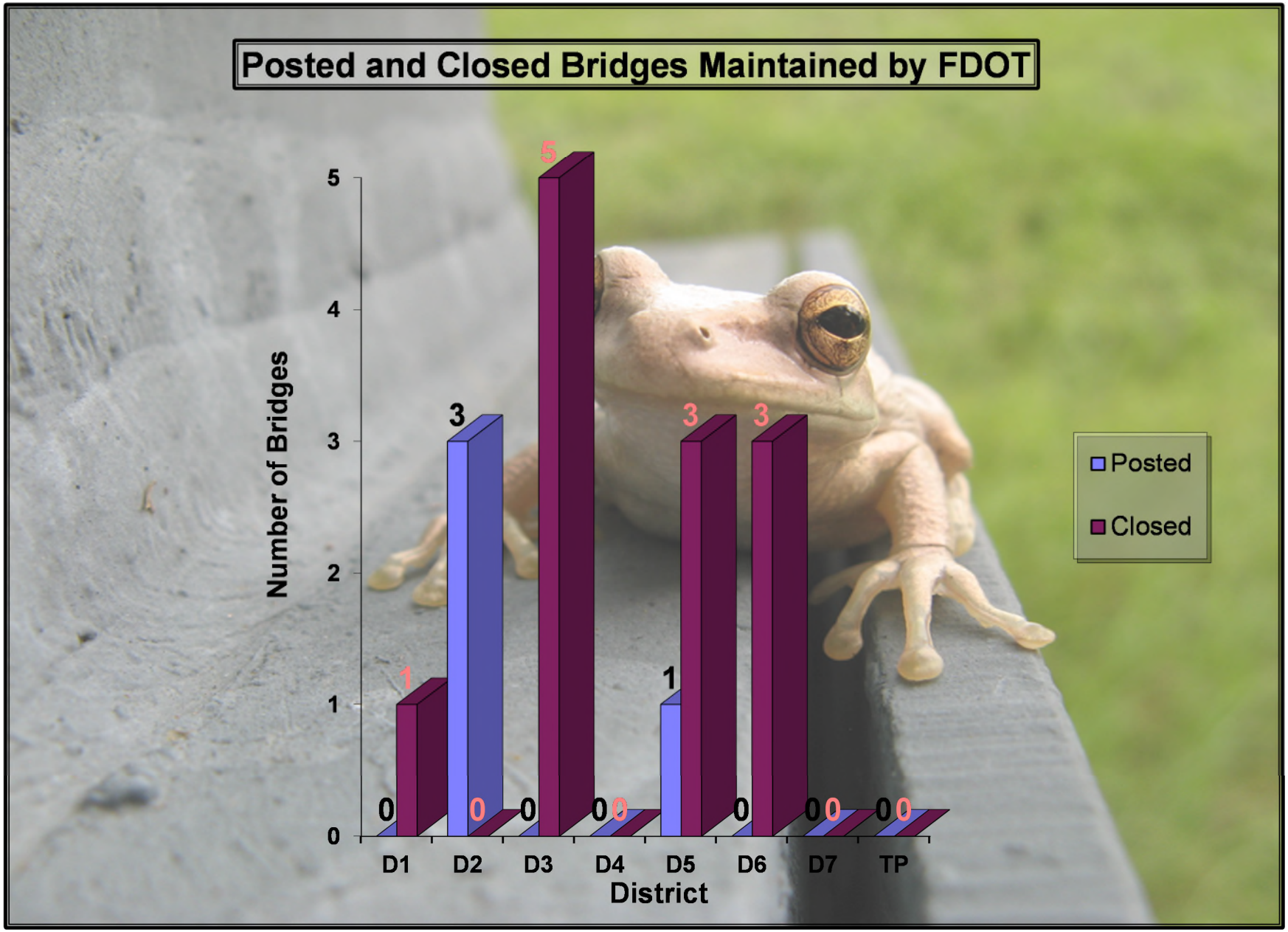

Posted and Closed Bridges Maintained by FDOT
Number of Bridges
0
1
2
3
4
5
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed
0
1
3
0
5
0
0
0
1
3
0
3
0
0
0
0

