WYOMING DEPARTMENT OF TRANSPORTATION (WYDOT)

TRANSPORTATION ASSET MANAGEMENT PLAN

2015

I. Wyoming Department Of Transportation's (WYDOT's) Mission, Vision, and Goals for Asset Management

WYDOT's mission is to "Provide a safe, high quality, and efficient transportation system" in Wyoming. To help define its mission WYDOT has established six goals. These goals are:

1) Improve safety on the state transportation system
2) Serve our customers
3) Take care of all physical aspects of the state transportation system
4) Improve agency efficiency and effectiveness
5) Develop and care for our people
6) Exercise good stewardship of our resources

WYDOT's mission statement and goals support the Moving Ahead for Progress in the 21st Century Act (MAP-21) Asset Management approach for transportation improvements and funding distribution.

What is Asset Management?

Transportation asset management is defined by the American Association of State Highway and Transportation Officials (AASHTO) as follows:

"Asset Management is a strategic and systematic process of operating, maintaining, upgrading and expanding physical assets effectively throughout their life cycle. It focuses on business and engineering practices for resource allocation and utilization, with the objective of better decision making based upon quality information and well defined objective." (NCHRP Report 632, National Cooperative Highway Research Program, 2009)

The objective of WYDOT's asset management system is to minimize the lifecycle cost of the infrastructure while maximizing its value with constrained fiscal funding.

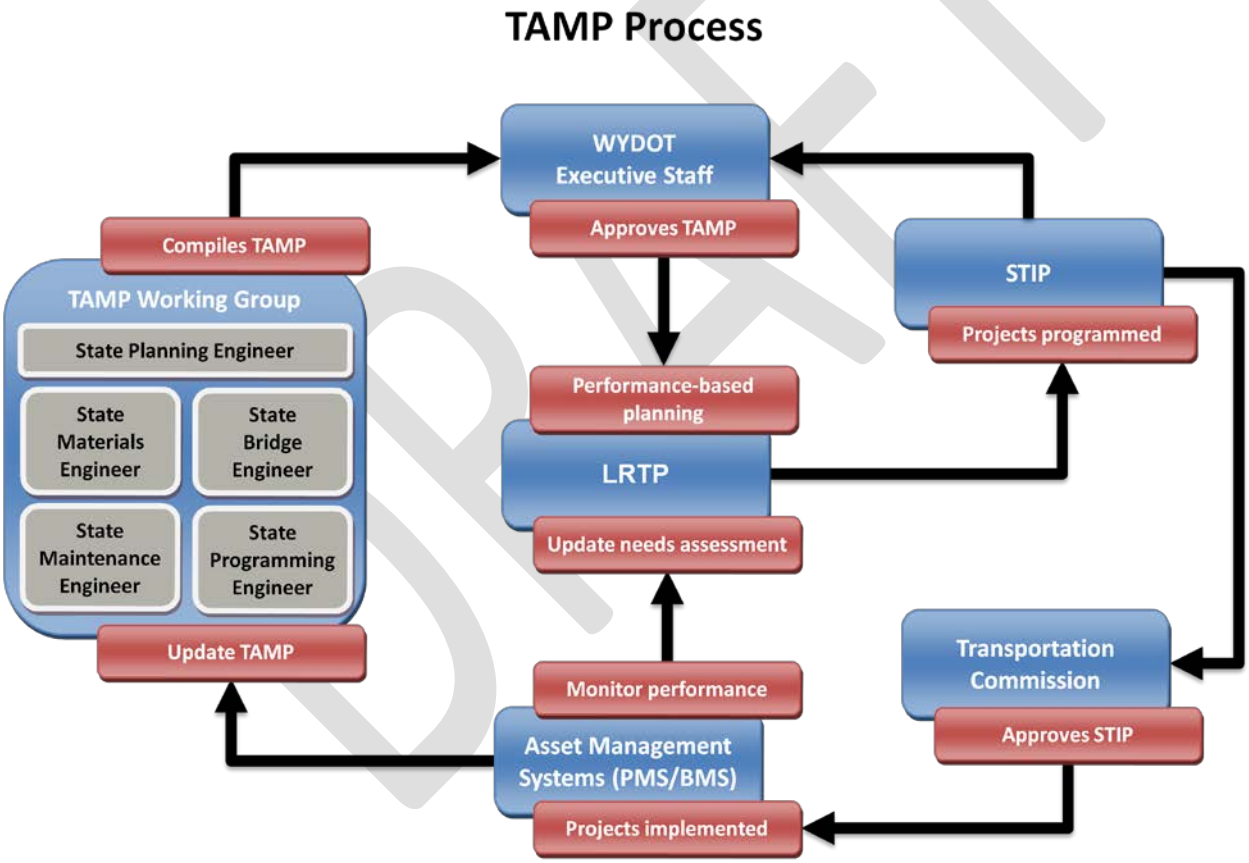
MAP-21 defines asset management as follows:

"The *term "asset management" means a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost.*" [23 USC, Sec. 101 (a) (2)].

WYDOT has adopted a preservation based strategy due to ageing transportation system materials combined with inflation that has reduced WYDOT's effective funding level. By using existing pavement, bridge, and safety management system software to analyze each system individually, it is possible to determine the best point in each asset's life cycle to apply a given rehabilitation treatment. Then multiple scenarios can be run using various funding and rehabilitation strategies to determine the best mix of preservation projects for Wyoming's transportation network. By applying the right treatments at the correct time, the overall transportation system's condition can be maintained at the highest possible level given a finite funding level. This is the objective of the asset management program.

WYDOT's program managers coordinate and compile the Transportation Asset Management Plan (TAMP) and the future revisions. The structure for constructing the plan is as follows:

TAMP Working Group:	Compiles the TAMP
State Planning Engineer	Serves as executive of the TAMP Working Group
State Materials Engineer	Compiles Chapter III, Statewide Pavement Condition and Programs
State Bridge Engineer	Compiles Chapter IV, Statewide Bridge Condition and Programs
State Maintenance Engineer	Documents the life-cycle cost of the assets
State Programming Engineer	Compiles Chapter V, Investment Plan, and staffs the draft document
WYDOT Executive Staff:	Reviews and provides guidance and oversight on the TAMP
Transportation Commission:	Approves the TAMP



The TAMP is a "living" document that will be reviewed and updated regularly in coordination with the implementation of WYDOT's management systems.

II. MAP-21 Legislation

The legislation that defines the federal requirement for the TAMP is the Moving Ahead for Progress in the 21st Century Act. This legislation requires the states to apply more emphasis on performance analysis and overall administration of transportation assets than past transportation legislation. MAP-21 reduces the number of category specific funding areas (thirteen to six), allowing states more flexibility in how to direct available funding. MAP-21 requires states to create a risk-based asset management plan. This plan is required for all states accepting federal money and requires the establishment of asset groups and performance targets for each group.

