

Bridge and Pavement Condition Management System

2018-2019 UPWP Report

Syracuse Metropolitan Transportation Council



JUNE 2019



BRIDGE & PAVEMENT CONDITION MANAGEMENT SYSTEM

Syracuse Metropolitan Planning Area

June 2019

2018-2019 Unified Planning Work Program

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Introduction

The purpose of the Bridge and Pavement Condition Management System (BPCMS) report is to serve as a comprehensive clearinghouse for condition information on selected bridges and pavements throughout the Metropolitan Planning Area (MPA) of the Syracuse Metropolitan Transportation Council (SMTC). Infrastructure improvements such as bridge rehabilitation and pavement milling routinely make up a significant portion of Transportation Improvement Program (TIP) funds spent in the MPA. Through the BPCMS report, member agencies are able to track investments in infrastructure across the system.

This report contains information on all roadway bridges and federal-aid eligible roads in the MPA. These conditions are presented through the lens of several different variables, such as facility owner, National Highway System (NHS) designation, and Environmental Justice considerations.

In 2017, one of the Federal Highway Administration (FHWA)'s final rules establishing performance measures for State Departments of Transportation and Metropolitan Planning Organizations took effect. The rule establishes measures to assess the condition of bridges and pavements, and addresses requirements established with the two most recent transportation legislations, the Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act. With these performance measures, the methods of collecting condition data on bridges and pavements continues to change, along with the reporting of this condition data.

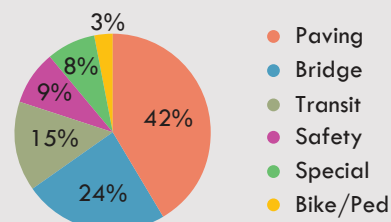
Although the overall mission and purpose of this report has remained consistent, the report has looked different with every recent iteration. Last year's report was split into a bridge section and a pavement section in order to coincide with data release schedules. This year, the report returns to its original state of a single document.

All data shown in this report were collected in the years of 2017 and 2018. The New York State Department of Transportation (NYSDOT) inspects all highway bridges that it owns, as well as those owned by local municipalities, at a maximum of 24 months. Tolling authorities (such as the New York State Thruway Authority) are responsible for their own inspections, but are required to submit their data to NYSDOT. The pavement data in this report was either collected in 2018 largely by SMTC staff (on all non-State Federal Aid Eligible routes) or in 2017 by NYSDOT (all State touring routes).

Bridge condition ratings are given in a scale of Good-Fair-Poor. This classification is based on the National Bridge Inventory (NBI) condition ratings for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), and Item 62 (Culvert). Each of these items are rated on a scale of 0-9. If the lowest rating is greater than or equal to 7, the bridge is classified as "Good." If the lowest rating is less than or equal to 4, it is classified as "Poor." Bridges rated below 7 but above 4 are classified as "Fair." Pavement condition ratings utilize a score of 1-10, based on the frequency and severity of surface cracking. The scores of 1-10 also correlate to four categories: Excellent, Good, Fair, and Poor.

A note on funding...

Transportation funding is distributed to capital projects in the SMTC's MPA through the Transportation Improvement Program (TIP). The TIP identifies the timing and funding of all transportation projects scheduled for implementation over a multi-year period. Bridge and Pavement projects consume the largest portion of available TIP funds; 67% of the TIP is programmed for either bridge or paving projects.



Bridges

There are many different types of bridges in the SMTC MPA, which includes all of Onondaga County and portions of Madison and Oswego Counties. This report only includes information on roadway bridges open to vehicular travel – it does not contain information on private railroad bridges or pedestrian or bicycle overpasses. In the MPA, there are 550 bridges that meet this definition.

Of these bridges, NYSDOT owns a majority, with 313. The second most is owned by a County (either Madison, Onondaga, or Oswego), with 131. The Thruway Authority, the City of Syracuse, and local towns and villages make up the remainder. Figure 1 illustrates bridge ownership in our area, and Figure 2 gives National Bridge Inventory (NBI) ratings by structure for these bridges.

A note on ratings included in this report...

The NBI rating system has changed over the past few years. In prior reports, bridges were given an NBI classification of either “Not Deficient,” “Structurally Deficient,” or “Functionally Obsolete.” Functionally obsolete is a legacy classification that was used to implement the Highway Bridge Program, which was discontinued with the enactment of MAP-21. FHWA no longer tracks this classification. The term Structurally Deficient has been redefined to coincide with the new term of “Poor,” to be consistent with the new performance measures.

Prior reports also included the NYSDOT Condition Rating, scored from 1.0 – 7.0. Due to changes in how this rating is calculated, SMTC staff and member agencies decided it would be best to not include condition ratings in this report.

Therefore, the bridge ratings used in this report are not the same as those used in previously published reports.

Figure 1: Roadway Bridges by Owner in the MPA

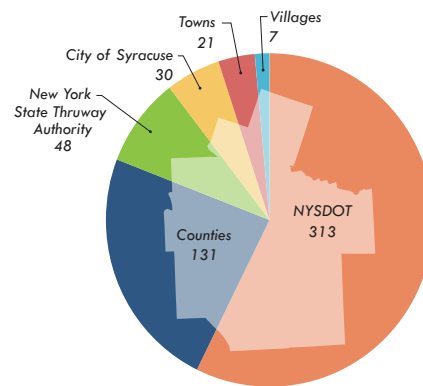
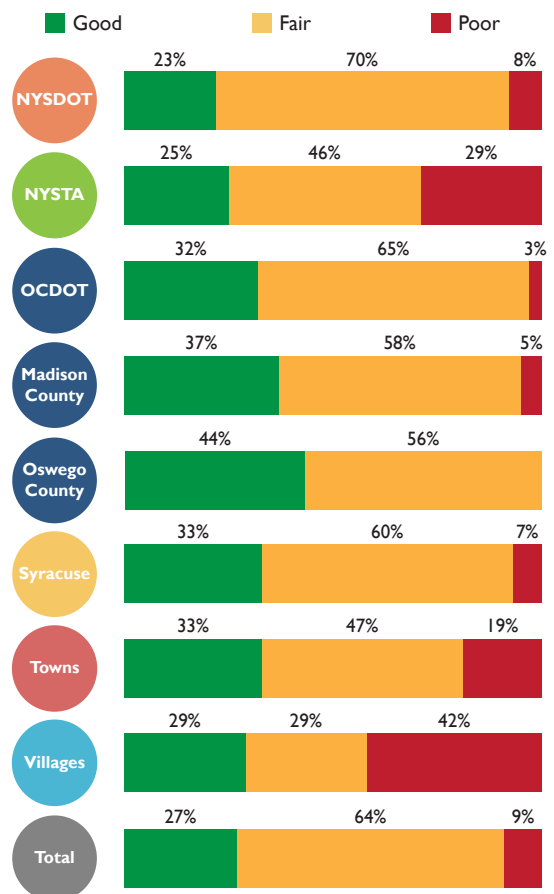


Figure 2: NBI Classification by Owner, by Structure



Source: FHWA NBI Rating via NYSDOT, 2017-2018

Deck Area

Another important factor to consider when reviewing bridge ratings is deck area, which paints a different picture of bridge maintenance than simply the number of structures owned. The federal performance measures specify using percentage of deck area for this reason. Figure 3 below illustrates the percentage of bridge deck owned by each jurisdiction. Note how that although NYSDOT owns 57% of bridges in the MPA, it is responsible for 81% of the total roadway

bridge deck area examined in this report. Figure 4 gives the percentage of deck area rated Good, Fair, or Poor by each bridge owner, and the total percentage of Good, Fair, and Poor deck area in the MPA. Breaking from prior reports, “deck” area on bridges that do not technically have a deck, such as arches and frames, were included in these calculations. This aligns with the federal performance measures final rule.

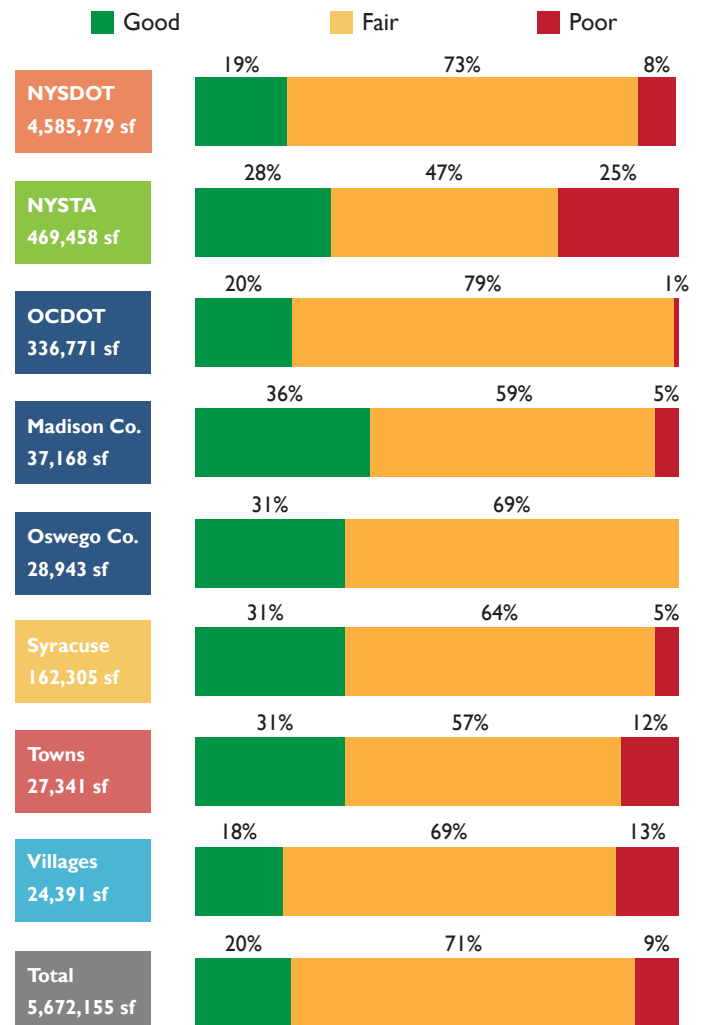
Figure 3: Bridge Ownership Weighted by Deck Area

Owner	Deck Area (sq ft)	% of All Deck Area	Bridges	% of All Bridges
NYSDOT	4,585,779	80.1%	313	56.9%
NYSTA	469,458	8.3%	48	8.7%
OCDOT	336,771	5.9%	96	17.5%
Madison County	37,168	0.7%	19	3.5%
Oswego County	28,943	0.5%	16	2.9%
Syracuse	162,305	2.9%	30	5.5%
Towns	27,341	0.5%	21	3.8%
Villages	24,391	0.4%	7	1.3%