Figure 23

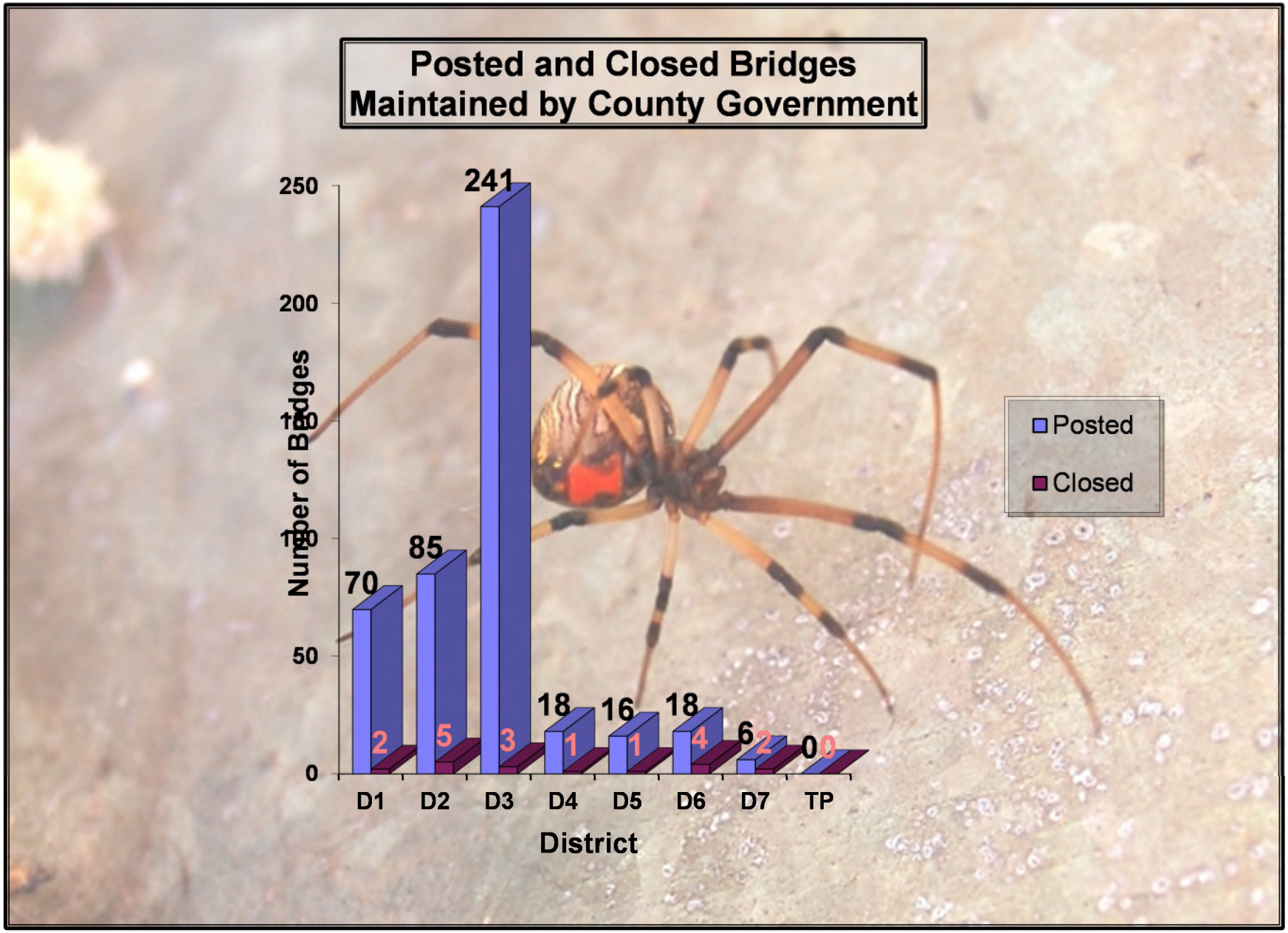

Posted and Closed Bridges
Maintained by County Government
Number of Bridges
250
200
150
100
50
0
70
85
241
18
16
18
6
0
2
5
3
1
1
4
2
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

Figure 24

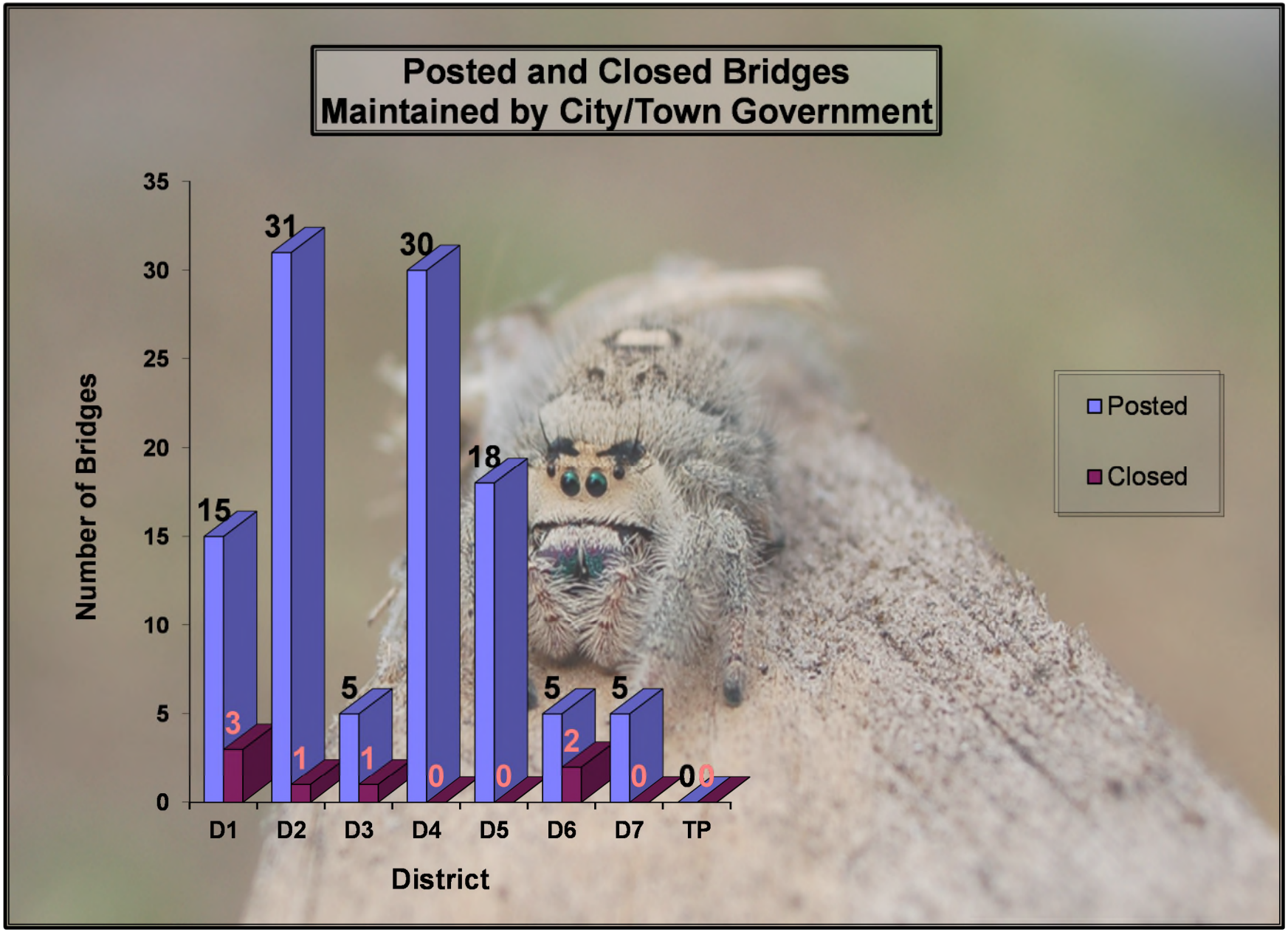

Posted and Closed Bridges
Maintained by City/Town Government
Number of Bridges
35
30
25
20
15
10
5
0
15
3
31
1
5
1
30
0
18
0
5
2
5
0
0
0
D1
D2
D3
D4
D5
D6
D7
TP
District
Posted
Closed

