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## **Highway Adequacy 2006 Interim Report**

Maine Department of Transportation

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# Maine Department of Transportation Highway Adequacy 2006 Interim Report



## **GOOD**

*Interstate 295 NB  
Brunswick*



## **FAIR**

*State Route 126  
Lewiston*



## **POOR**

*US Route 2  
Moscow*



## **CRITICAL**

*US Route 202  
Augusta*

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*Introduction:*

The science of determining deficient sections of roadway within the Department has undergone a long process of “evolution”. The Department finds itself on the doorstep of true information integration for the first time since the PC generation of the late 80s. The current environment of information technology provides an opportunity to once again take another step in the evolution of determining these inadequate sections of roadways.

*History:*

**Highway Sufficiency Ratings** of state-aid and state highways eligible for Federal Aid Highway funds, approximately 4,000 miles at the time, were conducted throughout the 50s, 60s, and 70s. These sufficiency ratings were presented in an annual report which included county maps, county summary tables, and statewide trend analysis all based on the Highway Sufficiency Rating. The Highway Sufficiency Rating\* was a 100 point index scored on the following criteria:

Condition (45 points):

- Foundation – 12
- Pavement – 8
- Shoulders – 5
- Drainage – 15
- Maintenance Costs – 5

Safety (30 Points)

- Pavement Width – 8
- Shoulder Width – 8
- Stopping Sight Distance – 8
- Lateral Obstructions – 4
- RR Crossings, Traffic Signals – 2

Service (25)

- Alignment and Grade – 10
- Passing Sight Distance – 6
- Pavement Width – 7
- Dustless Surface – 2

\*Sufficiency Rating Manual, 1970

The rating of highways in this manner was cost prohibitive, consuming many person hours to physically review each section of road and complete the ratings. At some point in the mid 70s this program was discontinued.

During the 80s and 90s the advent of a **Pavement Management System** was introduced within the Department. With Pavement Management came technology, including the PC and the first ARAN vehicle. These new tools allowed an objective way to rate pavement

condition on the state highway and state aid system. The Pavement Management System classified roadways as A (adequate), B (unbuilt), or C (will fail without a treatment).

In 1997 there was an effort to reevaluate the “**backlog**” of unbuilt roadways. Through visual inspection utilizing the ARAN video logs, a multi-disciplined team reviewed nearly 9,000 miles of roadway to rate each section. Each section of highway was classified as either backlog or built. Each backlog section was given a rating from the following disciplines: Environmental, Right-of-Way, Traffic Engineering, Maintenance, Highway Design. This information was utilized both in quantifying needs for highway construction funds and to identify appropriate treatments for each category.

The backlog efforts led to the development of the **Highway Deficiency Section (HDS)** model which was incorporated into an information technology project to create a data warehouse, TIDE. The HDS model was highly dependent on the backlog screening process that was undertaken. Also taken into consideration in the HDS model were:

- Pavement Benefit Score
- Alignment Benefit Score
- Safety Benefit Score
- Mobility Benefit Score
- Crash Score

The HDS was not highly utilized within the Department because it was not easily maintained nor was the data easily refreshed. This was a direct result of the index trying to do too much, such as predict project locations, scope, cost, and benefits. Inherently when an index or rating is asked to accomplish all of these things it becomes burdensome to maintain.

In 2002 GASB-34 reporting requirements made it necessary to quantify the condition and performance of the Highway Network Asset. An effort was undertaken to identify an index similar to the Highway Sufficiency Ratings previously discussed. Criteria and their respective point weighting were chosen based on three considerations; significance to a highways performance, reliability and accessibility of data, and the data elements sensitivity to outside forces. The following six criteria and their weightings were chosen to measure a **Highway’s Adequacy**:

- Pavement Condition Rating – 45
- Safety (crash rate) – 20
- Built vs. Unbuilt – 15
- Mobility (AADT/C) – 10
- Posted Speed – 5
- Paved Shoulders – 5

The Highway Adequacy Rating was quantified for every segment of roadway that is classified as state aid or state highway. In 2002 the first State of the System report included Division based maps and summary tables based on Highway Adequacy.