Spencer Street over I-81

Figure 4: Bridge Classifications Weighted by Deck Area



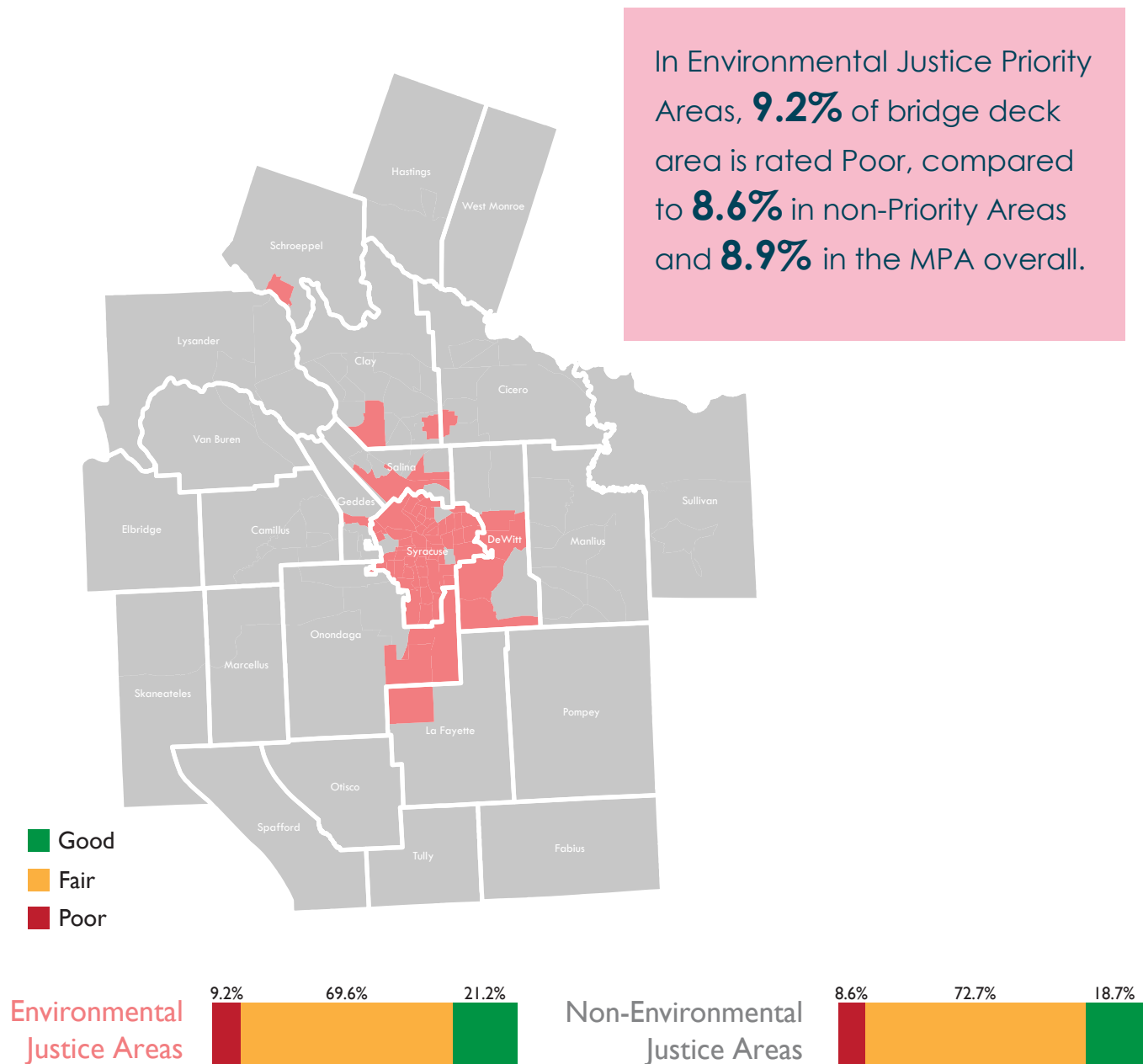
Source: FHWA NBI Rating via NYSDOT, 2017-2018

Environmental Justice Areas

Periodically, the SMTTC evaluates recent and future transportation planning projects and programs throughout the MPA, with a goal of ensuring that both the positive and negative impacts of transportation planning are fairly distributed across all socioeconomic populations and that no one population is adversely affected or neglected. As a part of this analysis, the

SMTTC uses data from the US Census to identify geographic areas with significant minority and low-income populations. These areas are known as Environmental Justice Priority Target Areas. Figure 5 shows the locations of these priority target areas in the MPA and compares bridge assessments (by deck area) in priority and non-priority areas.

Figure 5: Environmental Justice Areas



National Transportation Performance Measures

The Federal Highway Administration has published a final rule establishing performance measures to use in managing bridge conditions on the National Highway System (NHS). The measures are the percentage of NHS bridges by deck area in Good condition and the percentage of NHS bridges by deck area in Poor condition. NHS bridges are defined as structures carrying the National Highway System. As noted in this report's introduction, if the lowest NBI Item rating (for Items 58, 59, 60, and 62) is greater than or equal to 7, the bridge is classified as Good. If the lowest rating is less than or equal to 4, it is classified as Poor. Bridges

rated below 7 but above 4 are classified as Fair, but are not used in the performance measure.

Metropolitan Planning Organizations (MPOs), like the SMTC, must either support their DOT's targets or establish their own targets for these measures. The SMTC has chosen to support NYSDOT's targets. Figure 6 shows NYSDOT's targets, and the current performance of bridges in the SMTC MPA. Figure 7 gives extended definitions of individual NBI condition ratings.

Figure 6: NBI Classifications on the National Highway System

Performance Measure	NYSDOT Baseline	SMTC MPA Value	Two-Year Target	Four-Year Target
Percent of NHS bridges by deck area in Good condition	20.2%	17.4%	23.0%	24.0%
Percent of NHS bridges by deck area in Poor condition	11.7%	8.5%	11.6%	11.7%

Figure 7: NBI Bridge Condition Ratings

(9) EXCELLENT CONDITION

(8) VERY GOOD CONDITION - no problems noted.

(7) GOOD CONDITION - some minor problems.

(6) SATISFACTORY CONDITION - structural elements show minor deterioration.

(5) FAIR CONDITION - all primary structural elements are sound but may have minor corrosion, cracking or chipping. May include minor erosion on bridge piers.

(4) POOR CONDITION - advanced corrosion, deterioration, cracking or chipping. Also significant erosion of concrete bridge piers.

(3) SERIOUS CONDITION - corrosion, deterioration, cracking and chipping, or erosion of concrete bridge piers have seriously affected deck, superstructure, or substructure. Local failures are possible.

(2) CRITICAL CONDITION - advanced deterioration of deck, superstructure, or substructure. May have cracks in steel or concrete, or erosion may have removed substructure support. It may be necessary to close the bridge until corrective action is taken.

(1) "IMMINENT" FAILURE CONDITION - major deterioration or corrosion in deck, superstructure, or substructure, or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.

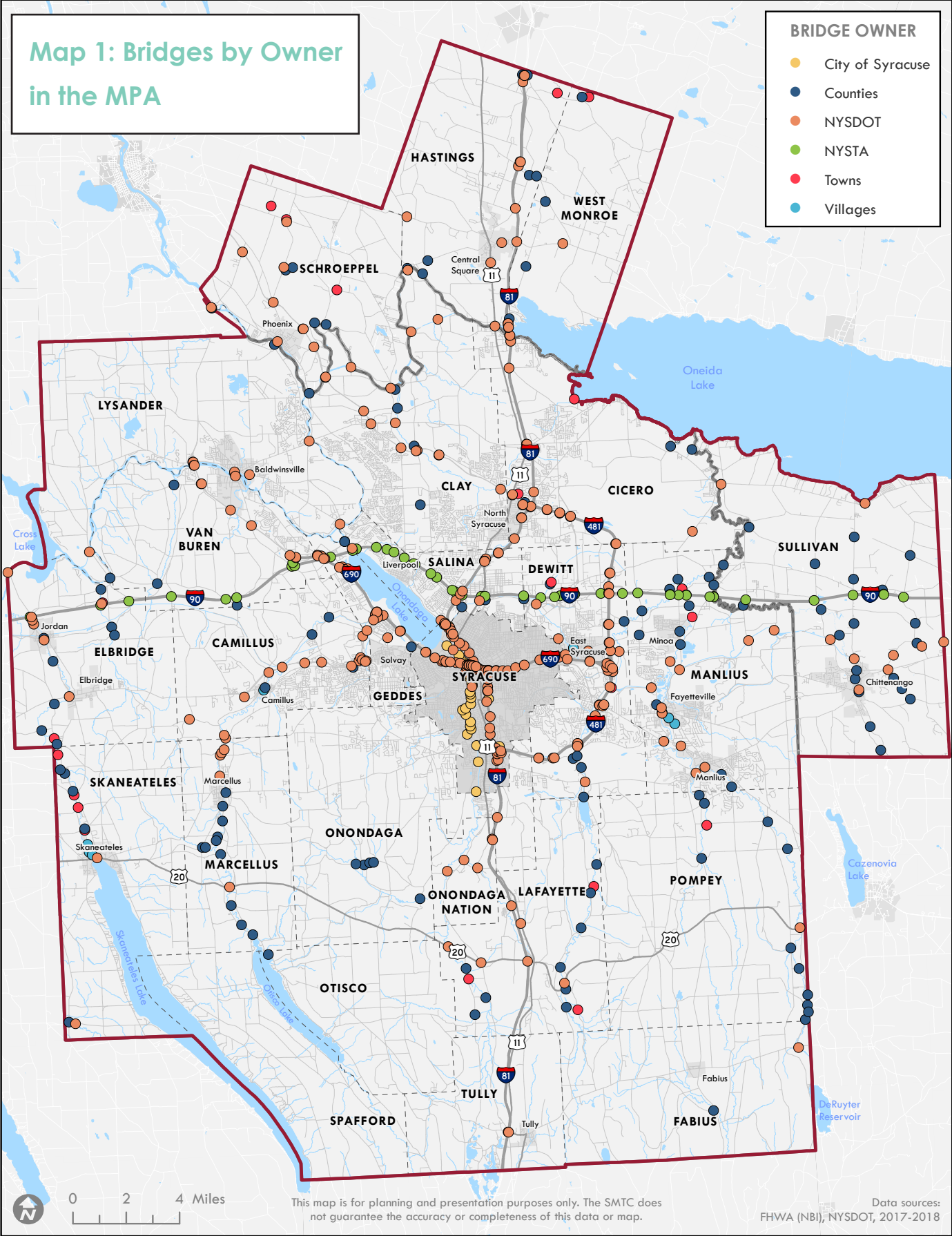
(0) FAILED CONDITION - out of service. Beyond corrective action.

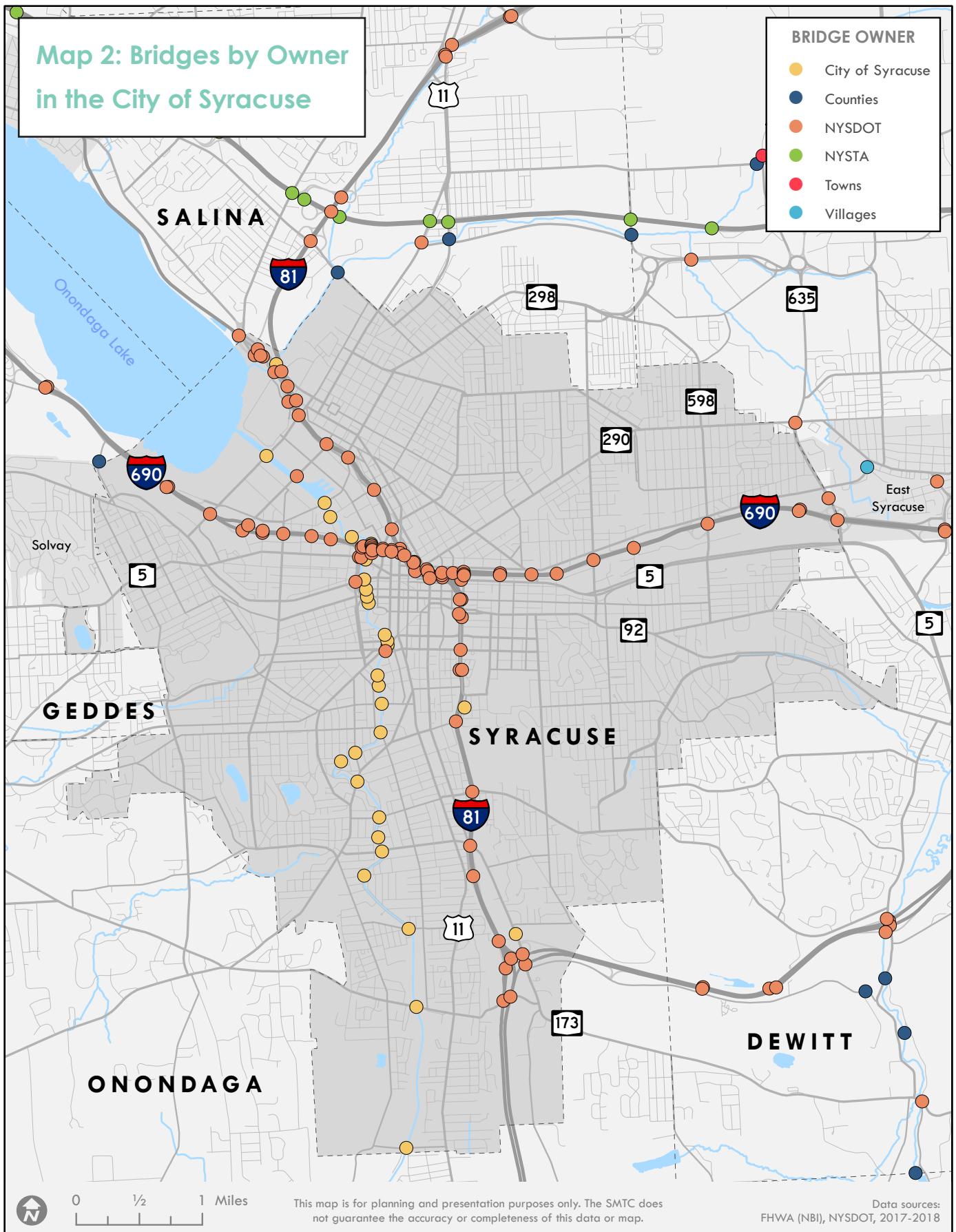
(N) NOT APPLICABLE.