As part of MAP-21, the National Highway Performance Program (NHPP) mandates that states develop a risk based asset management plan for the roads on the National Highway System. This plan includes six elements:

1) A listing and condition of pavement and bridge assets on the National Highway System (NHS)
2) Asset Management objectives and measures
3) Performance gap analysis between goals and condition
4) Lifecycle cost and risk-based management analyses
5) A financial plan for the future
6) Investment strategy

In addition to the requirements above, the TAMP must address risk to the transportation system. If a state fails to meet the minimum conditions for pavement or bridges outlined in MAP-21, the following requirements for funding distribution shall be imposed [§1106; 23 USC 119(f)]:

''(f) INTERSTATE SYSTEM AND NHS BRIDGE CONDITIONS.—

''(1) CONDITION OF INTERSTATE SYSTEM.—

''(A) PENALTY.—If, during 2 consecutive reporting periods, the condition of the Interstate System, excluding bridges on the Interstate System, in a State falls below the minimum condition level established by the Secretary under section 150(c)(3), the State shall be required, during the following fiscal year—

''(i) to obligate, from the amounts apportioned to the State under section 104(b)(1), an amount that is not less than the amount of funds apportioned to the State for fiscal year 2009 under the Interstate maintenance program for the purposes described in this section (as in effect on the day before the date of enactment of the MAP–21), except that for each year after fiscal year 2013, the amount required to be obligated under this clause shall be increased by 2 percent over the amount required to be obligated in the previous fiscal year; and

''(ii) to transfer, from the amounts apportioned to the State under section 104(b)(2) (other than amounts sub allocated to metropolitan areas and other areas of the State under section 133(d)) to the apportionment of the State under section 104(b)(1), an amount equal to 10 percent of the amount of funds apportioned to the State for fiscal year 2009 under the Interstate maintenance program for the purposes described in this section (as in effect on the day before the date of enactment of the MAP–21).

''(B) RESTORATION.—The obligation requirement for the Interstate System in a State required by subparagraph (A) for a fiscal year shall remain in effect for each subsequent fiscal year until such time as the condition of the Interstate System in the State exceeds the minimum condition level established by the Secretary.

''(2) CONDITION OF NHS BRIDGES.—

''(A) PENALTY.—If the Secretary determines that, for the 3-year-period preceding the date of the determination, more than 10 percent of the total deck area of bridges in the State on the National Highway System is located on bridges that have been classified as structurally deficient, an amount equal to 50 percent of funds apportioned to such State for fiscal year 2009 to carry out section 144 (as in effect the day

> before enactment of MAP–21) shall be set aside from amounts apportioned to a State for a fiscal year under section 104(b)(1) only for eligible projects on bridges on the National Highway System.
> ''(B) RESTORATION.—The set-aside requirement for bridges on the National Highway System in a State under subparagraph (A) for a fiscal year shall remain in effect for each subsequent fiscal year until such time as less than 10 percent of the total deck area of bridges in the State on the National Highway System is located on bridges that have been classified as structurally deficient, as determined by the Secretary.

With the goal to "take care of all physical aspects of the state transportation system," WYDOT's TAMP will focus on maintaining pavement and bridge condition. Information on current conditions can be found in the annually produced Wyoming Transportation Facts Book.
http://www.dot.state.wy.us/home/administration/strategic_performance/fact_book.html

III. Statewide Pavement Condition and Programs

Pavement Inventory and Current Conditions: The inventory and condition of WYDOT maintained roads are managed by the Materials Program. The Pavement Management System (PMS) utilizes a highly specialized asset management software package. This software module allows storage of data and various analyses of pavement sections. The WYDOT on-system highway network is broken into approximately 1,600 pavement management sections and encompasses approximately 6,500 centerlines miles. These managed 6,500 miles of road are not the entire lane miles owned by WYDOT, there are other roads such as Interstate ramps, service roads, and turnouts that are not measured. There are also several Non-Interstate NHS roads that are owned by local governments that are measured for performance but are not managed by the PMS system.

WYDOT divides the road network into three categories of roadways:

> Interstates: High speed, typically four lane divided controlled access roadways that carry the highest traffic volumes and the most freight load.
> Non-Interstate NHS: Federal designated roadways that are functionally classified as Principal Arterials, but are not classified as Interstates.
> Non-NHS: The remaining roadways that are managed by the state.

Pavement management sections are based on construction history and pavement type and are identified by location and functional classification. The sections are analyzed based on current and projected condition. Both contracted and in-house data collection feed the PMS and allow determination of ride quality, rut depth, cracking level, faulting (concrete slab rocking) and skid resistance of each pavement section.

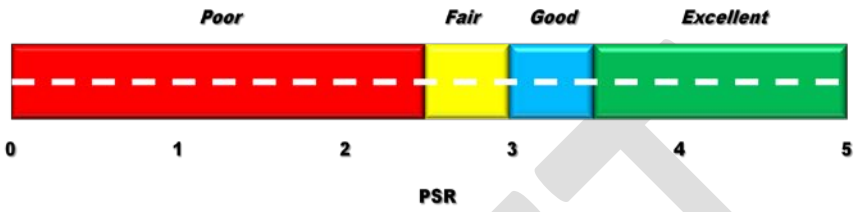
Condition ratings are based on a composite index called the Pavement Serviceability Rating (PSR) which combines ride quality, rut depth (for asphalt pavements), and cracking into a single index.

Pavement Serviceability Rating (PSR) is WYDOT's pavement health measure and it is the main driver for project selection.

Although the predominant influence on the PSR is ride quality, the measure was designed to include multiple performance characteristics and allow any individual characteristic to create a "Poor" rating if that characteristic reaches a defined threshold. For example, if the ride quality rating is "Good" and the cracking rating is "Good", but the rut depth is excessive (rut depth is 0.5 inches), the section will be rated as "Poor" due to safety concerns.

WYDOT evaluates surfacing conditions using a 0 to 5 PSR value that provides a relative comparison between road sections. Highways are classified as excellent, good, fair, or poor based on the PSR index.