### *Business Need*

The critical step in any initiative is to answer the question, “**What is the business need that is being addressed?**” Maintaining that focus through the development of that product is critical to success. The business needs that have been identified for highway ratings are:

- Providing a performance measure that is repeatable and reliable for highway sections
- Identifying Highway Improvement project locations
- Quantifying the system need for investment
- Supporting Asset Management

Can these needs be addressed through one performance measure or are a set of measures needed to achieve the desired results? It is feasible to accomplish the above with one index; however, the sensitivity of that index to any single input may be diminished.

### *Highway Adequacy Index*

The HAI is being developed to meet the business needs identified above. It is being heavily modeled around the Sufficiency Ratings conducted in the 60s and 70s. The greatest difference between the Sufficiency Ratings and the HAI is that the HAI will largely depend on data collected and stored within Departmental information systems instead of the manually intensive process of physically inspecting each roadway.

The newly refined method of calculating HAI rates each section of roadway in three major sub-indices with an accumulative index assigned:

Condition: 50 points  
Safety: 25 points  
Service: 25 points  
Total: 100 points

The HAI alone does not truly tell the user of the data whether they are evaluating a “good” section or a “bad” section. In order to better describe the HAI the following rating categories have been identified:

Good – Over 80  
Fair – 70 to 80  
Poor – 60 to 70  
Critical – Under 60

A complete breakdown of the scoring methodology can be found in the appendix of this report.

HAI is calculated for all roadways with a federal functional classification from Major/Urban Collector to Interstate. The total official mileage within the sample set is 6,237 miles. Official mileage is defined as the measure of the highway system as represented as a single centerline. It counts only one bound of a divided highway and excludes private roadways and ramps.

For analysis purposes, the sample set is further broken down by Federal Functional Class MaineDOT Maintenance Region, and/or State Rural/Urban status. The following summary tables provide the official mileage totals in each subgroup analyzed (*note: numbers are ±1 mile due to rounding*).

| Interstate               | 37  | 315  | 352  | 7  | 7  | 14  |
|--------------------------|-----|------|------|----|----|-----|
| Freeway/Expressway       | 10  | 5    | 15   | 4  | 0  | 4   |
| Other Principal Arterial | 142 | 787  | 929  | 8  | 21 | 29  |
| Minor Arterial           | 233 | 1048 | 1281 | 8  | 3  | 11  |
| Major/Urban Collector    | 405 | 3256 | 3661 | 46 | 30 | 76  |
| Totals:                  | 827 | 5411 | 6238 | 73 | 61 | 134 |

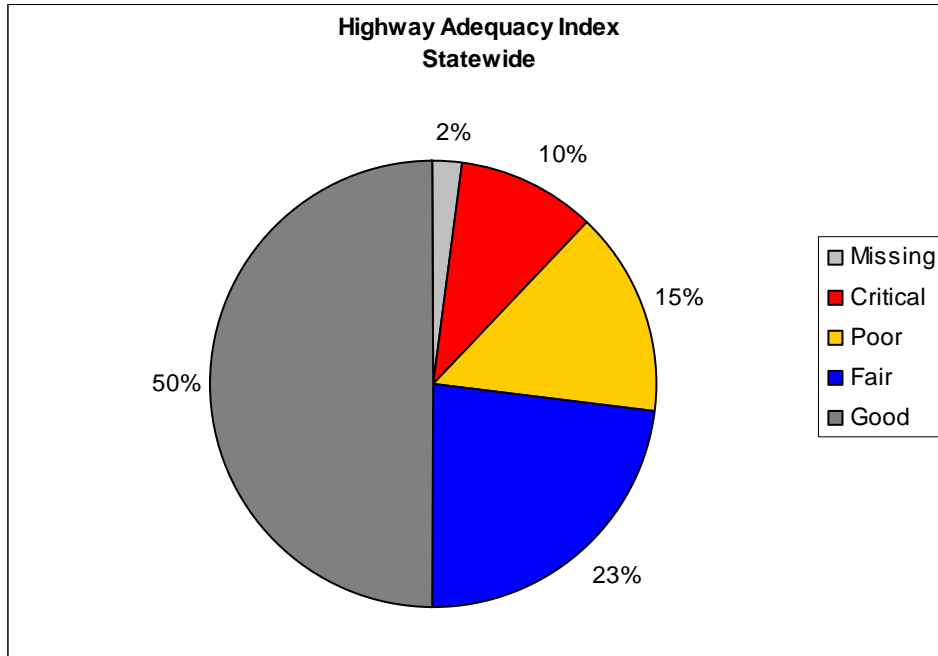
| 1 – Southern  | 522 | 909  | 1431 | 64 | 32 | 96  |
|---------------|-----|------|------|----|----|-----|
| 2 – Mid-Coast | 109 | 1062 | 1171 | 6  | 24 | 30  |
| 3 – Western   | 37  | 1115 | 1152 | 1  | 0  | 1   |
| 4 – Eastern   | 108 | 1350 | 1458 | 2  | 5  | 7   |
| 5 – Northern  | 50  | 975  | 1025 | 1  | 0  | 1   |
| Totals:       | 826 | 5411 | 6237 | 74 | 61 | 135 |