Source: FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges.

Maps

As a reference, maps with more bridge assessments and other applicable information are found in the pages that follow.



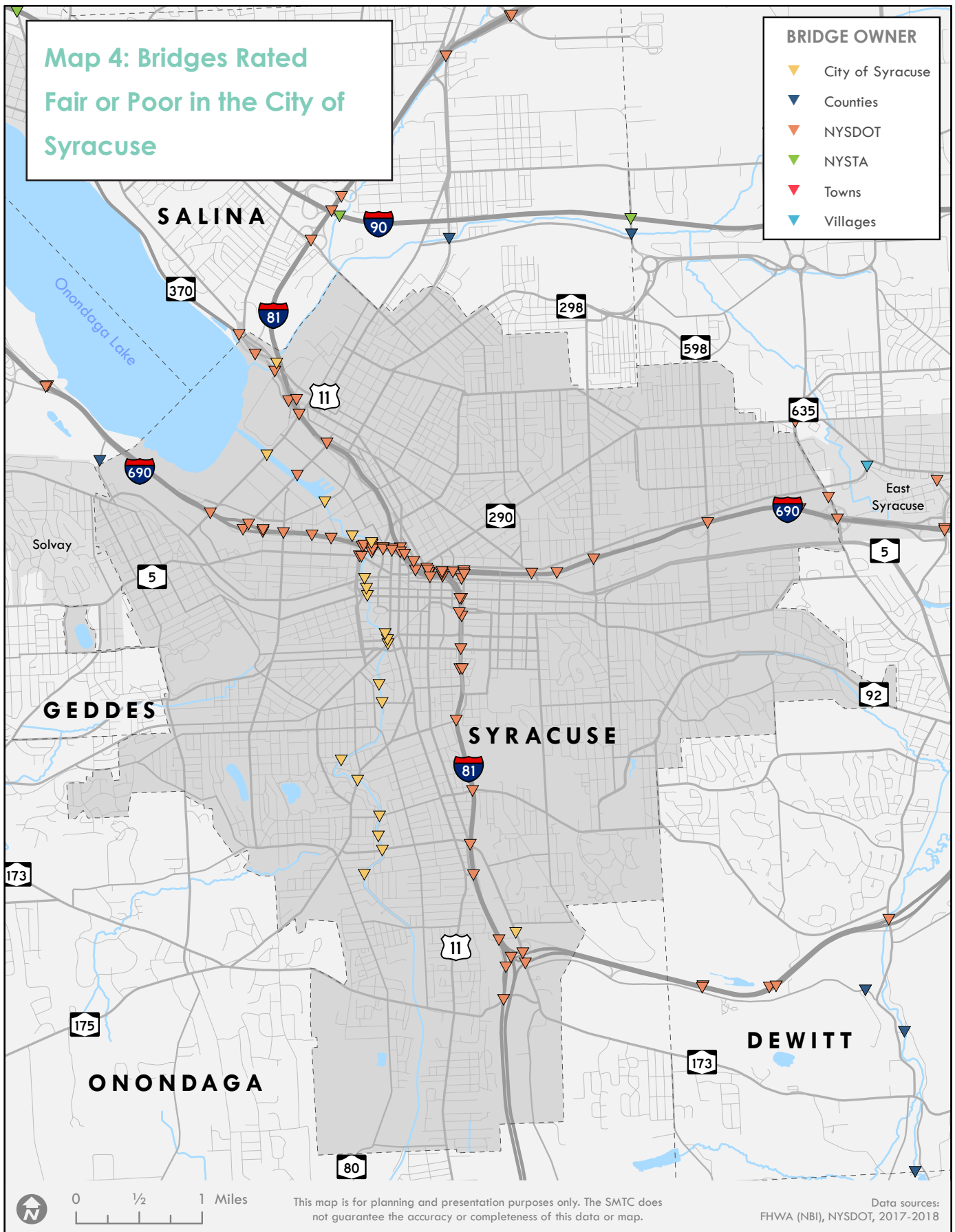




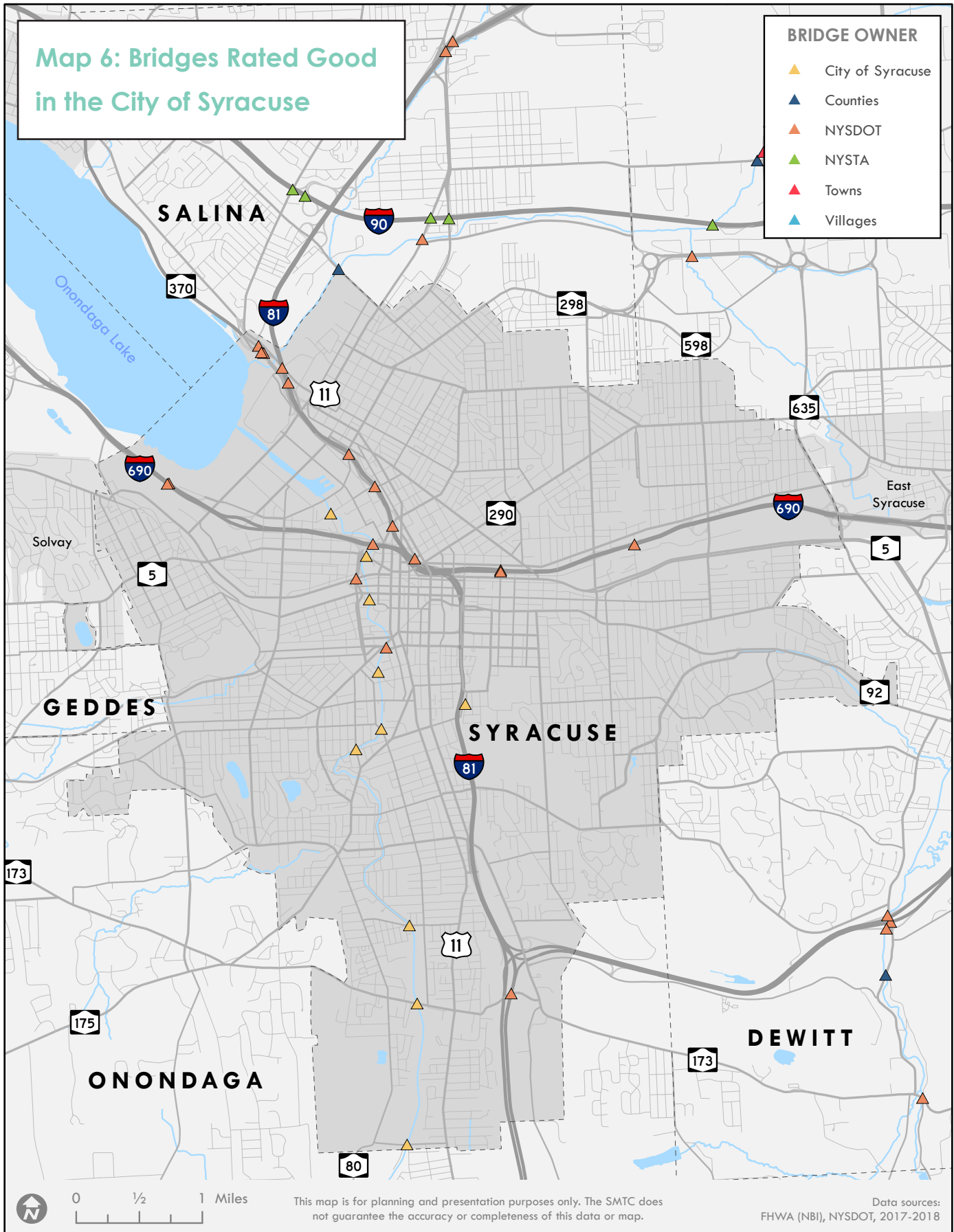
**Map 4: Bridges Rated
Fair or Poor in the City of
Syracuse**