Excellent	PSR >= 3.5
Good	3.5 > PSR >= 3.0
Fair	3.0 > PSR >= 2.5
Poor	PSR < 2.5



4/11/14

Visual Examples of PSR Values:

Poor Pavement Condition

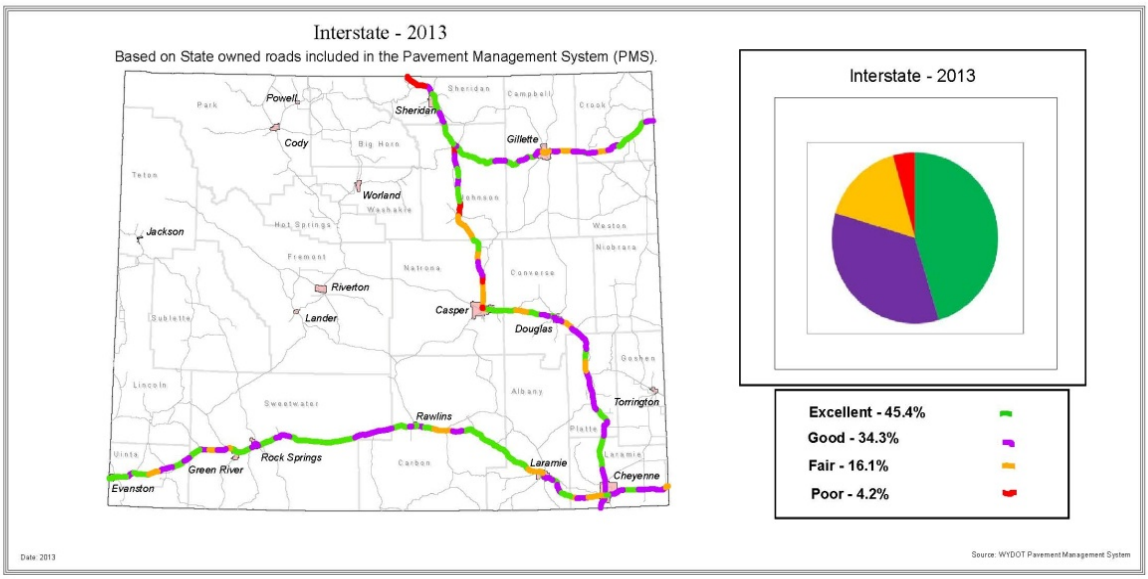
Fair Pavement Condition

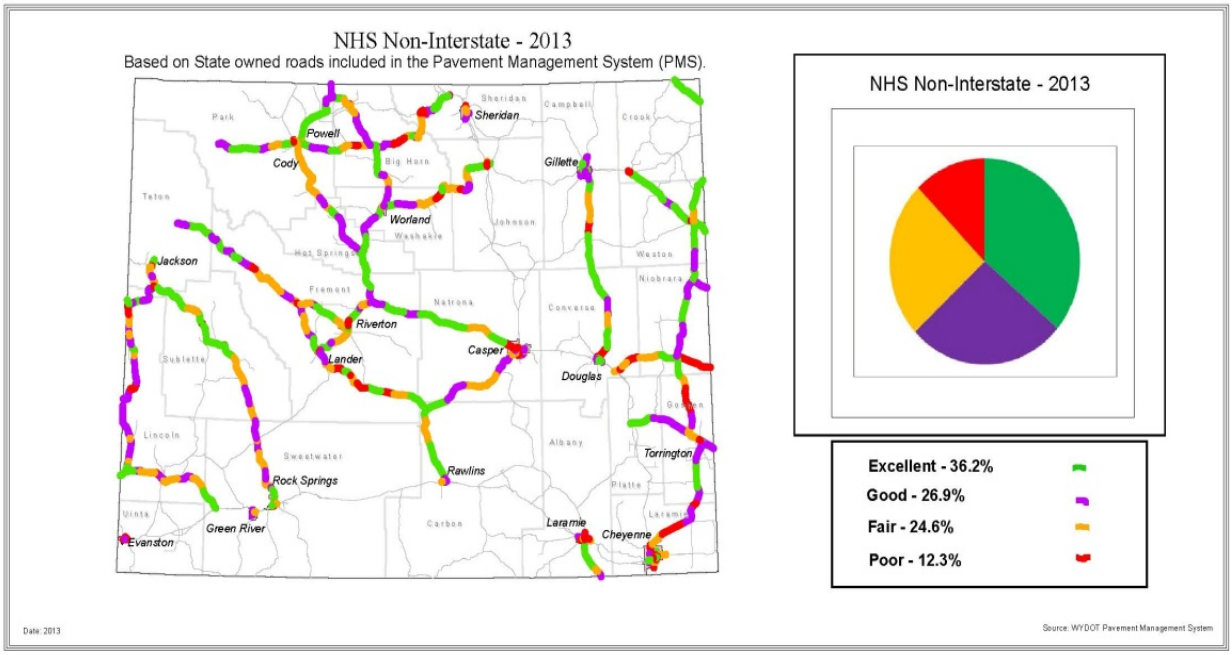
Good Pavement Condition

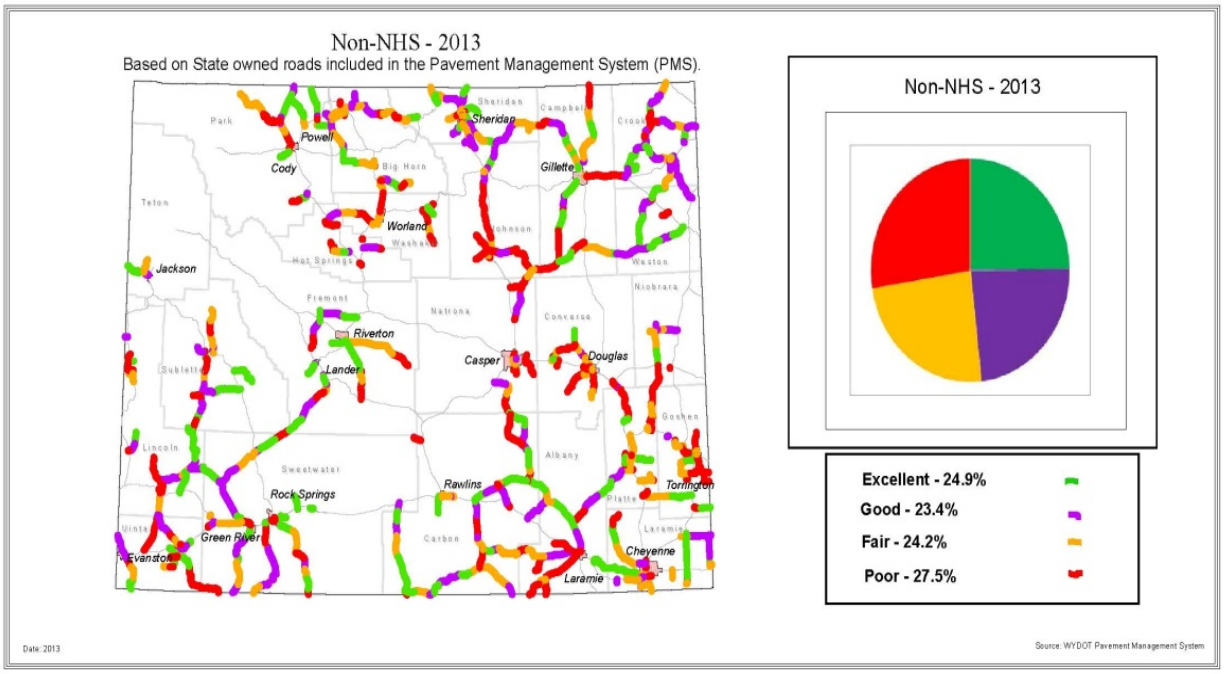
Excellent Pavement Condition

Current condition averages for the three roadway systems (Interstate, Non-Interstate NHS, and Non-NHS) are as follows:

	Excellent	Good	Fair	Poor
Interstate	45%	35%	16%	4%
Non-Interstate NHS	37%	26%	24%	13%
Non-NHS	25%	24%	24%	27%
Overall	32%	26%	23%	19%







The Materials Program publishes an annual Pavement Management System Analysis Report. This report has three sections:

Section 1
Inventory: This is a general overview of each management section detailing pavement condition, traffic level, construction history and STIP (State Transportation Improvement Program) status.