The HAI will be adaptable to new data and processes as the Department’s data becomes more available and reliable, however the core indices will stay the same and the HAI should be comparable over time. Some of the upcoming changes that will be made to the HAI are:

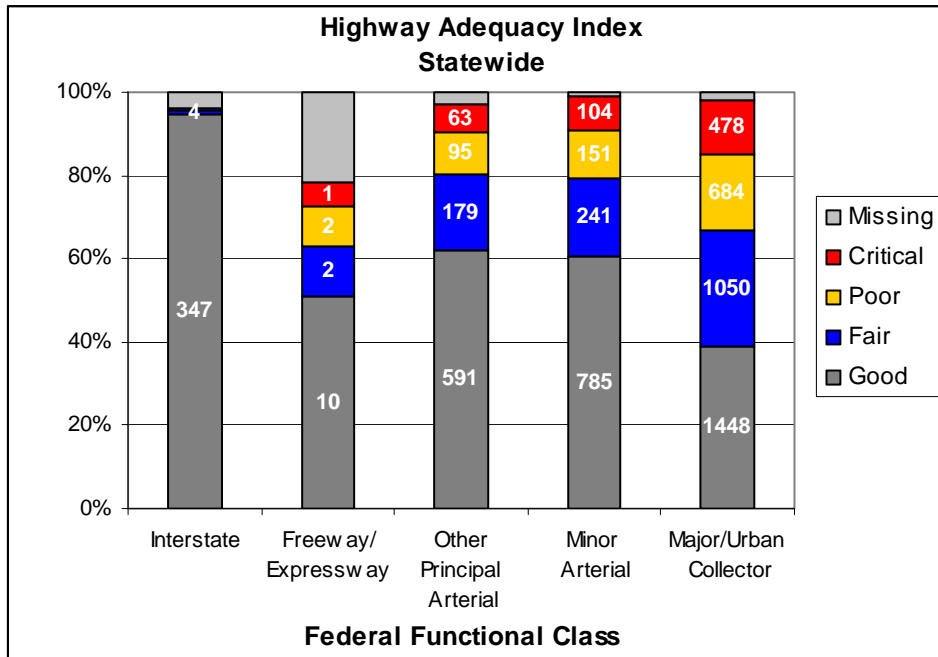
- Incorporation of network level falling weight deflectometer data to the Condition Index
- Incorporation of horizontal curvature data to the Safety Index
- Incorporation of grade data to both the Safety and Service Indices
- Maintenance Cost per mile calculations for inclusion in the Condition Index

The following charts display the 2006 HAI data statewide and regionally.

Statewide HAI summary data:

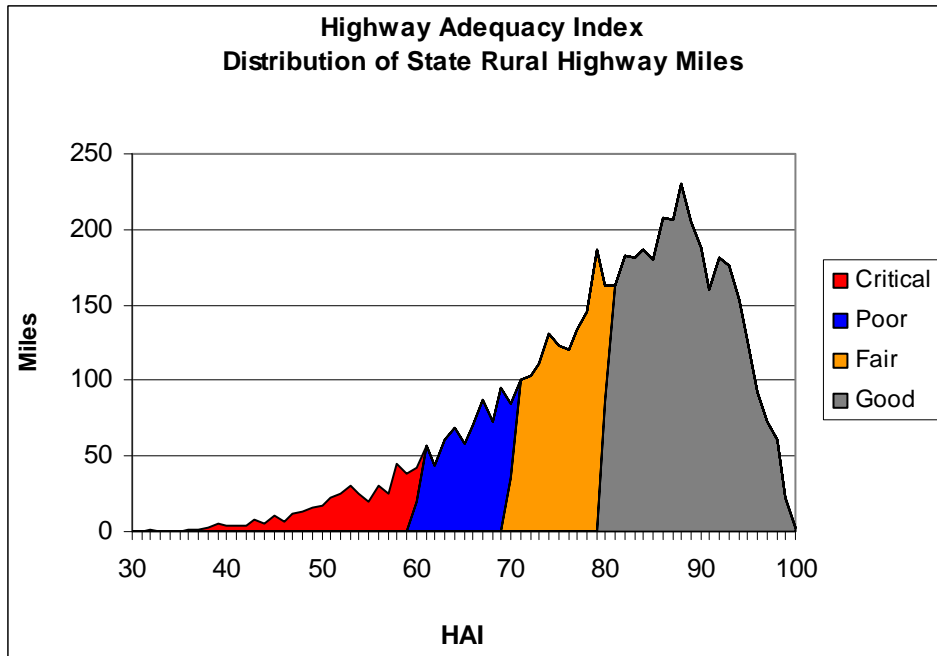


Of the 6000+ miles assessed throughout the state, nearly 75% rated "Fair" or better.

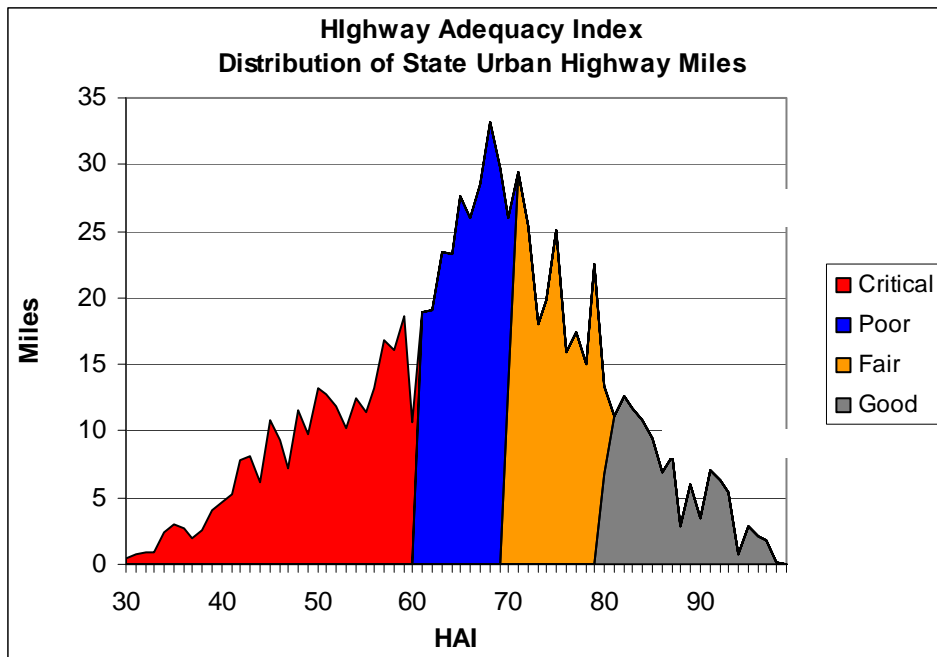


The collector system shows the greatest relative percentage of "Critical" miles. This is indicative of the policy to keep the higher federal functional classifications in better condition.