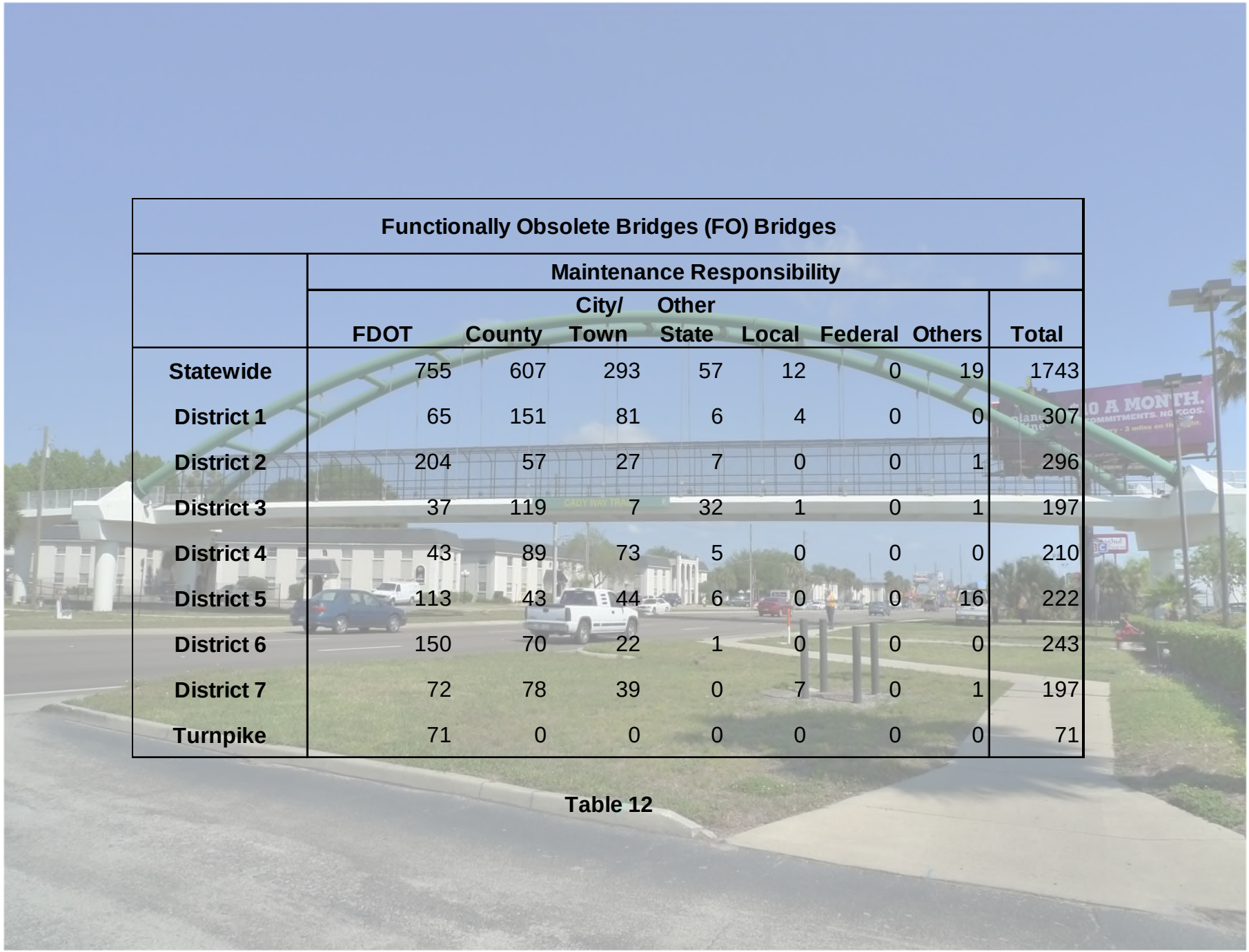
Figure 25

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).

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

There are currently 1,743 functionally obsolete bridges in Florida, about 13.91% of the total. The FDOT has maintenance responsibility for over 43.32% of all functionally obsolete bridges (see Figure 26). Refer to Figure 27 for a presentation of functionally obsolete bridges, by district, for each of the three maintenance responsibility groups.



Functionally Obsolete Bridges (FO) Bridges								
	Maintenance Responsibility							
	FDOT	County	City/ Town	Other State	Local	Federal	Others	Total
Statewide	755	607	293	57	12	0	19	1743
District 1	65	151	81	6	4	0	0	307
District 2	204	57	27	7	0	0	1	296
District 3	37	119	7	32	1	0	1	197
District 4	43	89	73	5	0	0	0	210
District 5	113	43	44	6	0	0	16	222
District 6	150	70	22	1	0	0	0	243
District 7	72	78	39	0	7	0	1	197
Turnpike	71	0	0	0	0	0	0	71

Table 12

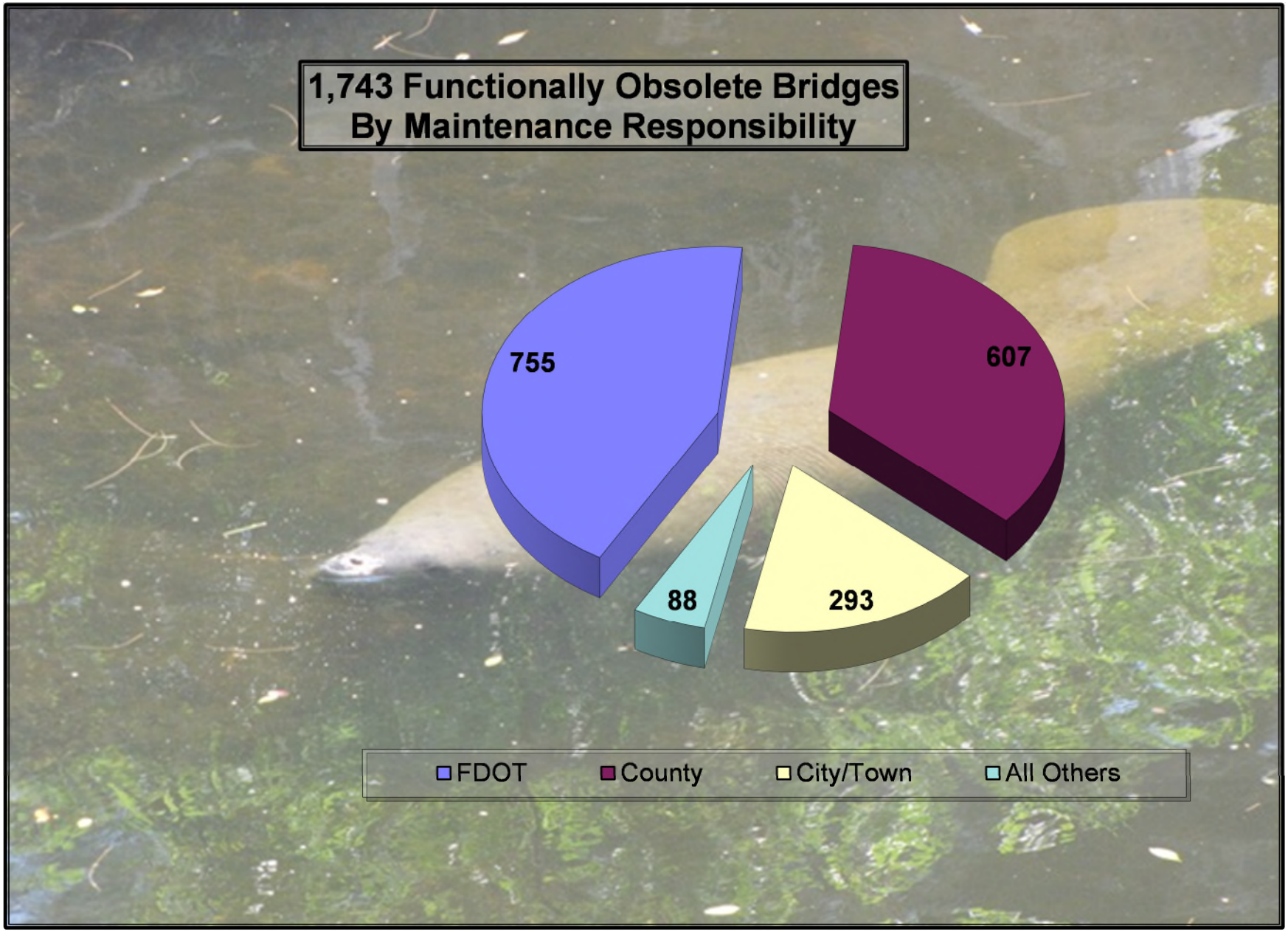

1,743 Functionally Obsolete Bridges
By Maintenance Responsibility
755
607
88
293
FDOT
County
City/Town
All Others