Section 2
Network-Level Analysis: This is the current and projected segment information that is produced by PMS software. This analysis takes into account budget projections and current road conditions to create projections for proposed work through the year 2032. Information is presented in charts, maps and graphs.

Section 3
Project-Level Analysis: This sets funding recommendations for each district according to WYDOT's pavement preservation philosophy. It lists the *Recommended Pavement Funding Strategy* for optimizing funding for each district and lists the *District Treatment Candidates* to aid district managers in selecting projects for the STIP.

Pavement Management Objectives Include:

1) Providing information to allow effective selection and design of future rehabilitation projects.
2) Accurately estimating future conditions versus funding scenarios to evaluate current pavement funding strategies.
3) Displaying analysis results in understandable formats to allow WYDOT Executive Staff and Wyoming's legislators to easily interpret the information.

The Pavement Management System is fully operational in regard to these objectives. Data is stored and available for decision makers and pavement designers to access for their needs. Selection of projects by the Districts is based on WYDOT's Pavement Preservation Strategy, which recommends a selection of projects for each District. This preservation strategy was optimized in order to maximize future network condition based on anticipated funding levels.

To fulfill WYDOT's goal to "Take care of all physical aspects of the state transportation system," specific pavement condition measures have been set. Performance measures were set based on an overall goal of maintaining 51 percent of Wyoming's state controlled road mileage in excellent/good condition.

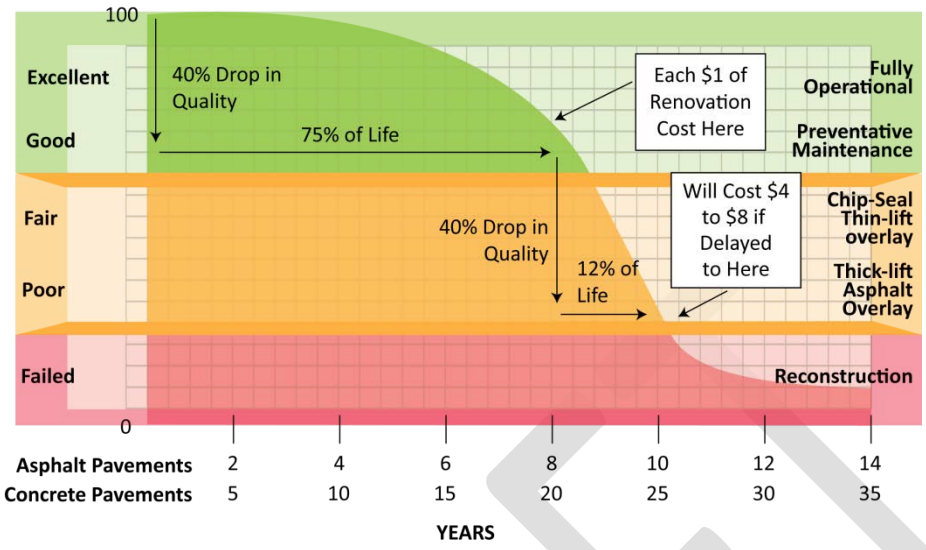
WYDOT's pavement goal is to maintain 51% of road mileage in excellent/good condition.

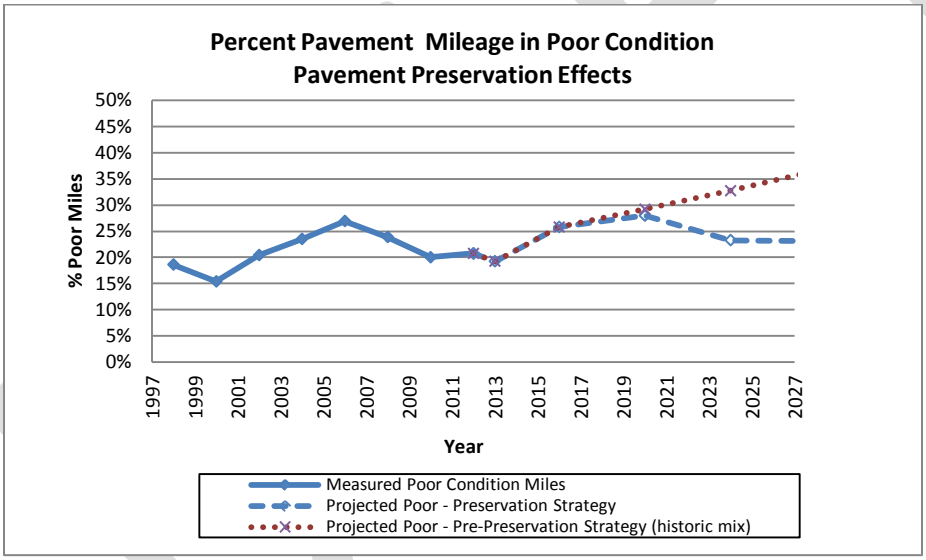
Condition Projections and Funding Scenarios: Historic condition vs. age data forms the backbone of pavement performance models used in WYDOT's PMS. WYDOT measures the condition of each management segment bi-annually and a detailed history of the construction treatments is maintained. Grouping like pavement types, and traffic levels provides a detailed set of data points used to create the deterioration curve models. These models are used by the PMS software to calculate annual changes in condition for future years based on a system-wide, incremental cost methodology. The system also allows entry of annual budgets for various treatment types into future years. Project candidates are selected by the system through the use of decision trees and benefit/cost analysis. Typical costs for each type of treatment are used by the system to draw from each year's budget for that treatment type. Annual inflation rates are determined by WYDOT managers and applied to the PMS, and affect future pavement treatment costs. This process allows the calculation of future condition levels based on various funding scenarios while also accounting for inflation.

In 2008 WYDOT recognized that, based on funding constraints and rising construction costs, the mix of projects within the STIP would result in an unacceptable condition of the transportation system. This recognition was the catalyst for changing the management strategy to a pavement preservation program.

The goal of a pavement preservation program is to maintain existing pavements through timely rehabilitation and limit the number of roads reaching "Poor" condition and thus requiring more costly repairs. As can be seen in the chart below, repair costs are much lower when applied early in a pavement's life. Minor repairs are not as effective once a road has deteriorated into the "Fair" or "Poor" rating. Therefore, a blend of strategies will optimize the health of the highway network. WYDOT's pavement preservation program was developed through an analysis of over three hundred computer simulations or scenarios in PMS, which predict the future condition of the highway network. Based on the optimal scenario that provides the best condition results in future years, each year a minimum number of miles must be completed utilizing the preventive maintenance, minor rehabilitation, and major rehabilitation strategies for each of the three classifications.