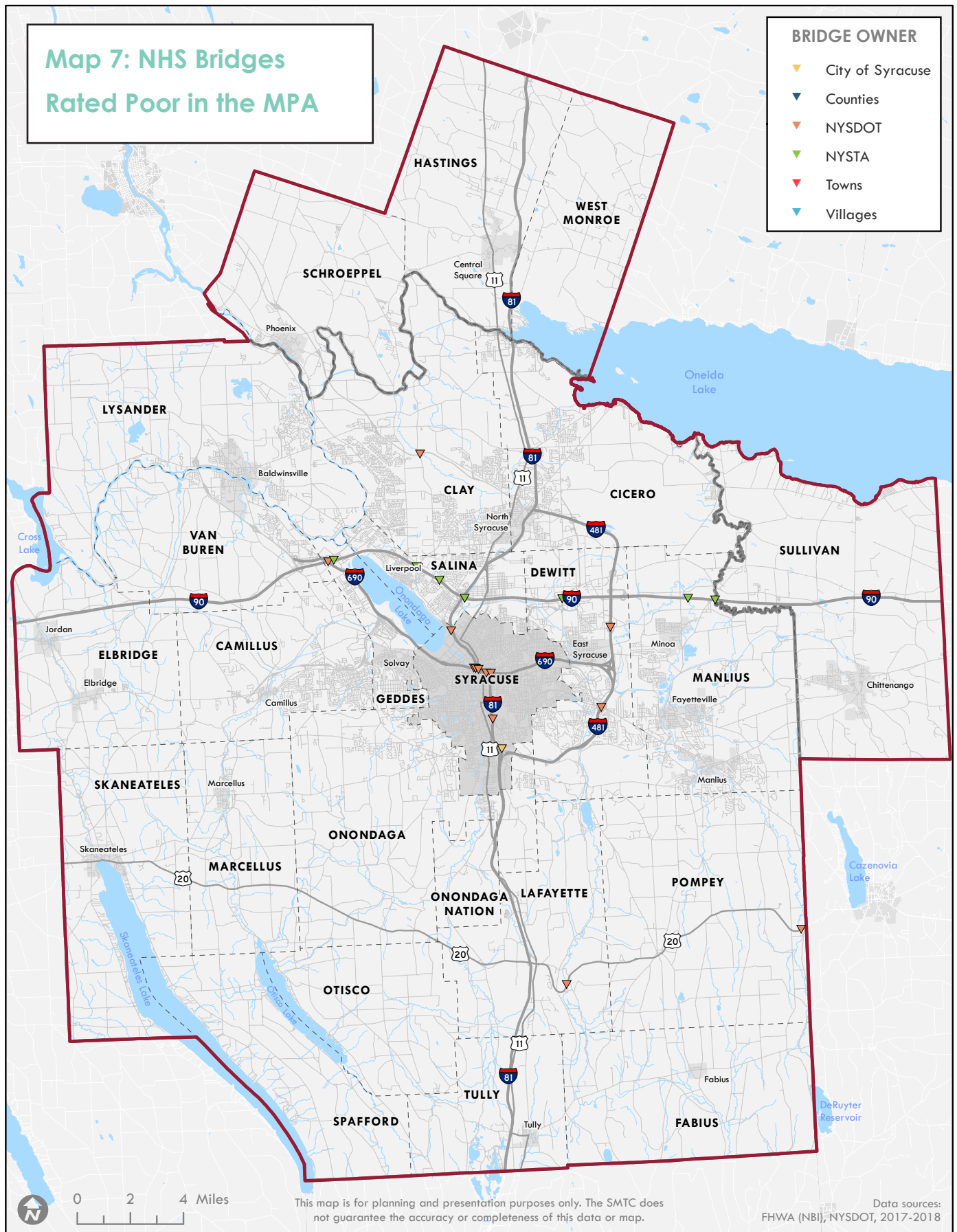
BRIDGE OWNER

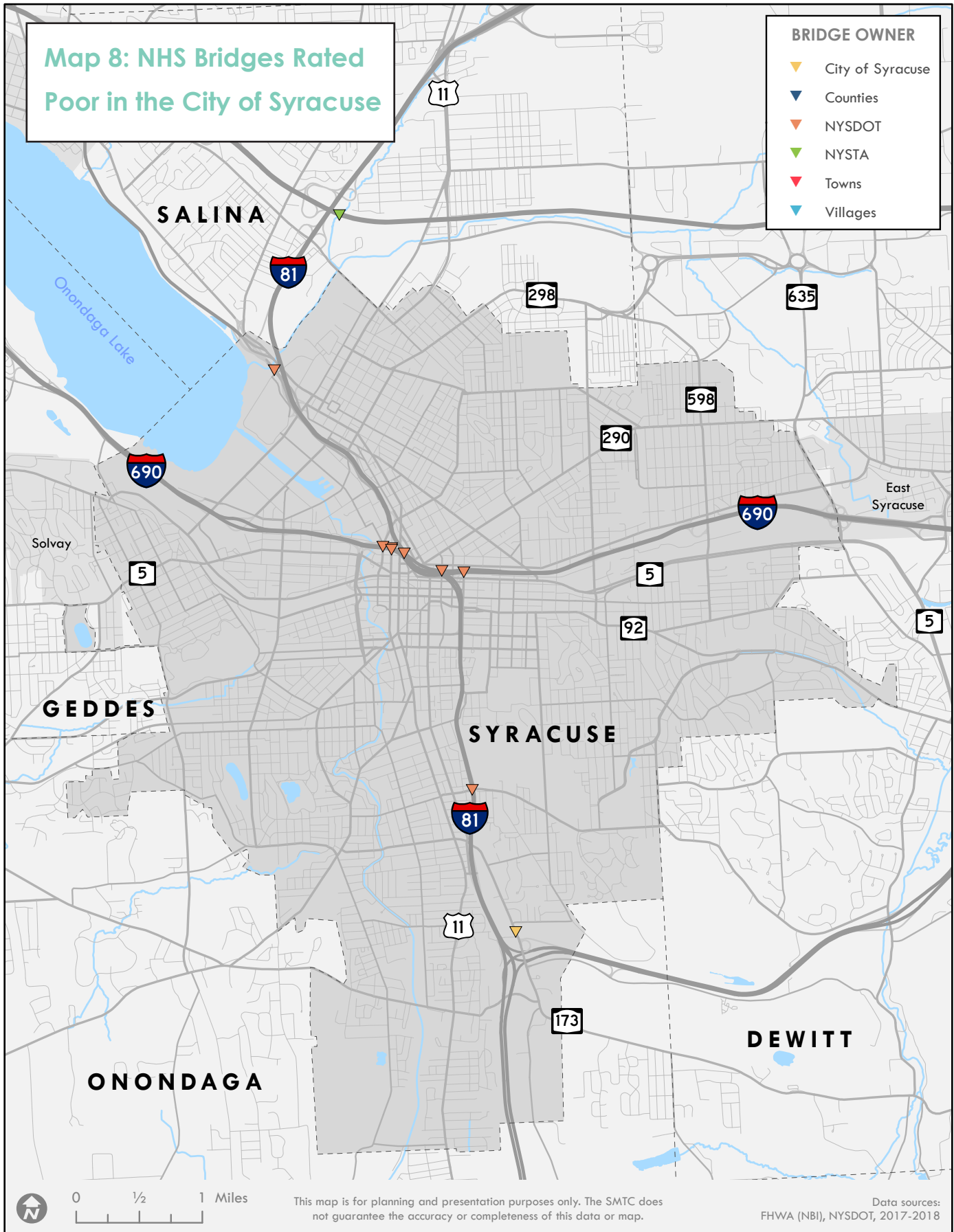
- City of Syracuse
- Counties
- NYSDOT
- NYSTA
- Towns
- Villages



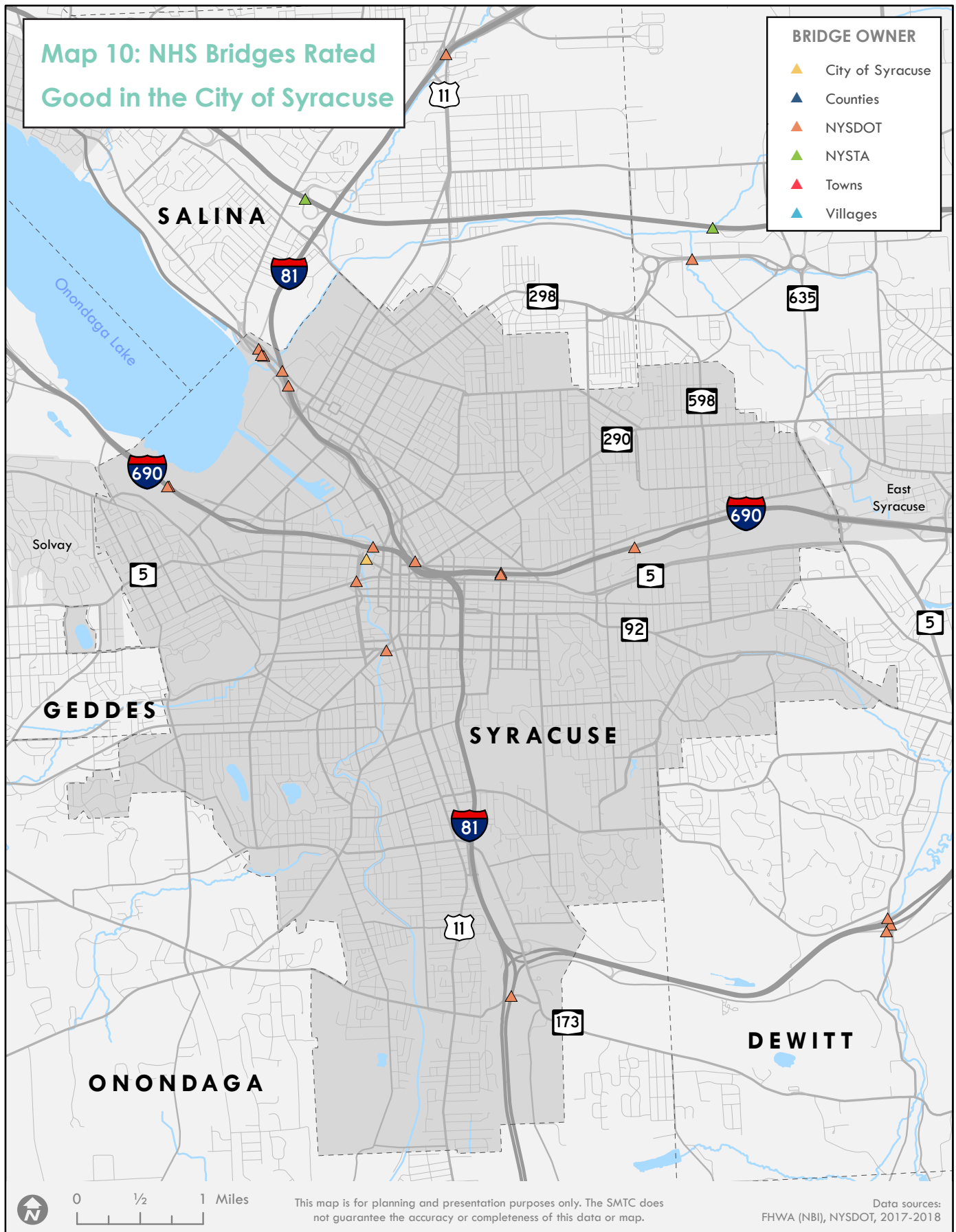












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Pavement

The SMTC reports on federal-aid eligible (FAE) roads in the MPA, which includes all of Onondaga County and portions of Madison and Oswego Counties. Roads are considered federal-aid eligible if they have a functional classification of Principal Arterial, Minor Arterial, Major Collector, or Urban Minor Collector. The pavement condition rating data in this document is based on linear centerline miles of roads, not lane miles of roads. A linear centerline mile of road is a continuous line of pavement along the center of the length of pavement, whereas a lane mile is the length of each lane in a given section of pavement.

There are approximately 979 centerline miles of federal-aid eligible road in the MPA, excluding ramps. These roads are owned by many different jurisdictions and municipalities. These miles are broken down into those owned by the New York State Department of Transportation (NYSDOT), the New York State Thruway Authority (NYSTA), the Onondaga County Department of Transportation (OCDOT), Madison County, Oswego County, and the City of Syracuse. Additionally, there are some federal-aid eligible roads that are not owned by one of the entities listed above but by some other municipality, such as a town or village. For purposes of this report, these roads are grouped into a “Local” category.

In the interest of consistency with road ratings, SMTC staff began rating federal-aid eligible roads owned by Onondaga County and the City of Syracuse in 2015. SMTC staff was trained in the NYSDOT system, so that road ratings across our MPA could be presented on a single, uniform scale. NYSDOT staff is still responsible for rating the Interstate System, the US Highway System, and the State Touring Route System, regardless of ownership. NYSDOT staff also rates all federal-aid eligible roads in Madison and Oswego Counties, as well as Local FAE Roads in Onondaga County. At the time of this report, State Touring Route, US Route, and Interstate ratings are available for 2017; all other ratings were collected in the summer of 2018.

The NYSDOT uses a moving-vehicle windshield survey to assess pavement condition. The rating procedure involves the use of a carefully developed scale, ranging from “1” (very poor) to “10” (excellent condition), based on the frequency and severity of pavement distress. This procedure is designed to permit rapid estimates of overall condition. Drawing from the NYSDOT standard, this report breaks the 1-10 rating into four categories: Excellent (9-10), Good (7-8), Fair (6), and Poor (1-5). This scale is shown in Figure 8 below. There are also a small number of roads listed as “unrated,” largely due to either construction occurring or the use of road materials not suited to pavement rating (such as brick or bridge deck).

All measurements in this section are based off of the SMTC’s roads database, built using a Geographic Information System (GIS). These measurements are not survey- or engineering-grade, and should be considered for planning purposes only. This report is not intended to be the system of record for road ownership in the MPA. The SMTC is constantly updating our roads database to better and more accurately depict conditions on the ground, to the best of our ability. Thus, small deviations in road measurements from year-to-year in this report are to be expected.

Figure 8: The NYSDOT Rating Scale

Rating	Condition Description
9-10 Excellent	No or slight pavement distress.
7-8 Good	Minor to moderate distress occurring infrequently to occasionally.
6 Fair	Moderate to severe distress occurring occasionally to frequently.
1-5 Poor	Severe or very severe distress occurring frequently. Travel may be impaired.