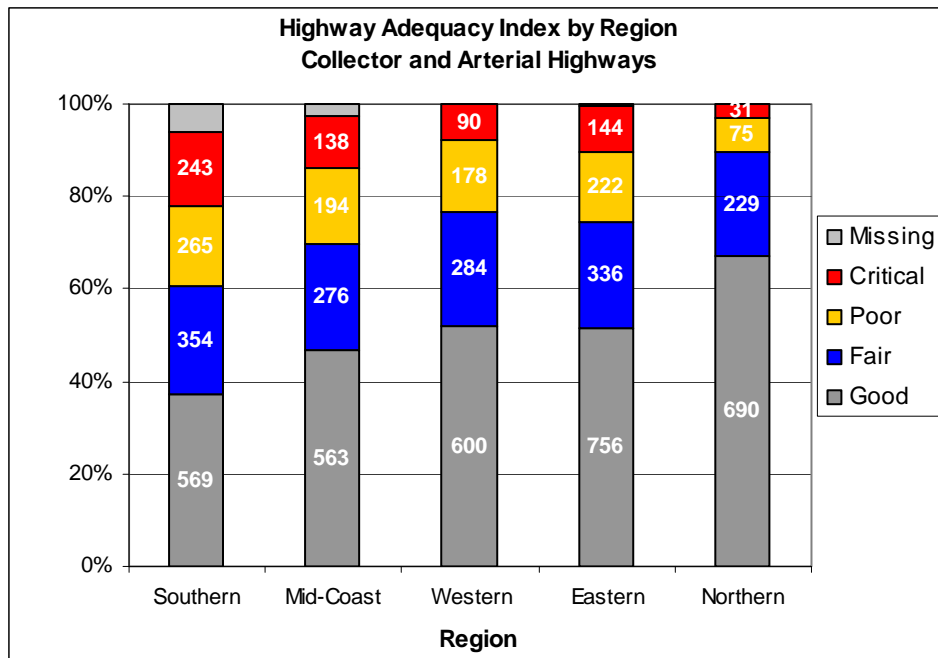


Over 3,000 miles, or 56%, of rural roads in the sample set have an adequacy rating of "Good", with 80% considered "Fair" or better.

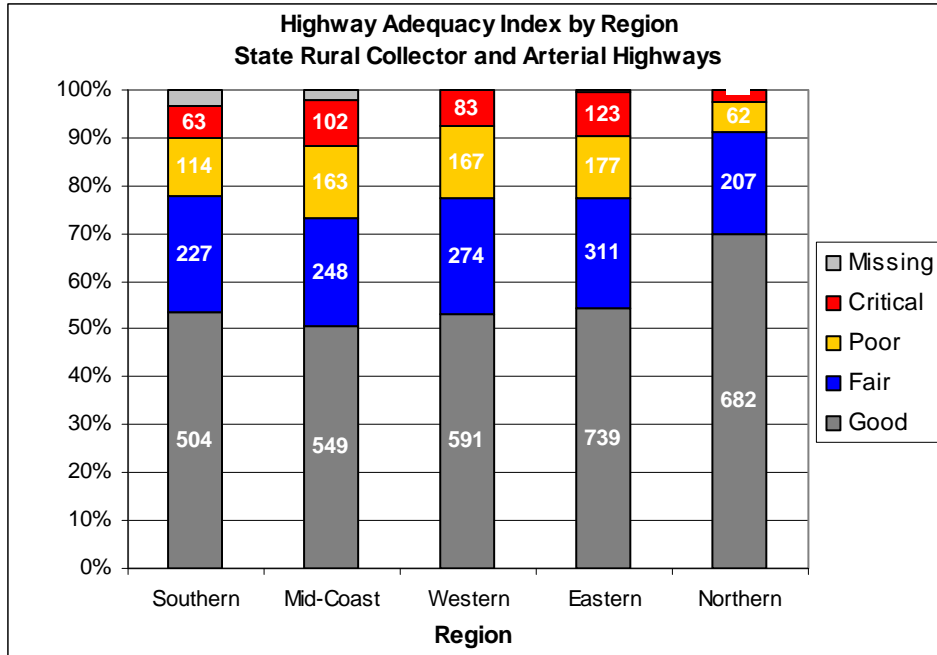


In State urban areas, over 30% of the miles are "Critical", while only 14% are "Good".