Life-Cycle Costs and Maintenance Strategy:





Gap Assessment: The desired goal of Pavement Management is to maintain current conditions within all functional classifications, but current funding levels are insufficient to accomplish this goal. The PMS projected that at past spending levels all road systems would deteriorate, so in 2012 WYDOT increased pavement funding to $125 million. Wyoming increased the gas tax by ten cents per gallon in the summer of 2013, and is using the additional tax revenue to increase the pavement work performed each year at an annual funding level of $165 million. With anticipated funding splits spread between functional classifications into future years, WYDOT's PMS estimates near stable pavement conditions over the next 20 years for Non-Interstate NHS and Non-NHS, but deteriorating conditions on the Interstate highways. The Interstate system is not being ignored; rather the substantially higher number of trucks, especially on I-80, causes a deterioration rate that is much steeper than the other systems. In

The PMS projected that continued use of past spending strategies would cause all road systems to deteriorate.

other words, there is not enough money to keep over 900 centerline miles of Interstate in the same condition without completely sacrificing the other system's 5,800 centerline miles of the pavement. An additional $34 million per year needs to be allocated for pavements to achieve a stable condition for the entire network.

WYDOT projects that an additional $34 million is needed annually to keep all road systems in their present condition.

Maintenance: As part of WYDOT's asset management approach, Maintenance actively performs routine repairs on all WYDOT maintained roadways. The pavement deterioration models include the effects of the surface maintenance performed by WYDOT, therefore, maintenance is considered a critical component of a pavement's life-cycle costs. Maintenance work is a combination of work performed by contract and in-house and includes crack sealing, short patches (patches less than a pavement management segment in length), chip seals, and slab replacement. Without this work the pavement deterioration models would have a short life expectancy, therefore it is critical to maintain the current level of effort in the maintenance budget. The current annual maintenance (average life-cycle) costs for pavements are as follows:

WYDOT's maintenance work provides the just-in-time repairs required to ensure a serviceable system exists and is critical in providing the lowest life-cycle costs.

Interstate	$ 6.2 million
Non-Interstate NHS	$ 9.1 million
Non-NHS	$11.6 million

Projected Demands: Traffic demand and vehicle mix (truck/car ratio) influence the deterioration rate and future condition of highway infrastructure. Higher traffic volumes, particularly trucks, can dramatically increase pavement and bridge deterioration rates. Increased deterioration caused by increased traffic volumes affects the level of funding needed to maintain the system and can affect future rehabilitation strategy selection.

In order to understand current and future demands on Wyoming's systems, it is important that current and projected traffic levels and vehicle types are accurately estimated. WYDOT's Planning Program has approximately 110 permanent automated traffic counter installations throughout the state that continuously gather traffic data. Traffic Surveys is responsible for collecting and analyzing this data, as well as monitoring and predicting traffic growth. Over the past several years, traffic counts have remained fairly static throughout the state, with very little growth (except in a few limited areas; specifically the oil and gas fields in the vicinity of Sublette County and the Highway 59 corridor from Douglas to Gillette).

The Pinedale anticline area saw significant traffic increases in the early 2000s as the Jonah field and other natural gas fields were developed. Increases in total vehicular traffic were reported, as well as significant increases in truck traffic. Traffic levels decreased after field development was completed, but they never returned to previous levels. The oil and gas field development now occurring in Converse County (north of Douglas) is expected to follow the same trend; i.e. a sharp increase in traffic as the field is developed, followed by a moderate to slight decline once the field development is completed.

Interstate 80 passes through Wyoming carrying traffic from California to New York, while serving as a major truck route for the United States. Traffic volumes on Wyoming's portion of I-80 are among the highest in the state, averaging 12,000-17,000 vehicles per day. Fifty-two percent of Wyoming's I-80 traffic is truck traffic. Traffic on I-80 has increased by 1.9 percent per year for the past 20 years, while truck traffic has been increasing by 2.7 percent per year. The increase in truck traffic has significantly impacted I-80 pavement deterioration rates and has created a substantial drain on funding, as noted in the previous section.

IV. Statewide Bridge Condition and Programs

Bridge Definition: Bridges are structures erected over a depression or an obstruction, such as a waterway, highway or railway, for carrying traffic loads while culverts are structures erected under a roadway. For WYDOT's purposes, both bridges and culverts with openings equal to or more than 20 feet in length are considered "Bridges".

Bridge Inventory and Current Conditions: The WYDOT Bridge Program manages and maintains the 1,955 bridges owned by WYDOT. Each of these, as well as bridges owned and maintained by towns, cities, counties and other state agencies, are carefully inspected at least once every two years by teams of highly trained WYDOT bridge inspectors.

There are exceptions to the two-year frequency. Bridges requiring posted load restrictions are inspected annually. Additionally, bridges having certain levels or types of deterioration or with specific details that may affect the safe usage of the structure receive special inspections designed to closely monitor their unique condition.

These inspections are completed in accordance with the requirements set forth in the National Bridge Inspection Standards outlined in the *Code of Federal Regulations* Title 23, Part 650, Subpart C. The inspection procedures are based on the codes, instructions, assessment criteria, and reporting requirements of the Federal Highway Administration's (FHWA's) *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges,* the PONTIS and Wyoming Element level bridge inspection criteria and the AASHTO *Manual for Bridge Evaluation.*

For each structure, inspectors measure, assess, and record the required National Bridge Inventory (NBI) items, including dimensions, clearances, alignment, waterway data and structural conditions. Structural conditions are evaluated by using structural elements. Each component of the bridge (girders, deck, railing, columns, piling, etc.) is assigned an element and the condition of each element is evaluated based on several condition assessments. The structure's NBI data is then used to determine its Wyoming Bridge Index (WBI).

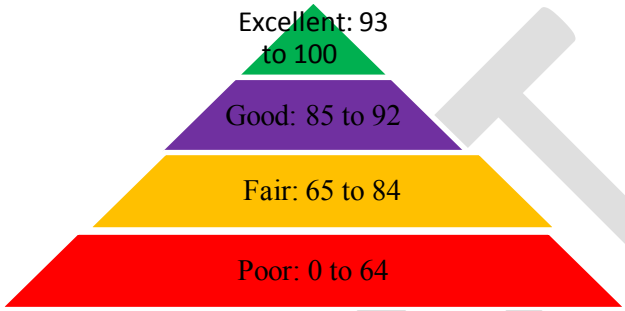
WYDOT's measure for the health of the bridges, and project selection, is the Wyoming Bridge Index.

The WBI was developed by the WYDOT Bridge Program and provides a high level view for reporting purposes while individual components help distinguish differences in bridge attributes that may otherwise go unnoticed when using a single rating or index (e.g. Sufficiency Rating). The WBI uses a 100 point scale that considers four components. These components are:

- Structural Condition Rating (SCR) - Assessment of structural adequacy.