Source: NYSDOT Pavement Rating Manual

Note: Functional classifications and NHS designations in the SMTC MPA were updated in Summer 2018, after rating had occurred. All references to FAE and NHS roadways in this section are based on the older classifications.

Bridge and Pavement Condition Management System

Figure 9 below illustrates pavement ratings by category and mileage for road owners in the MPA, whereas Figure 10 illustrates the same but in chart form. As noted in the figures, the average pavement rating across the MPA for this cycle is 6.7, or Fair. NYSDOT and OCDOT have the highest mileage of rated roads. The

category with the largest percentage of rated roads is “Good,” with 42% of rated mileage receiving this rating. Approximately 13% are considered Excellent, 27% Fair, and 17% Poor. Additionally, a small amount (0.5%) of roads were not rated this cycle.

Figure 9: Pavement Ratings for Federal Aid-Eligible Roads

NYSDOT

	Miles	Percent	Average Rating 6.3
Excellent	33.0	7.4%	
Good	147.1	33.1%	
Fair	145.3	32.7%	
Poor	119.2	26.8%	
Total	444.7	100%	

NYSTA

	Miles	Percent	Average Rating 8.0
Excellent	11.1	30.8%	
Good	23.8	65.9%	
Fair	0.0	0.0%	
Poor	0.0	0.0%	
<i>Unrated</i>	1.2	3.3%	
Total	36.1	100%	

Onondaga County

	Miles	Percent	Average Rating 7.4
Excellent	55.5	19.7%	
Good	161.8	57.5%	
Fair	59.1	21.0%	
Poor	4.5	1.6%	
<i>Unrated</i>	0.7	0.2%	
Total	281.5	100%	

Oswego County

	Miles	Percent	Average Rating 6.9
Excellent	1.5	5.5%	
Good	16.1	59.0%	
Fair	8.3	30.5%	
Poor	1.4	5.0%	
Total	27.3	100%	

City of Syracuse

	Miles	Percent	Average Rating 6.4
Excellent	10.7	9.2%	
Good	40.4	34.9%	
Fair	28.5	24.6%	
Poor	35.5	30.6%	
<i>Unrated</i>	0.8	0.7%	
Total	115.8	100%	

Madison County

	Miles	Percent	Average Rating 8.0
Excellent	8.4	47.3%	
Good	8.8	49.6%	
Fair	0.5	3.0%	
Poor	0.0	0.0%	
Total	17.8	100%	

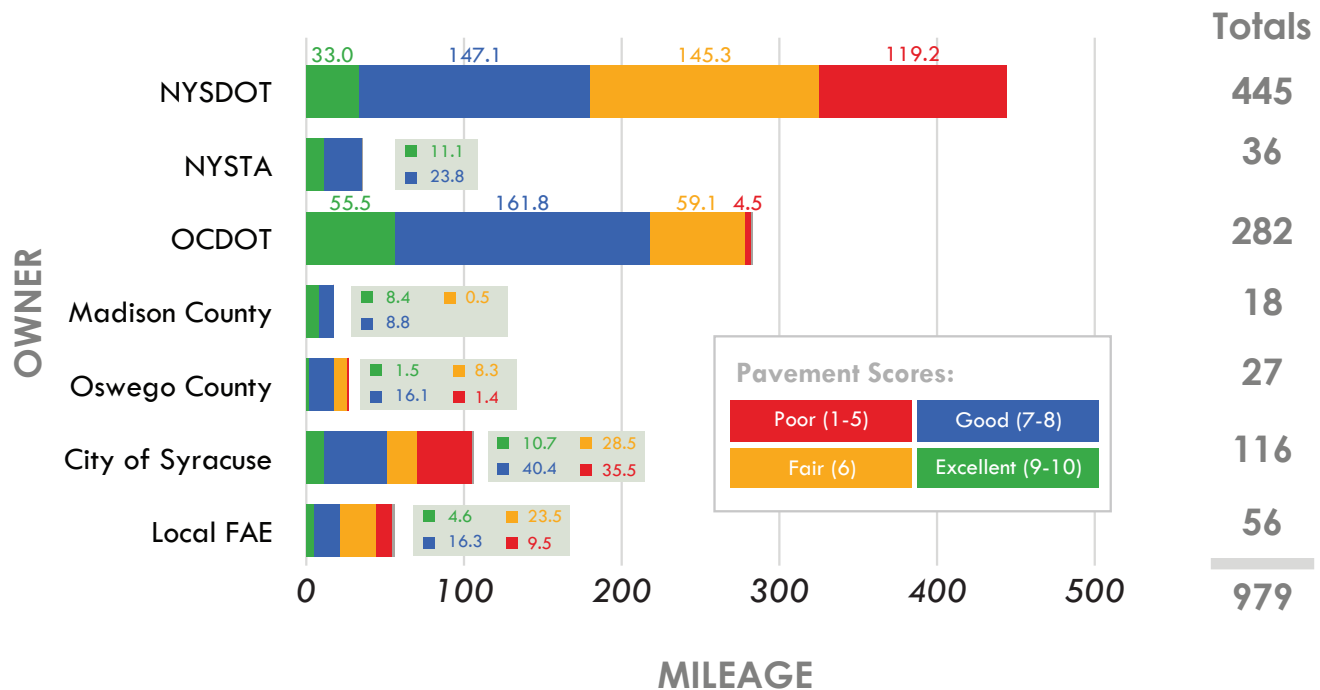
Local FAE

	Miles	Percent	Average Rating 6.5
Excellent	4.6	8.2%	
Good	16.3	29.2%	
Fair	23.5	41.9%	
Poor	9.5	17.0%	
<i>Unrated</i>	2.0	3.6%	
Total	55.9	100%	

All FAE Roads

	Miles	Percent	Average Rating 6.7
Excellent	124.8	12.7%	
Good	414.4	42.3%	
Fair	265.2	27.1%	
Poor	170.1	17.4%	
<i>Unrated</i>	4.7	0.5%	
Total	979.1	100%	

Figure 10: Pavement Ratings for Federal Aid-Eligible Roads by Owner, Rating Category, and Mileage



Functional Classification

As mentioned previously, federal-aid eligibility is based on functional classification. There are ten functional classification codes used to describe the road network. Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Arterials generally have higher design standards than other roads, often with multiple lanes and some degree of access control. Collectors provide a lower degree of mobility than arterials, and are designed for travel at lower speeds and for shorter distances. Collectors are typically two-lane roads that collect and distribute traffic from the arterial system. Roads not falling into one of these categories are classified as “Local.” Note that this “Local” is different than the way “Local” is used in terms of Road Ownership in this report, i.e. federal-aid eligible roads not owned by one of the major entities. Additionally, roads are also classified as “Urban” or “Rural,” largely based on urban area boundaries from the US Census. The above table reviews the functional classification system, with designations for classifications that are considered federal-aid eligible.

Urban Classifications

Urban Principal Arterial (interstates, other expressways and other principal arterials)

Urban Minor Arterial

Urban Major Collector
Urban Minor Collector

Urban Local

Rural Classifications

Rural Principal Arterial (interstates, other expressways and other principal arterials)

Rural Minor Arterial

Rural Major Collector
Rural Minor Collector

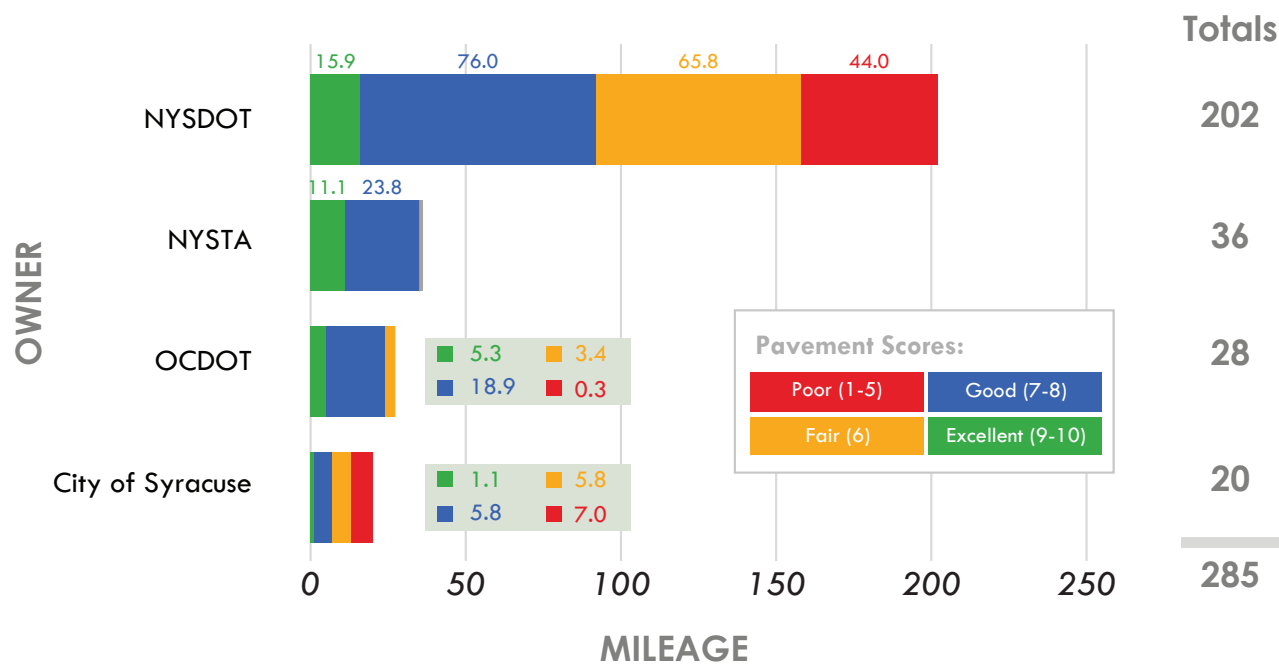
Rural Local

Functional Classifications in Italics are not federal-aid eligible, and therefore not included in this report.

Bridge and Pavement Condition Management System

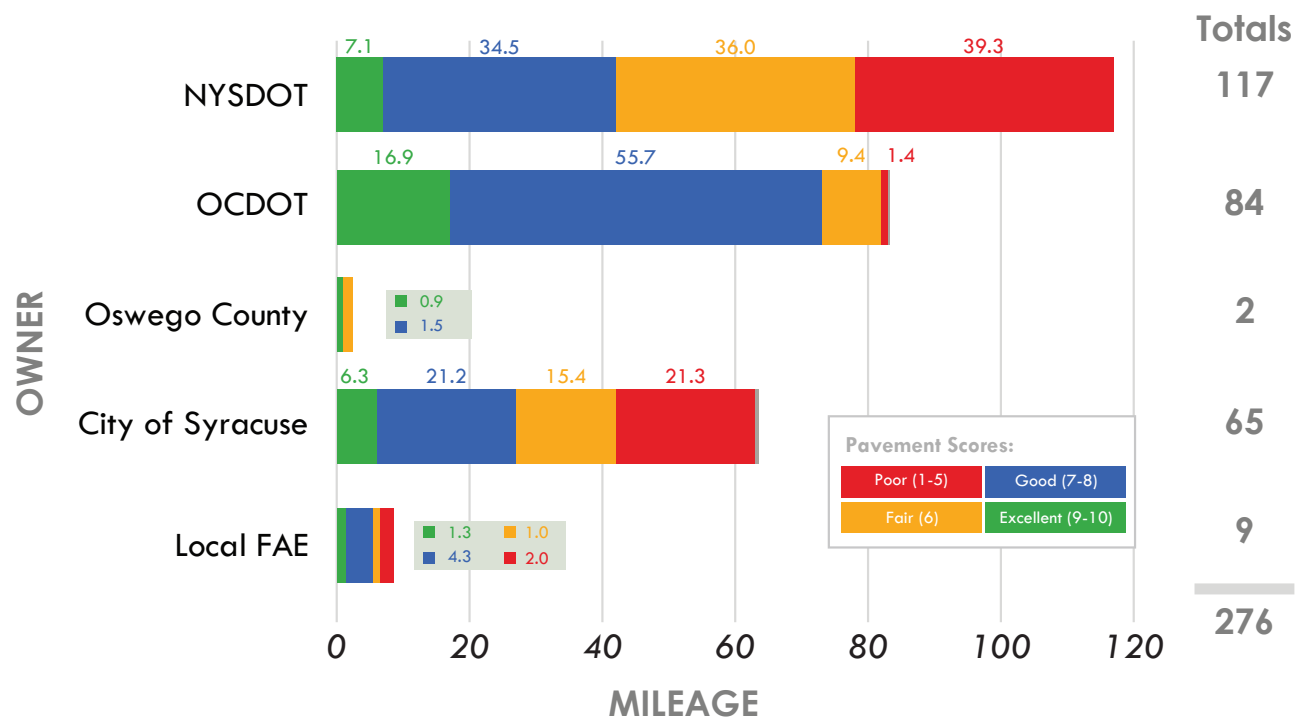
Figures 11, 12, and 13 illustrate the rating mileage by owner of Principal Arterials, Minor Arterials, and Collectors, respectively. In the figures, road owners who do not own roads in a given category are omitted from the graphs. Of the total FAE mileage in the MPA, Principal Arterials make up approximately 29%, Minor Arterials 28%, and Collectors 43%.