Figure 26

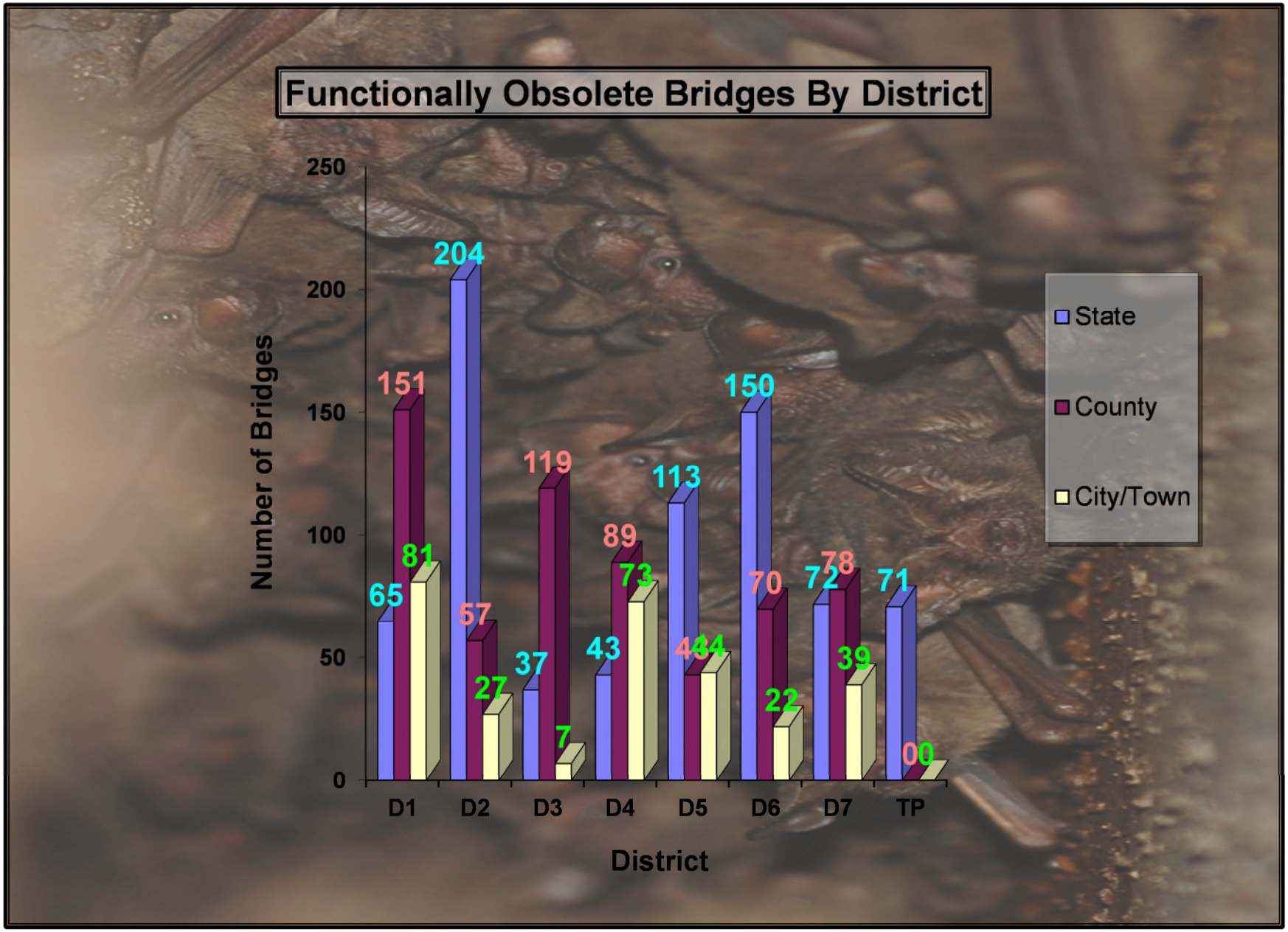

Functionally Obsolete Bridges By District
Number of Bridges
250
200
150
100
50
0
District
D1
D2
D3
D4
D5
D6
D7
TP
State
County
City/Town
65
151
81
204
57
27
37
119
7
43
89
73
113
444
150
70
22
72
78
39
71
00

Figure 27

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.

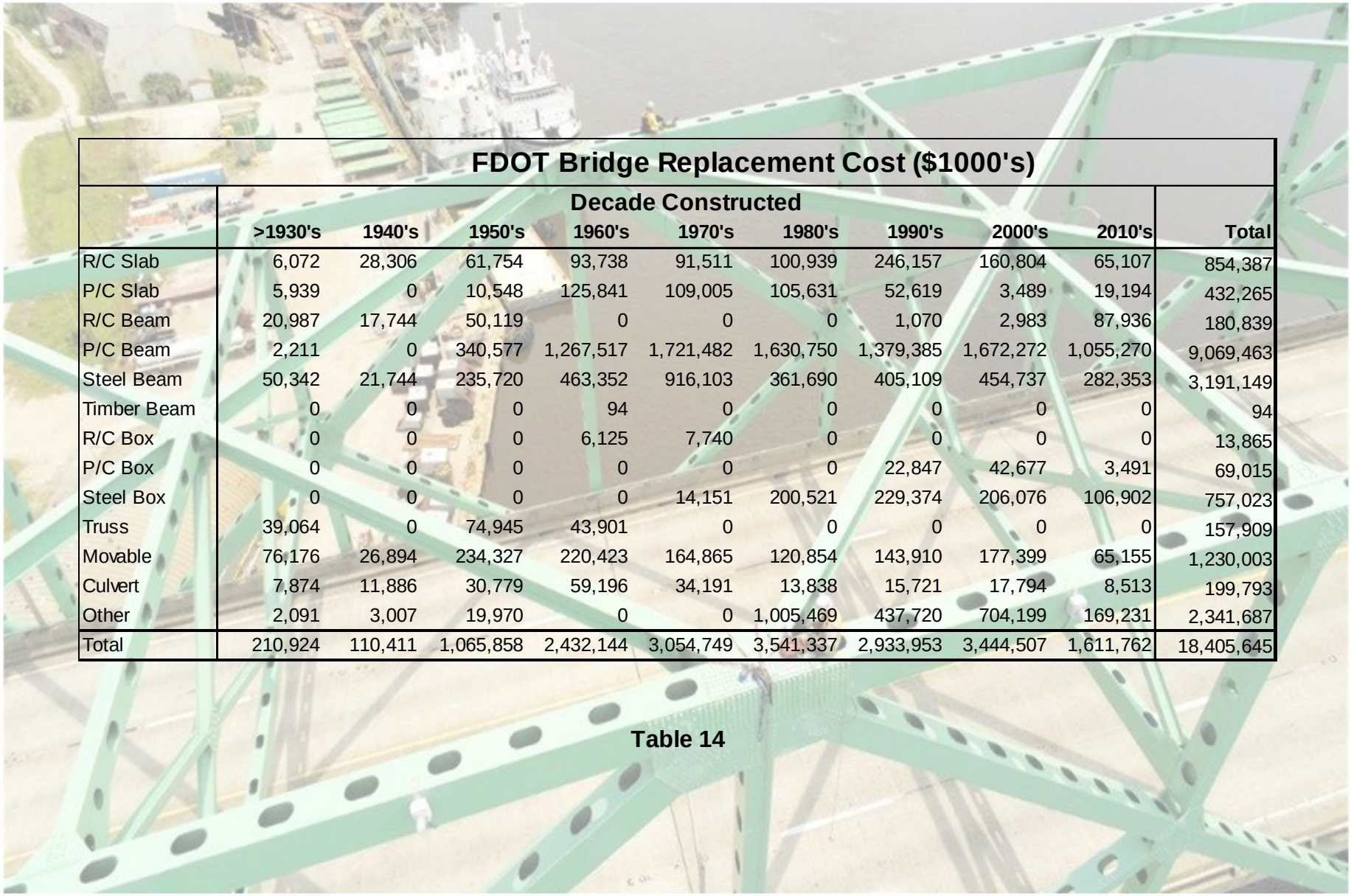
The estimate includes only construction of the structure. There are no values associated with R.O.W., approach work, design engineering, preliminary engineering, future maintenance and operation cost, or any other activity not associated with the actual construction of the bridge.