- Maintenance Rating (MR) - Evaluation of the condition of commonly maintained bridge components.
- Functionality Rating (FR) - Evaluation of how bridge attributes affect the travelling public.
- Risk Rating (RR) - Evaluation of bridge attributes vulnerability to failure.

Each bridge is given an overall WBI Performance Category of Excellent, Good, Fair, or Poor based on a composite score of the four component ratings. The WBI and Performance Category bands are as follows:



The WYDOT Bridge Program uses a comprehensive Bridge Management System (BMS) to assist with managing the State's bridges by utilizing historical data along with current in-service conditions to:

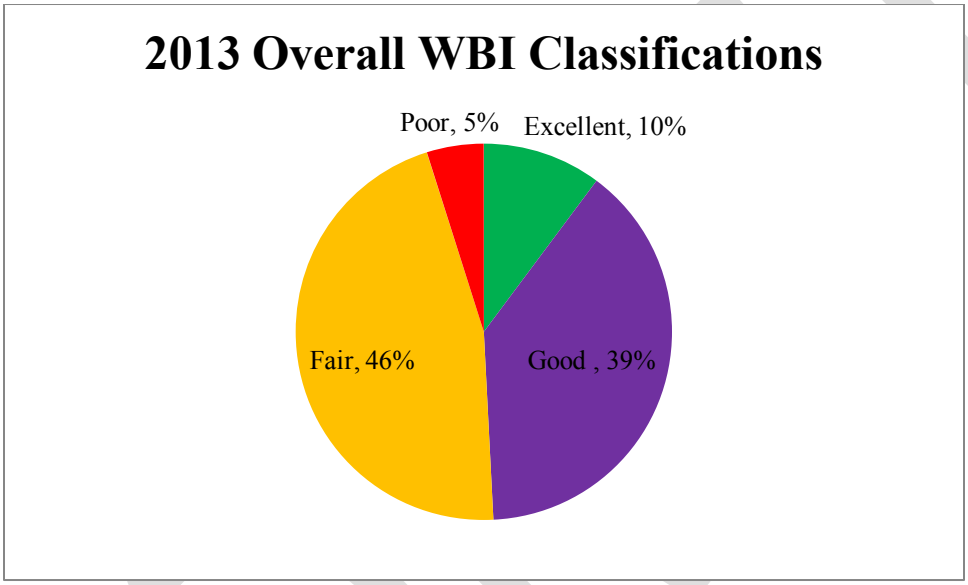
- Quantify current needs and forecast future ones
- Develop preservation, maintenance, rehabilitation or replacement candidate lists and recommendations
- Prioritize needs
- Select projects based on given budget scenarios

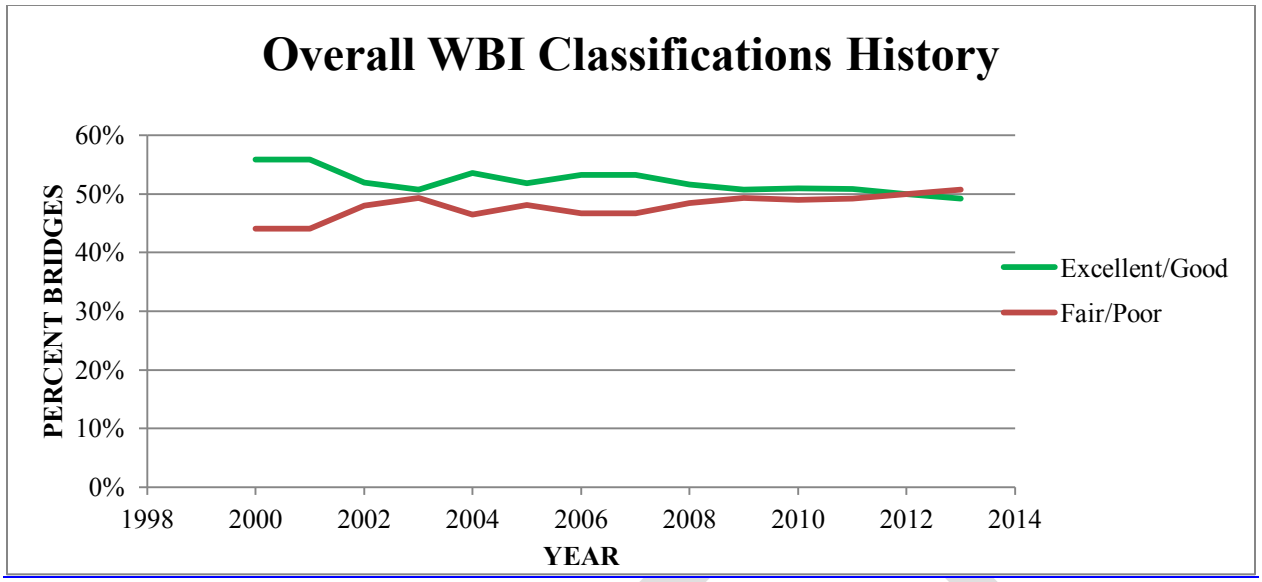
The BMS is a set of tools rather than a "black box" and is comprised of:

- AASHTOWare™ Bridge Management software BrM (*formerly Pontis*)
- Bentley inspection software
- Oracle database
- WYDOT Bridge Program developed BRASS™ Suite of Programs
- Customized spreadsheets including WBI calculations and reports
- Manuals

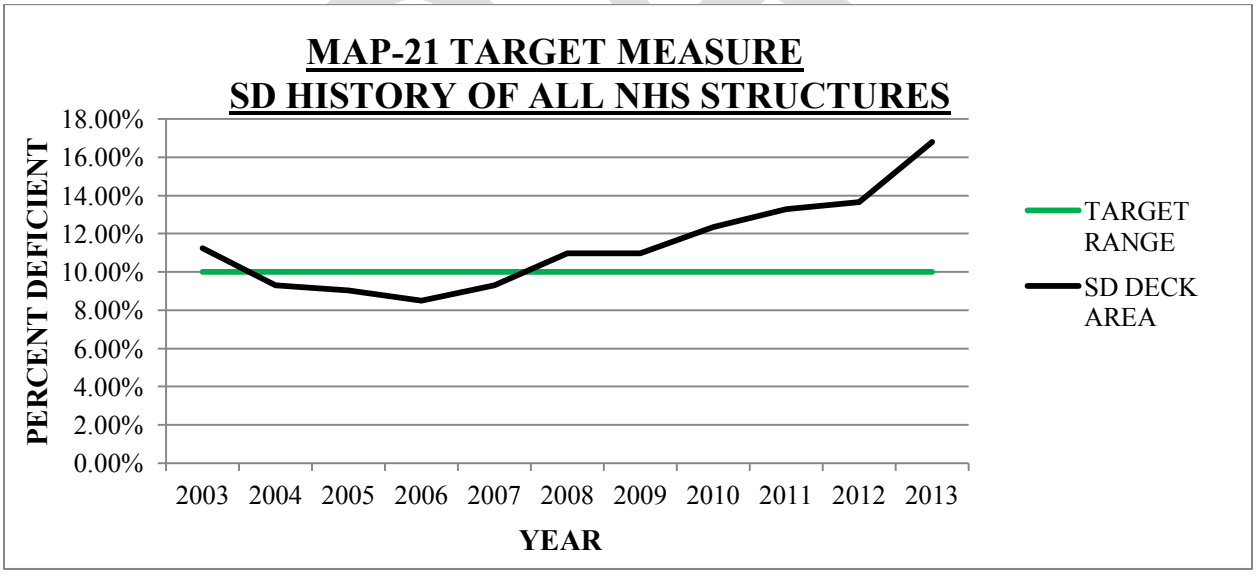
Current WBI condition ratings for the three functional classifications (Interstate, Non-Interstate NHS, and Non-NHS) are as follows:

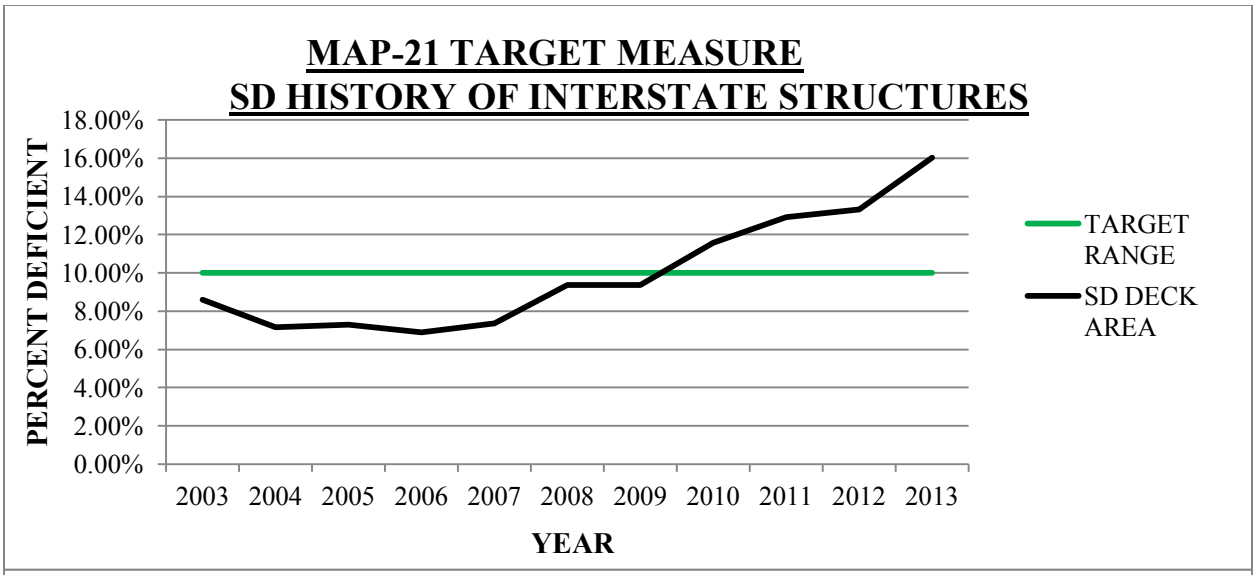
2013 WBI Classifications									
Functional Classification	Number of Bridges	Condition							
		Excellent		Good		Fair		Poor	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Interstate	925	52	5.6%	326	35.3%	509	55.0%	38	4.1%
Non-Interstate NHS	419	59	14.1%	183	43.6%	159	38.0%	18	4.3%
Non-NHS	611	89	14.6%	253	41.4%	229	37.5%	40	6.5%
Overall	1955	200	10.2%	762	39.0%	897	45.9%	96	4.9%