Figure 11: Pavement Ratings for Principal Arterials, by Mileage, Rating Category, and Owner



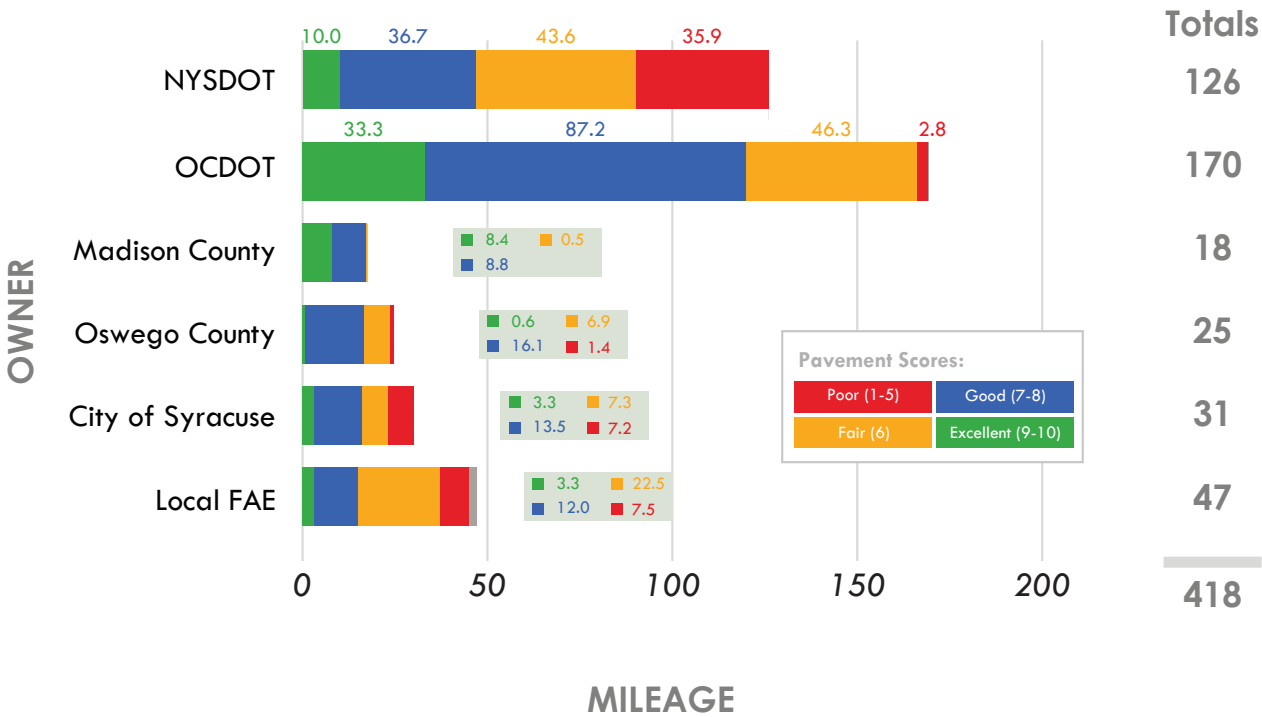
East Genesee Street in Syracuse - Principal Arterial

Figure 12: Pavement Ratings for Minor Arterials, by Mileage, Rating Category, and Owner



Onondaga Boulevard in Onondaga - Minor Arterial

Figure 13: Pavement Ratings for Collectors, by Mileage, Rating Category, and Owner



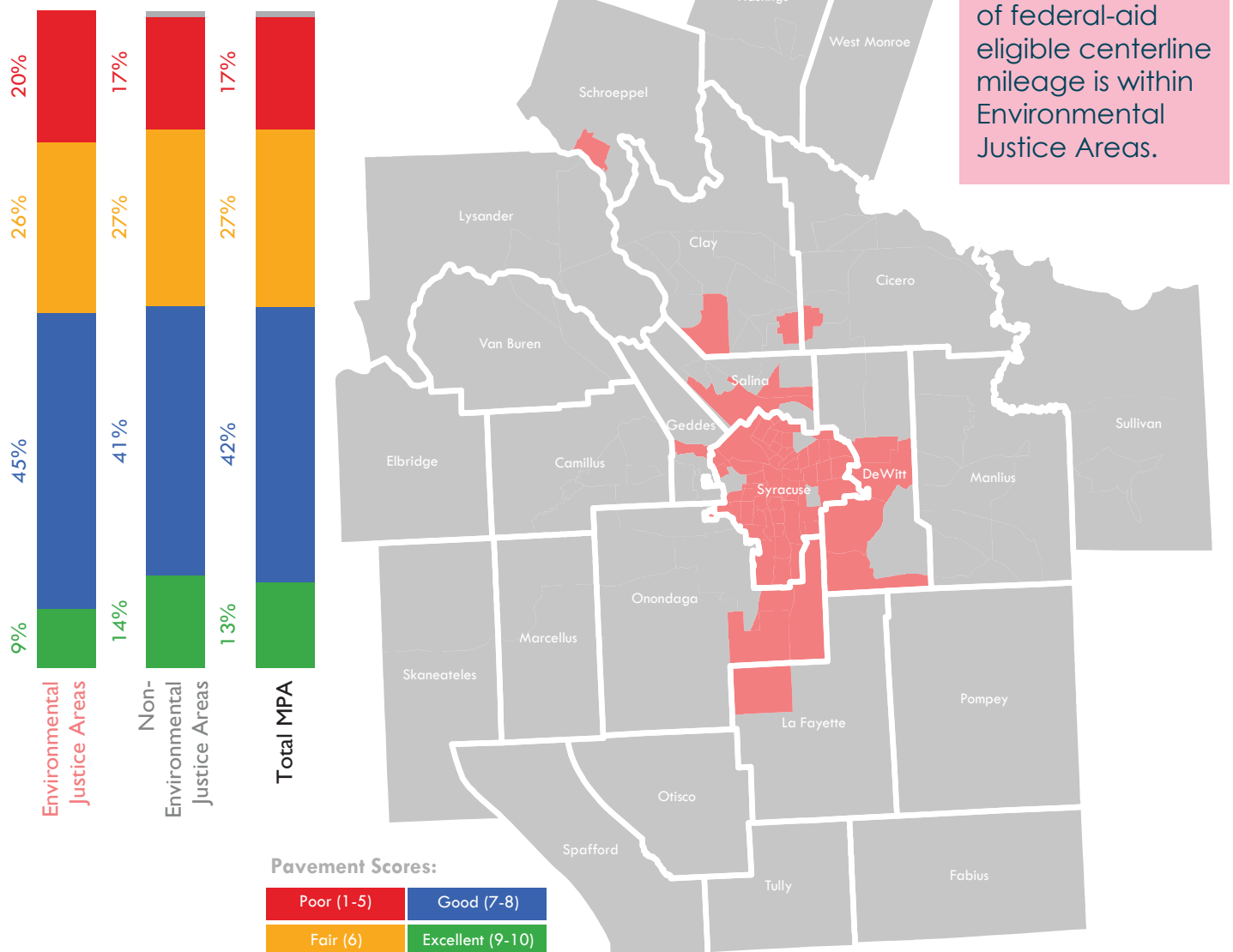
Avery Avenue in Syracuse - Collector

Environmental Justice Areas

As noted elsewhere in this report, the SMTC uses data from the US Census to identify geographic areas with significant minority and low-income populations, called Environmental Justice Priority Target Areas. Additionally, the SMTC's 2050 Long Range Transportation Plan (LRTP) has a performance objective of ensuring that "pavement conditions within priority target areas are at or above regional averages." Using the current 1-10 scale, pavement conditions in

priority target areas are similar to the MPA as a whole, but there is a lower percentage of Excellent-rated pavement (9% compared to 13% overall) and a higher percentage of Poor-rated pavement (20% compared to 17% overall) in the priority target areas. Figure 14 shows locations of these priority areas in the MPA and compares pavement ratings in priority areas, non-priority areas, and the MPA as a whole.

Figure 14: Environmental Justice Areas and Pavement Condition Ratings



National Transportation Performance Measures

The Federal Highway Administration (FHWA) published a final rule establishing performance measures for State Departments of Transportation to manage pavement performance on the National Highway System. The measures are the percentage of Interstate pavements in Good condition, the percentage of Interstate pavements in Poor condition, the percentage of non-Interstate National Highway System pavements in Good condition, and the percentage of non-Interstate National Highway System pavements in Poor condition. Figure 15 defines these condition ratings. *These new FHWA conditions are different than the Good and Poor conditions used at this time.*

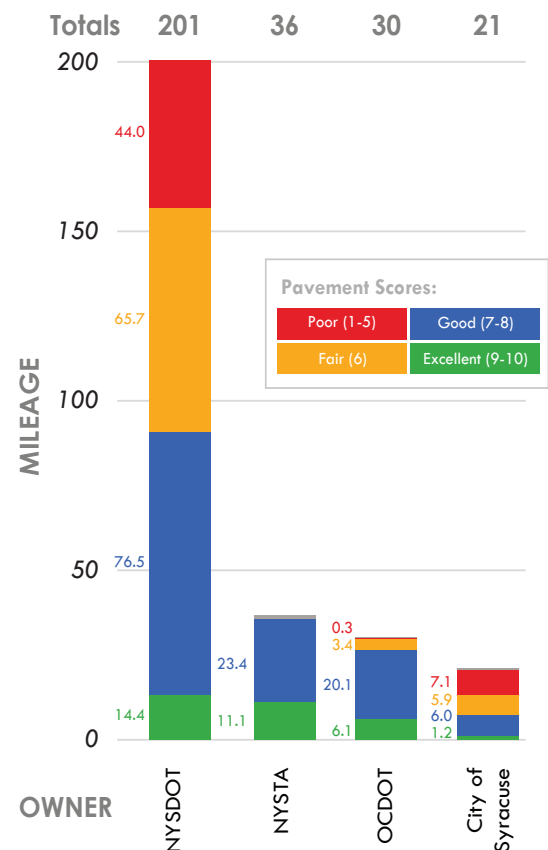
State DOTs were required to report Interstate data that conforms to this final rule on April 15th, 2019. It is anticipated that the SMTC will report pavement conditions in the MPA using this new scale in the coming years, as data becomes available from the NYSDOT. Until then, Figures 16 and 17 show pavement conditions on the NHS using the current scale.