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	50,598	233,584	509,495	705,365	636,203	695,277	1,669,031	1,119,530	485,597	6,104,679
P/C Slab	39,593	0	70,321	838,940	726,702	704,205	350,790	23,259	127,959	2,881,769
R/C Beam	220,916	186,775	527,573	0	0	0	11,260	31,399	859,020	1,836,943
P/C Beam	21,054	0	3,243,587	12,054,173	16,356,210	15,448,437	12,640,663	15,488,294	9,974,959	85,227,377
Steel Beam	452,369	183,138	2,016,704	3,715,932	7,666,095	2,857,827	3,223,007	3,648,814	2,366,021	26,129,908
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	294,323	24,075	318,398
Steel Box	0	0	0	0	94,340	1,336,804	1,529,161	1,373,837	712,678	5,046,819
Truss	223,224	0	428,255	250,860	0	0	0	0	0	902,340
Movable	163,176	87,839	654,954	544,007	659,422	371,782	473,157	564,073	236,253	3,754,662
Culvert	88,998	123,895	322,122	623,646	361,730	147,483	165,488	187,630	105,776	2,126,768
Other	13,937	20,048	133,130	0	0	6,704,355	2,918,134	4,694,663	1,162,134	15,646,401
Total	1,273,865	835,279	7,906,141	18,774,739	26,552,302	28,266,170	23,138,256	27,425,825	16,054,472	150,227,048

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	6,072	28,306	61,754	93,738	91,511	100,939	246,157	160,804	65,107	854,387
P/C Slab	5,939	0	10,548	125,841	109,005	105,631	52,619	3,489	19,194	432,265
R/C Beam	20,987	17,744	50,119	0	0	0	1,070	2,983	87,936	180,839
P/C Beam	2,211	0	340,577	1,267,517	1,721,482	1,630,750	1,379,385	1,672,272	1,055,270	9,069,463
Steel Beam	50,342	21,744	235,720	463,352	916,103	361,690	405,109	454,737	282,353	3,191,149
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	42,677	3,491	69,015
Steel Box	0	0	0	0	14,151	200,521	229,374	206,076	106,902	757,023
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

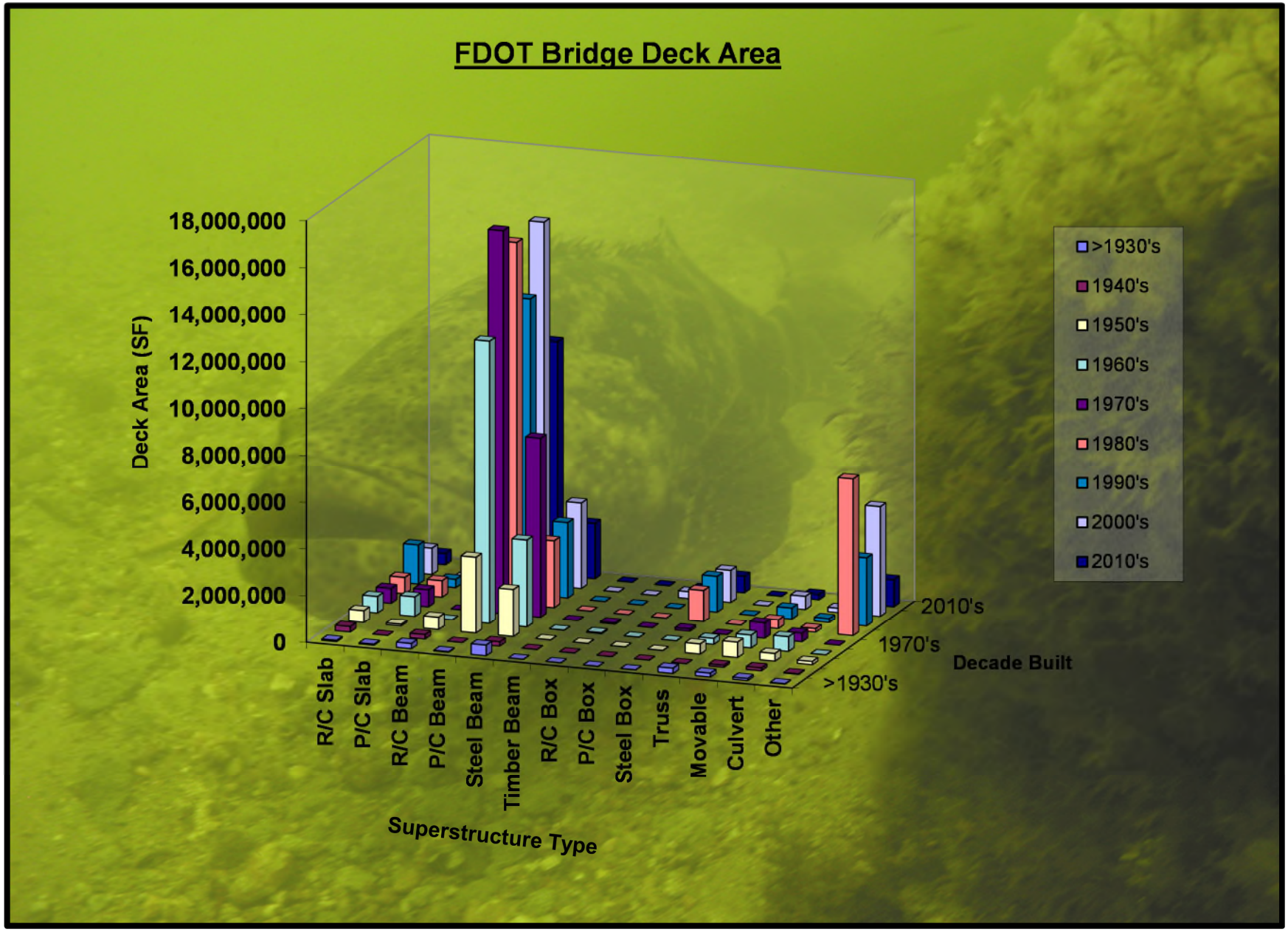

FDOT Bridge Deck Area
Deck Area (SF)
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other
Superstructure Type
2010's
1970's
>1930's
Decade Built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