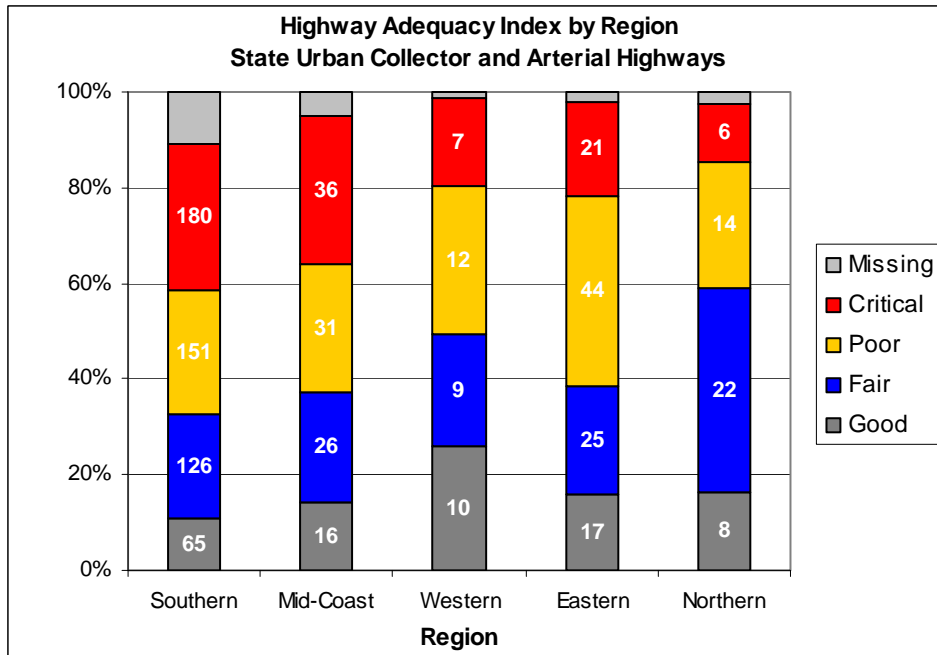
*Regional HAI summary data:*



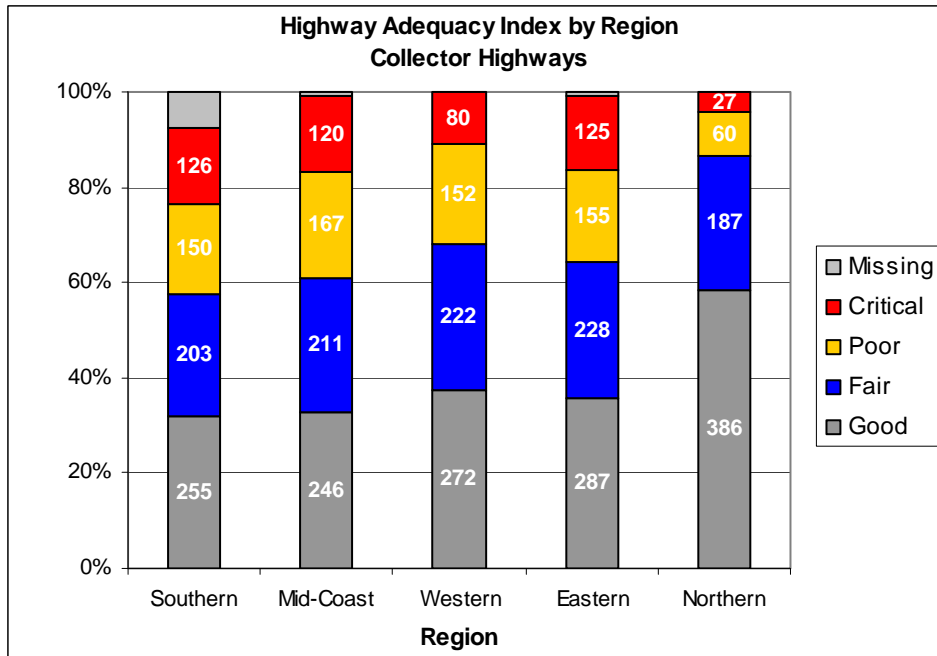
Regionally, the Northern region has the best HAI ratings, with only 3% of the collectors and arterials in the “Critical” range and 67% in the good range. The Southern Region has almost as many miles of collectors and arterials assessed as the Eastern region, however, the roads are less adequate, with 17% in the “Critical” range as compared to 9.9% in the Eastern region.