Figure 15: New Condition Ratings

Metric	Good	Fair	Poor
IRI (in/mi)	< 95	95-170	> 170
PSR* (0.0 - 5.0)	≥ 4.0	2.0 - 4.0	≤ 2.0
Cracking Percent	< 5%	CRCP 5-10 Jointed 5-15 Asphalt 5-20	CRCP > 10 Jointed >15 Asphalt >20
Rutting (in)	< 0.20	0.20 - 0.40	> 0.40
Faulting (in)	< 0.10	0.10 - 0.15	> 0.15

*PSR may only be used in place of IRI on routes with posted speed limit < 40mph.

Figure 16: NHS Pavement Conditions by Owner



IRI, International Roughness Index, objectively measures the cumulative deviation from a smooth surface in inches per mile.

PSR, Present Serviceability Rating, is a subjective rating system based on a scale of 0 to 5.

Cracking Percent is defined as the percentage of pavement surface exhibiting cracking: fissures or discontinuities of the pavement surface not necessarily extending through the entire thickness of the pavement.

Average **Rutting**, longitudinal surface depressions in the asphalt pavement derived from measurements of a profile transverse to the path of travel on a highway lane.

Average **Faulting**, vertical misalignments of pavement joints on concrete pavements.

Figure 17: NHS Pavement Conditions

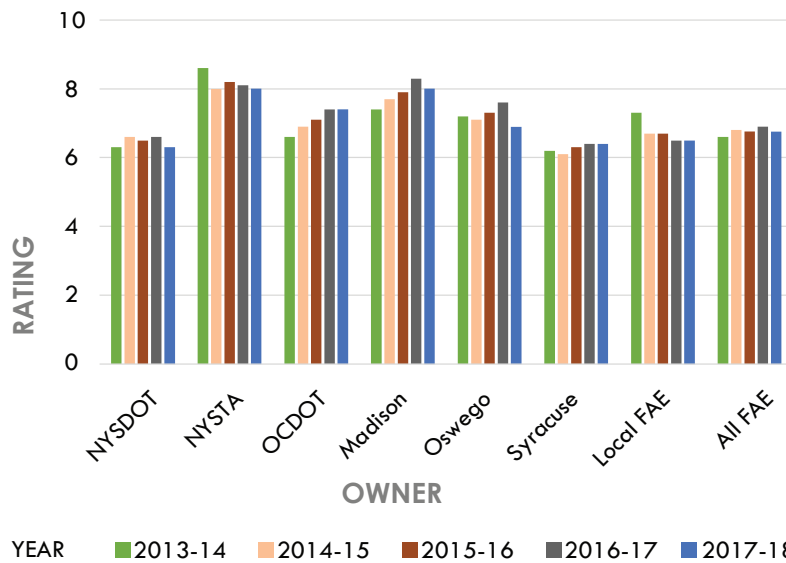
Road Type	Excellent		Good		Fair		Poor		Totals
	Miles	Percent	Miles	Percent	Miles	Percent	Miles	Percent	
NHS - Interstate	11.1	10%	64.7	59%	23.7	22%	8.1	7%	109
NHS - Non-Interstate	21.6	12%	61.7	35%	51.3	29%	43.3	24%	179
									288

* 1.2 miles of Interstate and 0.9 mile of Non-Interstate were not rated.

Pavement Trends

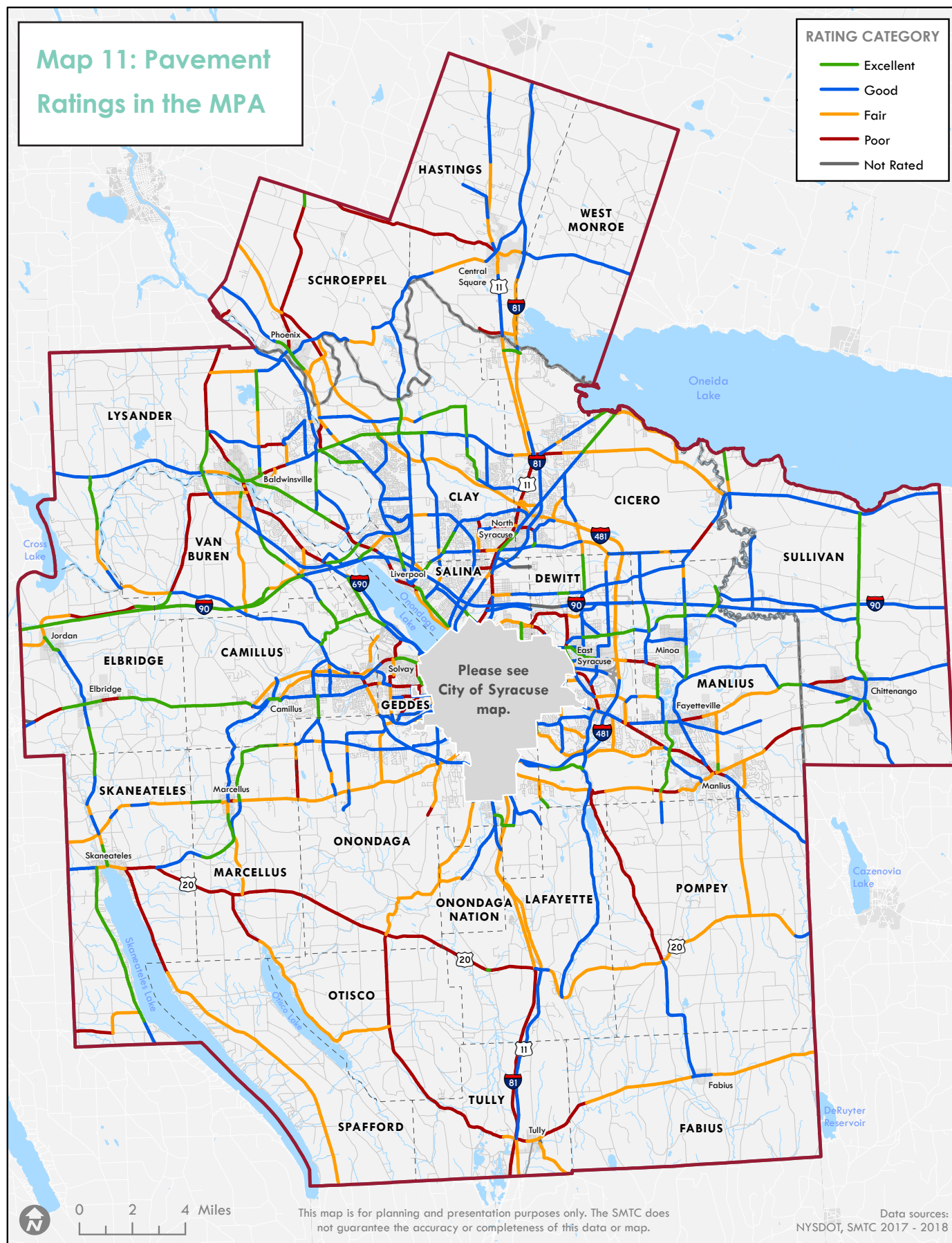
Since the Bridge and Pavement Condition Management System report is an annual undertaking by the SMTC, there is a large amount of data collected and synthesized from year to year. One of the advantages of this process is to be able to observe trends in bridge and pavement conditions throughout our metropolitan planning area. Figure 18 below shows average pavement ratings by owner over the last 5 rating cycles. Pavement conditions are slightly down this year, from 6.9 to 6.7.