Figure 28

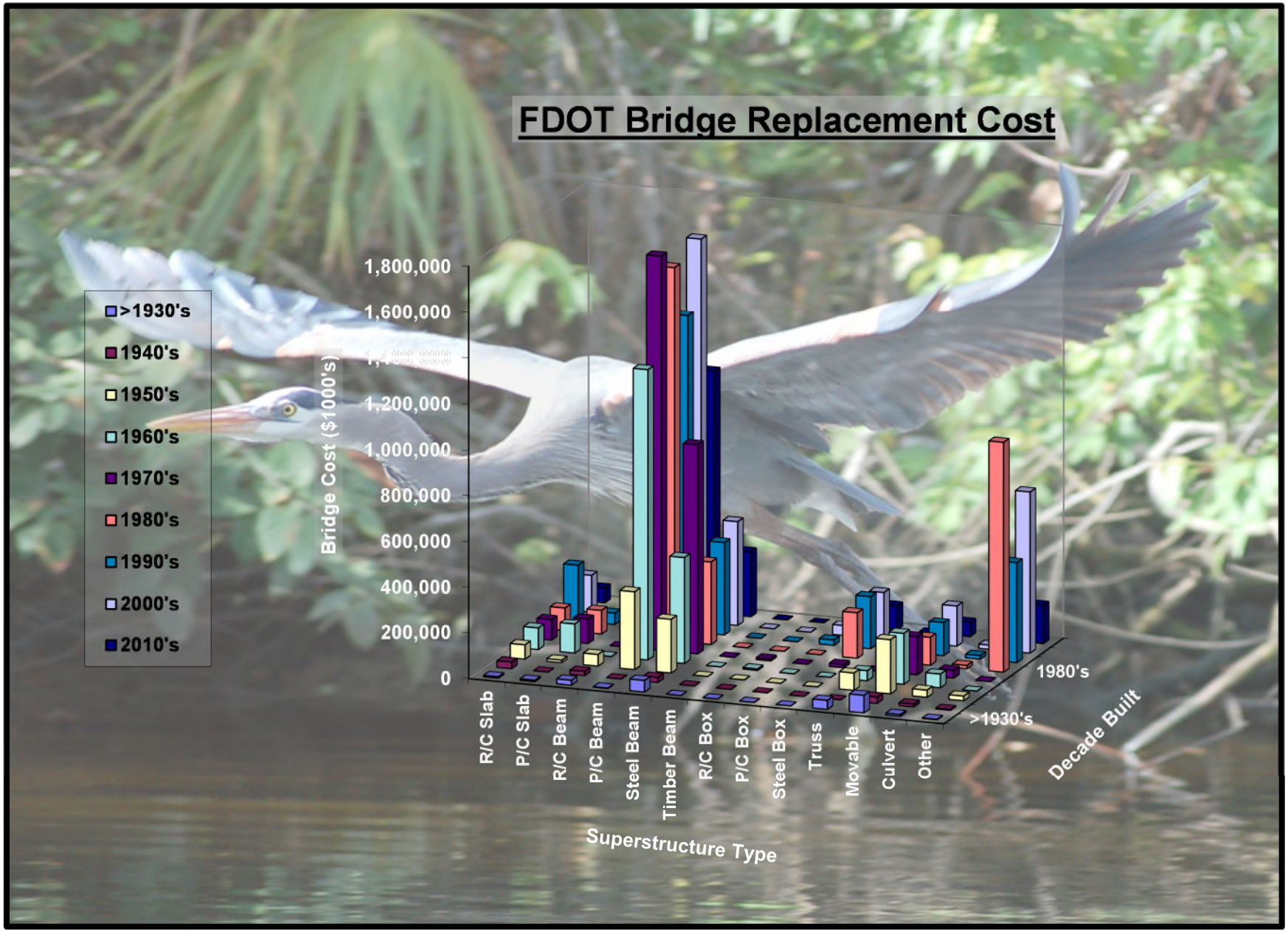

FDOT Bridge Replacement Cost
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Bridge Cost ($1000's)
1,800,000
1,600,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
R/C Slab
P/C Slab
R/C Beam
P/C Beam
Steel Beam
Timber Beam
R/C Box
P/C Box
Steel Box
Truss
Movable
Culvert
Other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

Figure 29

FDOT Bridge Deck Area (Square Feet)									
	District								
	D1	D2	D3	D4	D5	D6	D7	Turnpike	Total
>1930's	59,278	343,697	288,979	92,308	77,762	258,464	153,377	0	1,273,865
1940's	171,558	334,093	165,977	18,231	20,248	98,057	27,114	0	835,279
1950's	879,478	1,807,266	765,387	435,327	567,212	1,496,850	1,357,430	597,192	7,906,141
1960's	1,143,661	5,412,125	1,095,280	1,089,510	3,335,514	4,024,420	1,924,386	749,843	18,774,739
1970's	2,525,123	6,050,066	4,349,136	4,223,189	1,382,828	2,116,673	3,849,713	2,055,573	26,552,302
1980's	3,705,331	2,427,726	2,593,652	6,797,929	1,099,028	4,754,463	5,849,264	1,038,778	28,266,170
1990's	1,872,971	2,708,191	5,284,785	3,201,458	2,338,915	1,518,442	3,287,262	2,926,232	23,138,256
2000's	2,934,733	5,338,688	4,884,453	3,619,007	3,303,165	1,347,235	4,196,084	1,802,460	27,425,825
2010's	766,709	3,027,594	2,873,274	0	2,828,151	1,442,905	2,935,326	619,216	14,493,176
Total	14,058,842	27,449,445	22,300,924	19,476,959	14,952,823	17,057,510	23,579,955	9,789,294	148,665,751