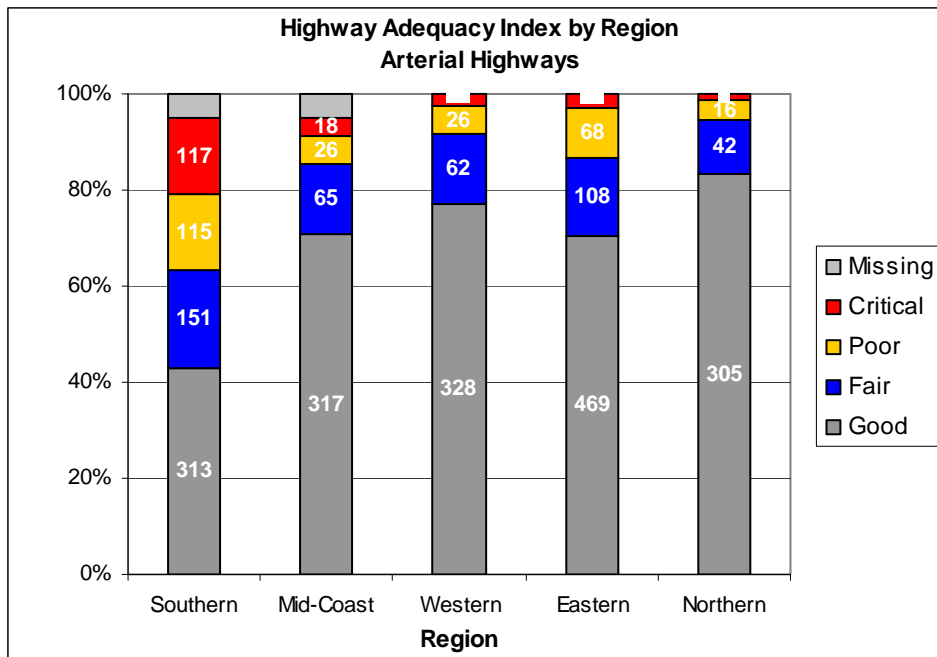
Rural roads in the regions are primarily "Good", with the highest number of "Critical" rural miles occurring in the coastal regions. Of the 1,062 miles of rural arterials and collectors in the Mid-Coast region, 102 (9.6%) are "Critical". Similarly, in the Eastern region, 9.1%, or 123 out of 1,250 miles, are considered "Critical".



As indicated in a previous chart, urban collectors and arterials have higher percentages of miles in the critical and poor range. Again, the northern region fares the best, with the lowest percentage of "critical" roads. However, it should be noted that these percentages are relative to the number of miles in each region. For example, the Southern Region has 522 urban miles and the Northern Region has only 50.



Collector highways account for the majority of mileage assessed (3,661) but tend to receive less construction funding than the arterials. As a result, there are more collector miles in "Critical" condition as compared to the arterials (see chart below).



As stated above, arterial highways appear to be in better condition than collectors. The southern region has the highest number of "Critical" and "Poor" miles, but approximately 40% of the arterials in the Southern Region are Urban. For comparison, the Mid-Coast region had the next highest percentage of urban arterials, at 12%.

## *Summary*

The HAI shows the Interstate System as having nearly 99% of the analyzed system rated "Good". However, those interstate miles only comprise approximately 6% of all highway mileage analyzed. Conversely, the Major Collector System has 36% of its mileage rated "Poor" or "Critical" and it comprises almost 60% of the highway network. In fact, of the 646 "Critical" miles in the highway system, 478, or 74%, are on the Major Collector system.

The HAI is a way for the Department to prioritize highways to be addressed through capital improvements and to better quantify the system need for these improvements. Currently the quantification for system need is done using unbuilt roads data and or springtime postings. While these are valuable ways to identify roadways that require significant treatments to address their deficiencies they do little in discerning a difference between unbuilt sections of roadway. HAI takes into account both safety and the service being provided to the traveling public and in turn derives a priority rating based on the three sub-indices.

HAI is currently in its infancy. Over the next biennium the Department intends to greatly expand the reliability and accuracy of the HAI. Many initiatives are currently underway to improve the HAI, the two that will have the largest impact are inclusion of Curve and Grade Data into the Safety Index and the inclusion of network level Falling Weight Deflectometer readings into the Condition Index. With these two major improvements it is expected that the HAI rating of each road can greatly enhance the methods for which the Department identifies, quantifies the needs, and prioritizes the improvements of the highways under its jurisdiction.

The following maps summarize the HAI graphically by region and supporting tables further break down the HAI by municipality and route.