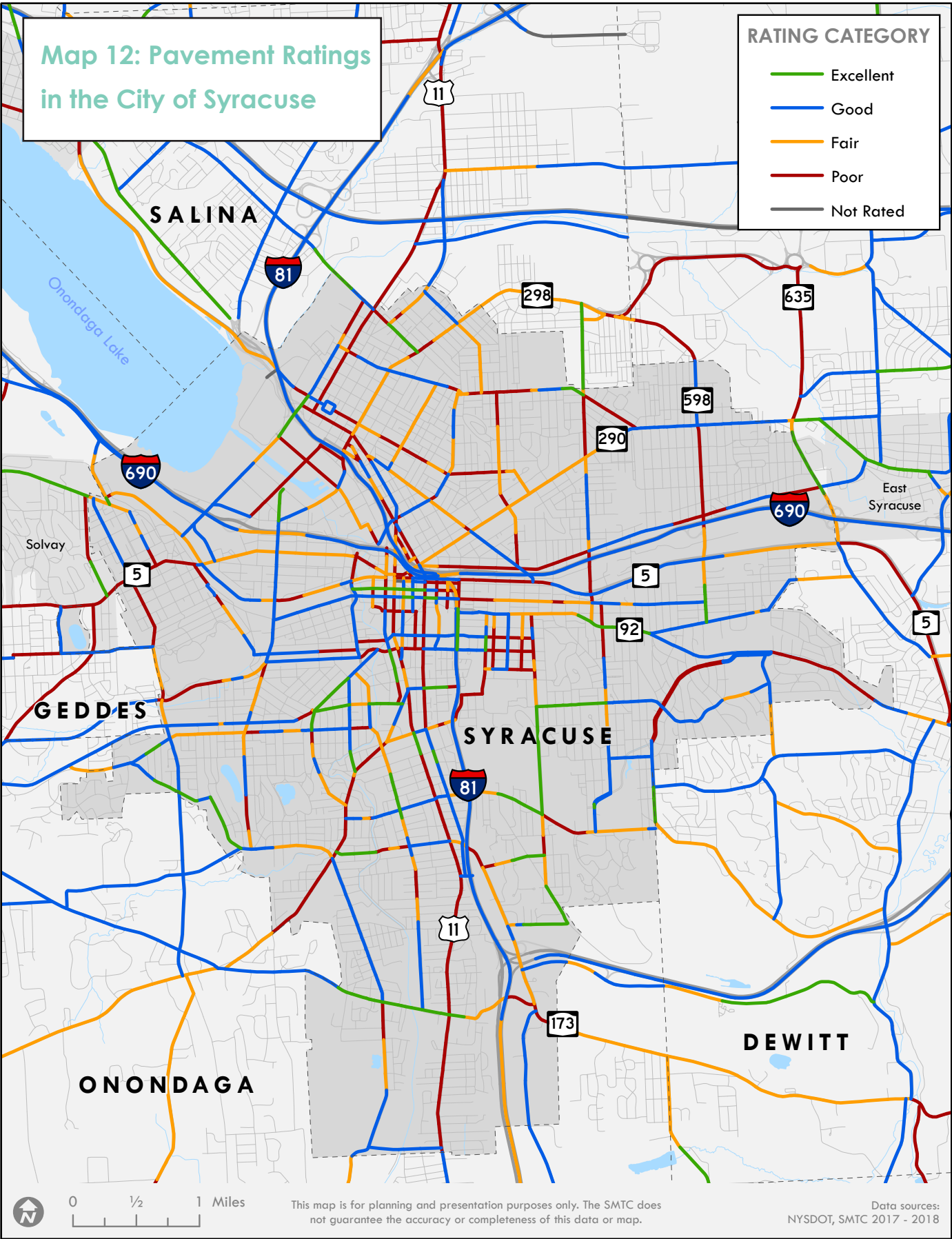
Figure 18: Average Rating Over Time



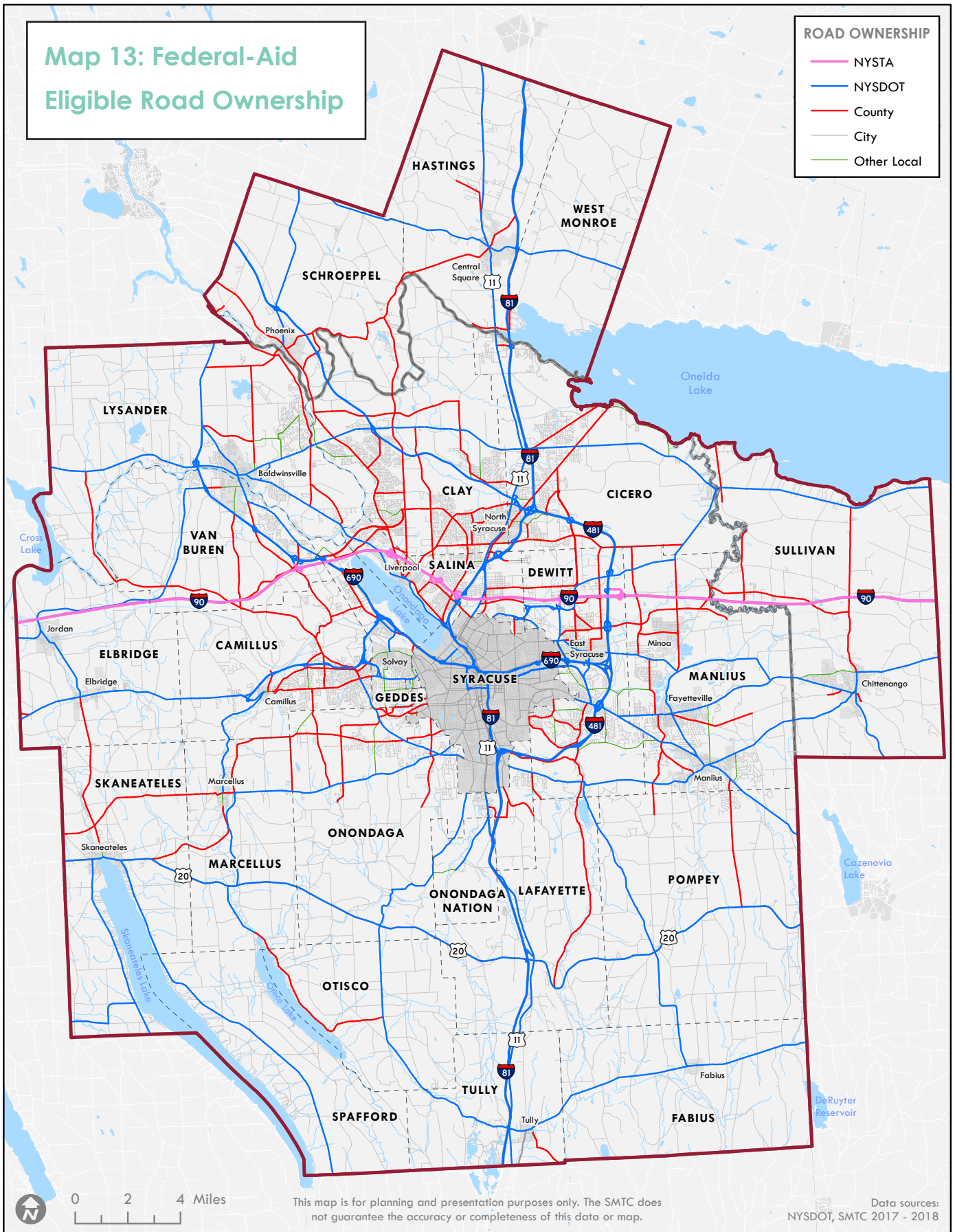
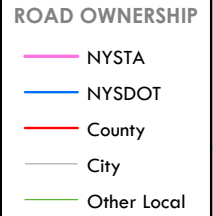
Maps

As a reference, maps with more pavement rating and other applicable information are found in the pages that follow.





**Map 13: Federal-Aid
Eligible Road Ownership**



Map 14: Functional Classification

FUNCTIONAL CLASSIFICATION

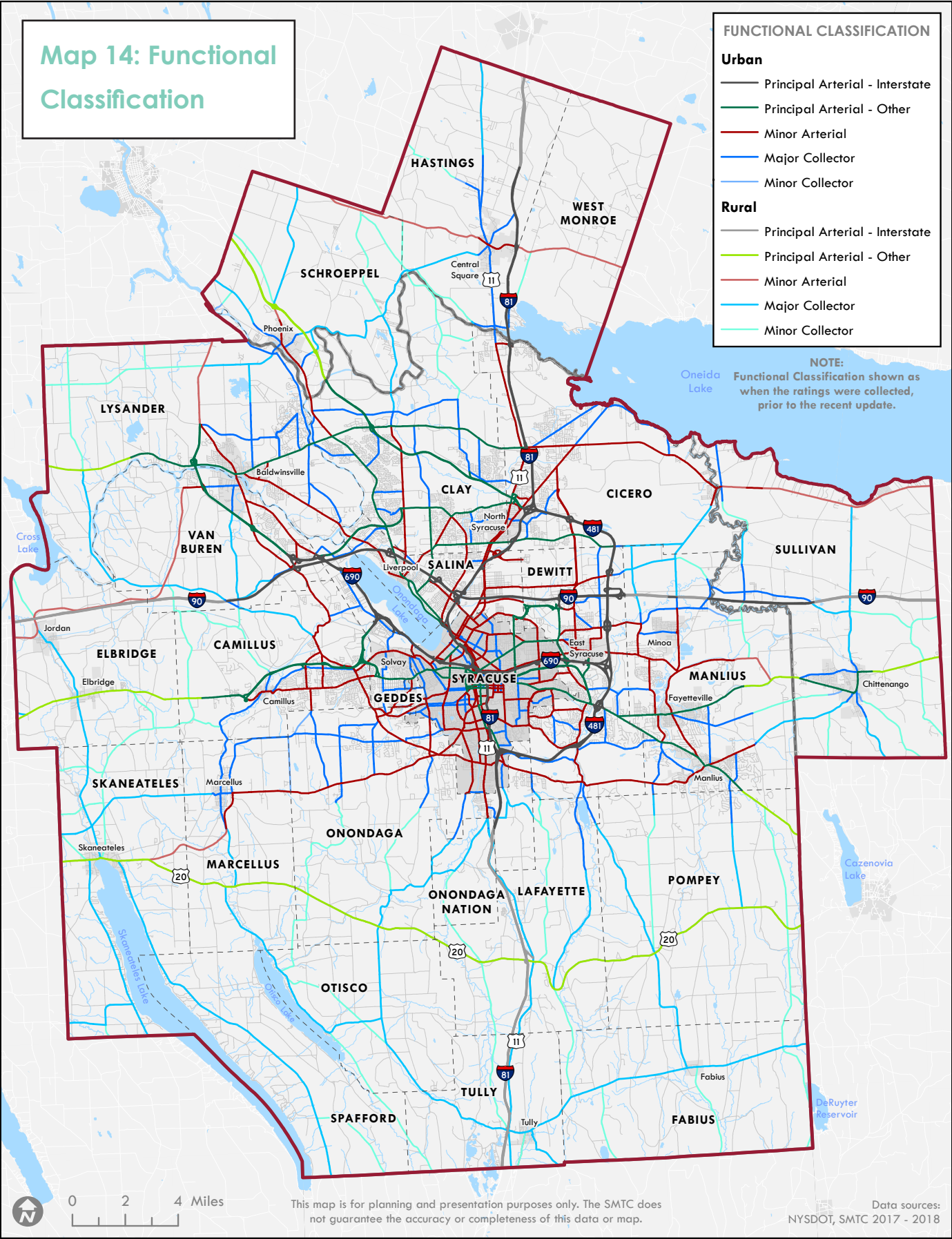
Urban

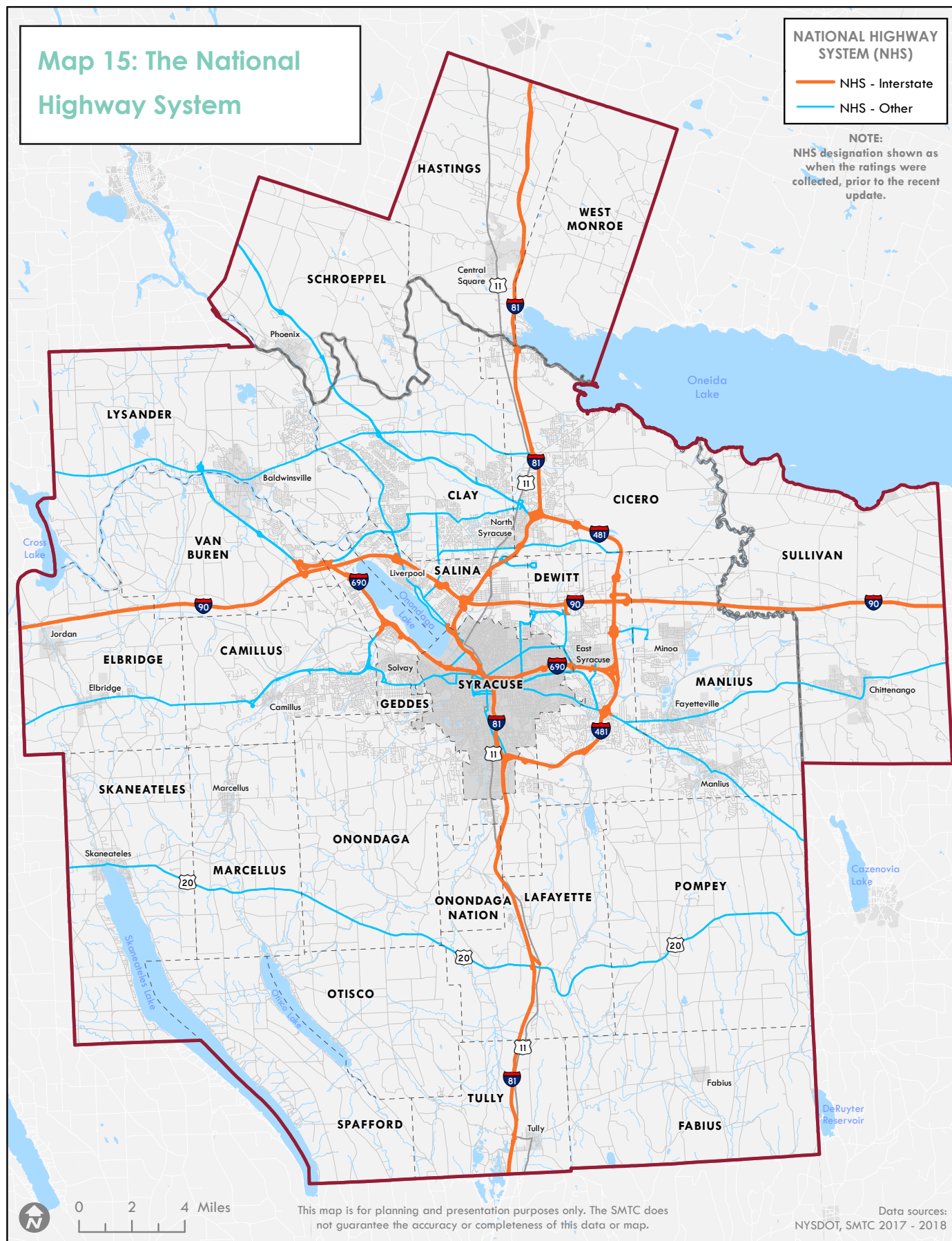
- Principal Arterial - Interstate
- Principal Arterial - Other
- Minor Arterial
- Major Collector
- Minor Collector

Rural

- Principal Arterial - Interstate
- Principal Arterial - Other
- Minor Arterial
- Major Collector
- Minor Collector

NOTE:
Functional Classification shown as
when the ratings were collected,
prior to the recent update.





Conclusion

Overall, the goal of this report is to illustrate and analyze data collected on bridge and pavement conditions over the past rating cycle. This uniform dataset serves as a useful tool to the SMTC's member agencies, and provides a window into the tangible return on infrastructure investment. By collecting and publishing this data, the SMTC hopes to continue to elucidate the importance of ongoing maintenance efforts. As mentioned in this report, a large portion of capital project funds are spent on highway and bridge projects in our MPA. The data in this report helps plan for ways to preserve and maintain the bridges and pavement of our infrastructure system, especially with limited increases in funding for capital improvements.



Milton Avenue under NYS 5 Bridge in Camillus