Table 15

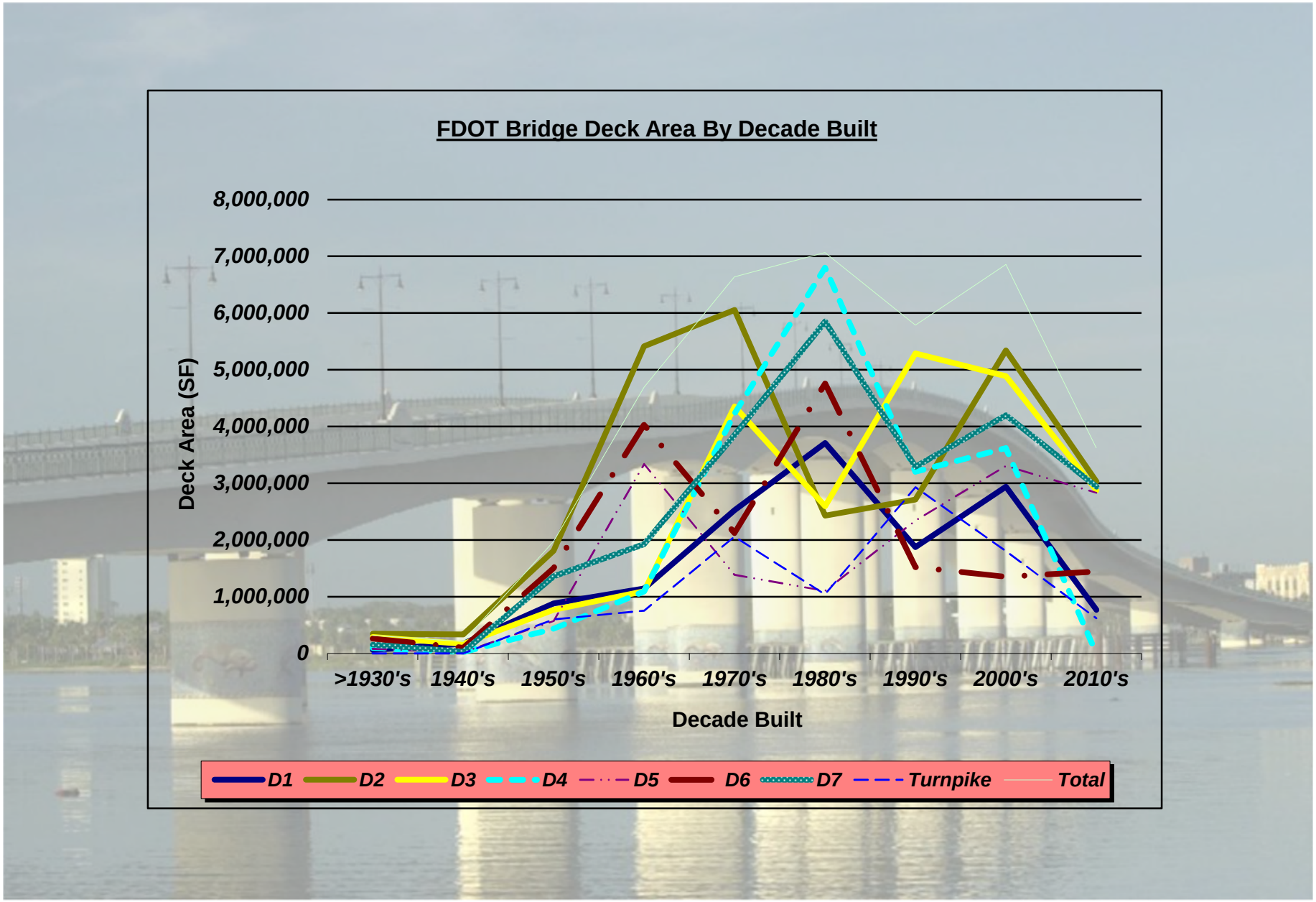

FDOT Bridge Deck Area By Decade Built
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Deck Area (SF)
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
Turnpike
Total

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	18,211,563

Table 16

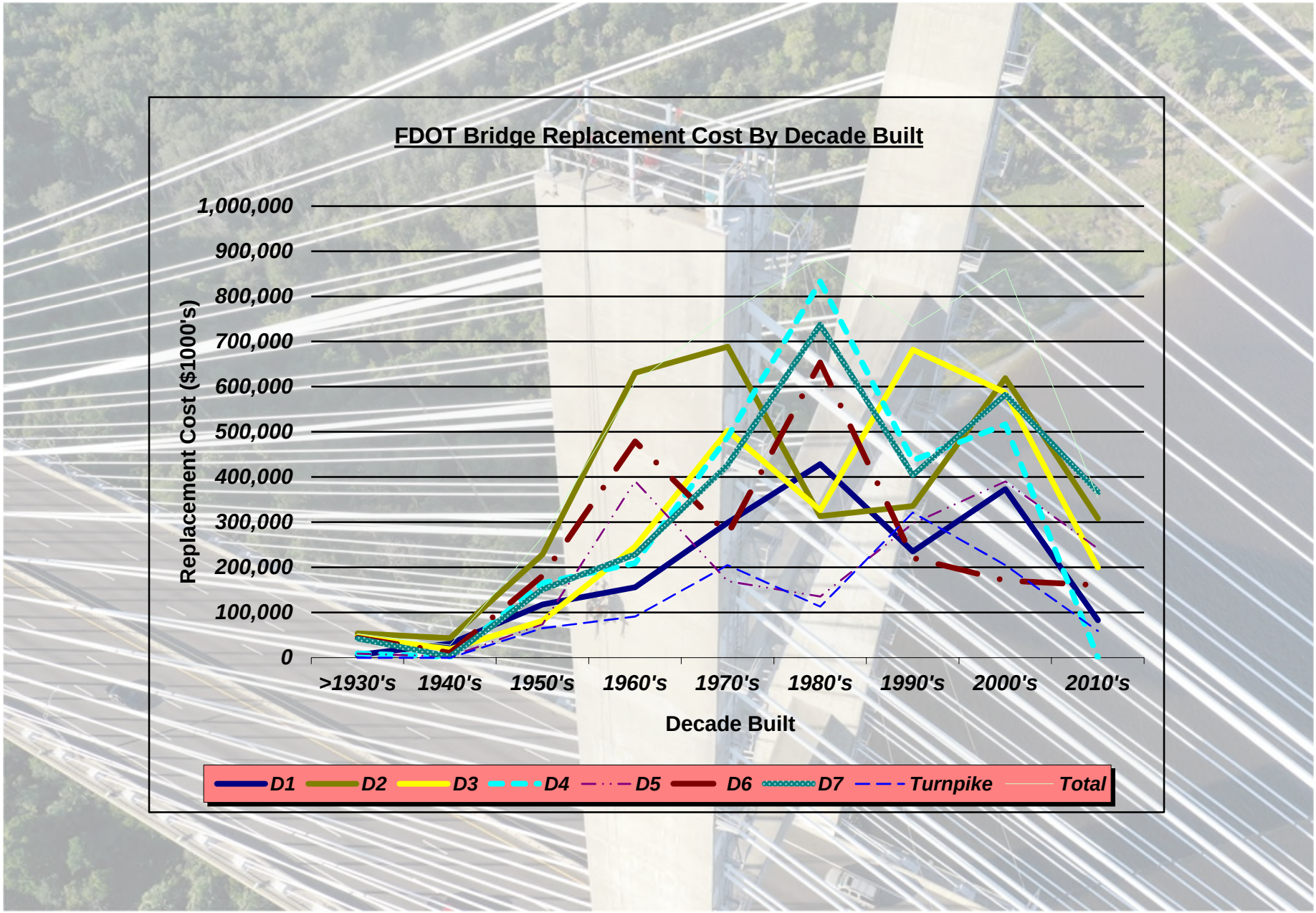

FDOT Bridge Replacement Cost By Decade Built
Replacement Cost ($1000's)
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
>1930's
1940's
1950's
1960's
1970's
1980's
1990's
2000's
2010's
Decade Built
D1
D2
D3
D4
D5
D6
D7
Turnpike
Total

Figure 31

FDOT Inventory of Water Crossing (WC) vs. Non-Water Crossing (NWC) Bridges				
	Deck Area (SF)		Bridge Cost ($1000's)	
District	WC	NWC	WC	NWC
1	10,260,883	3,396,810	1,304,916	389,093
2	17,632,045	9,275,368	2,109,518	1,081,844
3	18,449,530	3,535,081	2,222,423	429,248
4	10,413,540	10,561,320	1,603,042	1,251,377
5	8,392,960	6,352,941	1,037,027	701,767
6	10,810,460	6,243,424	1,482,282	710,389
7	13,453,643	9,816,580	1,737,081	1,182,469
Turnpike	3,694,158	5,939,645	406,502	655,470
Total	93,107,219	55,121,169	11,902,792	6,401,658

Table 17

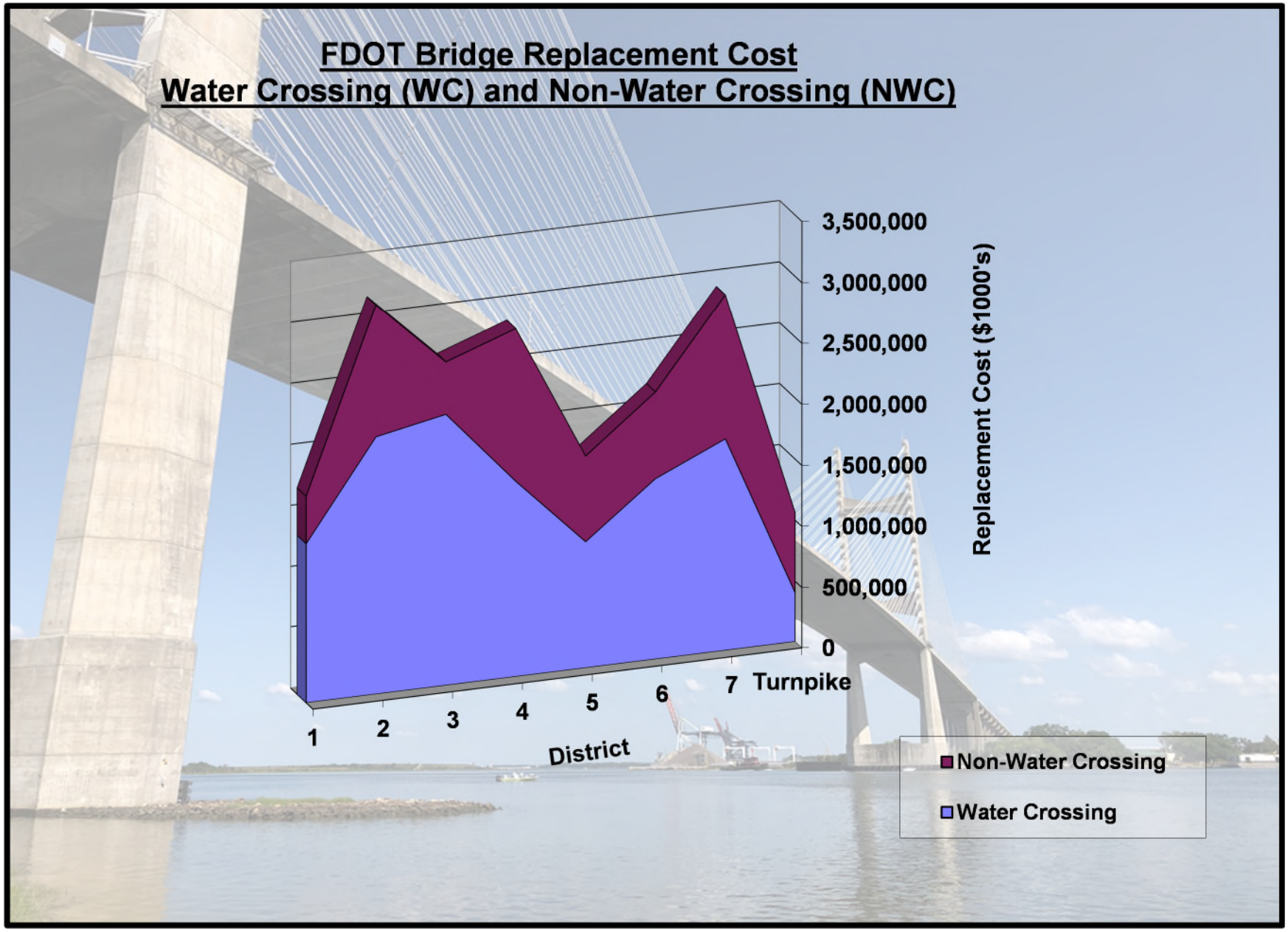

FDOT Bridge Replacement Cost
Water Crossing (WC) and Non-Water Crossing (NWC)
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
0
Replacement Cost ($1000's)
1
2
3
4
5
6
7 Turnpike
District
Non-Water Crossing
Water Crossing

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 12,529 bridges accounted for in Florida. The FDOT has maintenance responsibility for 7,044 of the bridges, or 56.22%. County governments maintain 3,924 bridges (31.32%), city and towns maintain 1,259 bridges (10.05%), with the remaining 302 bridges (2.41%) maintained by others. 14.15% of all bridges currently in service in Florida were constructed prior to 1960; 34.83% were constructed in the 1960's and 1970's, while the remaining 51.02% have been built since 1980. This distribution is relatively consistent for the three maintenance groups (FDOT, Counties, and City/Towns) used in this report. Bridges do not last forever. Through aggressive preventive maintenance, the strategy is to leverage advances in material science, design practices, and construction methods to extend the useful life of the bridges, thereby minimizing the need to replace a large number of bridges within a short time period. The challenge is to determine the most cost effective mix of preventive maintenance, routine maintenance, repair, rehabilitation, replacement, and other actions over the life of the bridges.

Florida's bridges are generally in good condition, with those maintained by the FDOT in better condition than those maintained by local governments or others. The most serious threat to bridges in Florida is the corrosion of steel reinforced concrete substructures in coastal regions. Much has been learned in recent years about corrosion in marine environments, affecting material specifications and design practices that helps new bridges built today. However, the older bridges in the coastal regions are beginning to require careful evaluation and extensive corrective actions. On-going research will continue to provide useful information to help meet this challenge. Other challenges include: confronting the increasingly extensive environmental and public health issues related to protective coatings for steel bridges with lead based paint; completing the statewide bridge scour evaluation program to identify scour critical bridges (bridges that could fail during floods) and to provide scour countermeasures as corrective action where required; to stay on top of movable bridge maintenance and rehabilitation; and to improve preventive maintenance on the large population (34.83% 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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