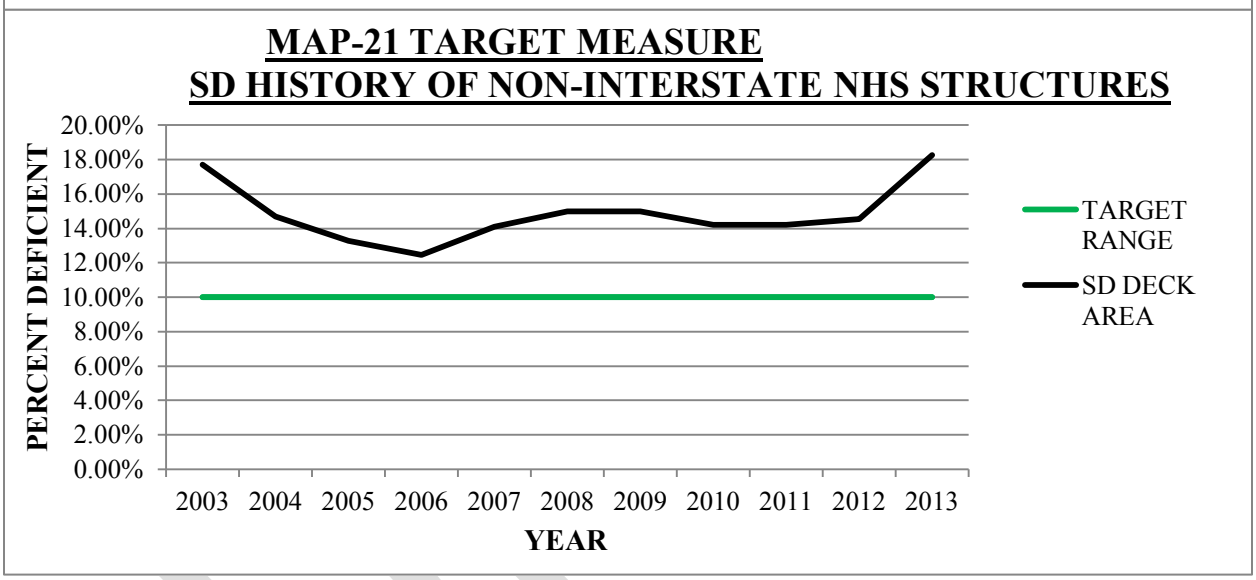


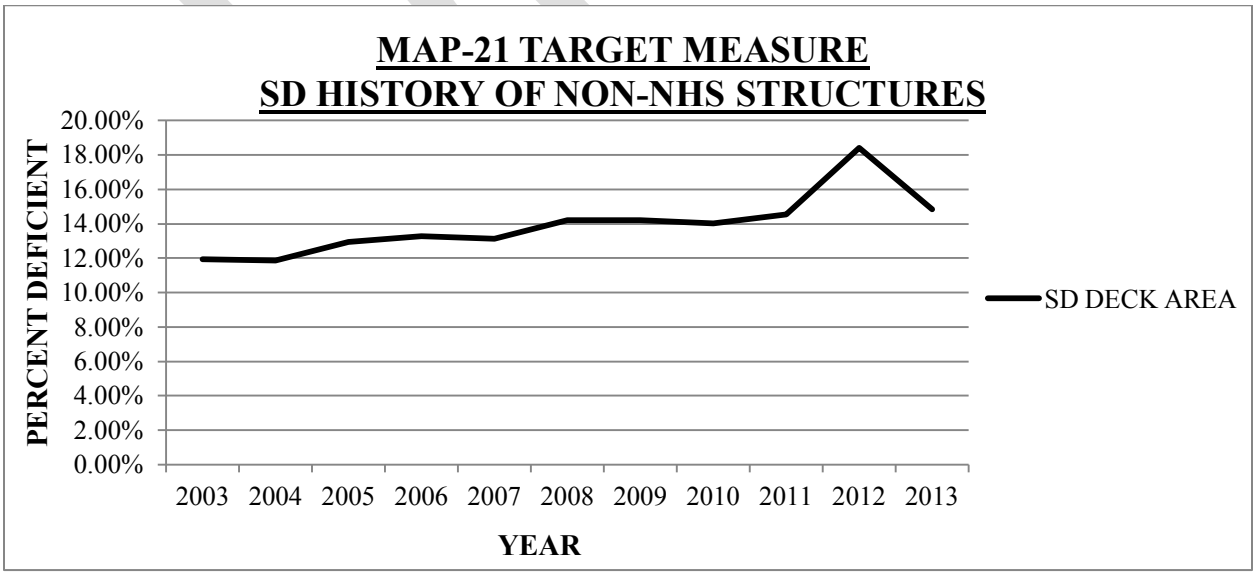


A bridge may be designated as structurally deficient (SD) based on an assessment of its physical condition and load rating. This federal designation indicates that bridge elements have experienced a level of deterioration that could reduce the structure's ability to carry design loads. The fact that a bridge is SD does not imply that it is likely to collapse or is unsafe. It may only indicate that maintenance or rehabilitation of various components is necessary to restore its condition. The following graphs and table shows the percentage of structures (based on square footage (SF) of deck area) that are classified as SD.




MAP-21 TARGET MEASURE
SD HISTORY OF INTERSTATE STRUCTURES
PERCENT DEFICIENT
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
YEAR
TARGET RANGE
SD DECK AREA


MAP-21 TARGET MEASURE
SD HISTORY OF NON-INTERSTATE NHS STRUCTURES
PERCENT DEFICIENT
20.00%
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
YEAR
TARGET RANGE
SD DECK AREA


MAP-21 TARGET MEASURE
SD HISTORY OF NON-NHS STRUCTURES
PERCENT DEFICIENT
20.00%
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013
YEAR
SD DECK AREA

2013 DEFICIENT STRUCTURES (BASED ON SF DECK AREA)			
	TOTAL DECK AREA	**STRUCTURALLY DEFICIENT**	**% DEFICIENT**
NHS			
INTERSTATE	5,228,853	838,632	16.0%
NON-INTERSTATE NHS	2,949,036	538,687	18.3%
TOTAL NHS	**8,177,889**	**1,377,319**	**16.8%**
NON-NHS			
STATE	3,007,588	446,349	14.8%
TOTAL NON-NHS	**3,007,588**	**446,349**	**14.8%**
TOTALS			
TOTALS	**11,185,477**	**1,823,668**	**16.3%**

Performance Measures:
The Bridge Program publishes an annual Bridge Needs Report. This report documents the WBI classification, SD status, and needed work items (preservation, rehabilitation, or replacement) for each state owned bridge.

WYDOT projects an additional $30 million is needed annually to meet our goals and the MAP-21 bridge system requirements.

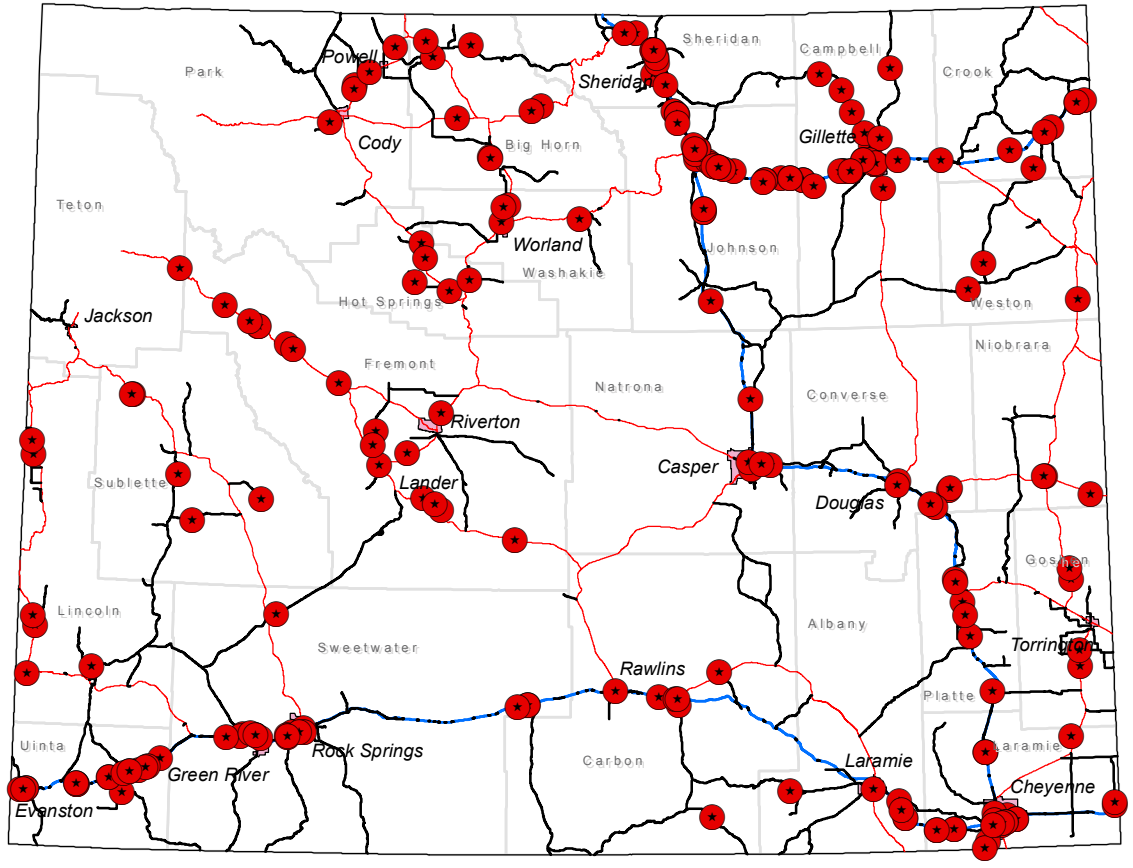
Federal performance measures, as noted in Section II, require that no more than 10 percent of the bridges, (based on deck area), may be designated as SD for all NHS bridges.

WYDOT's goals are to maintain at least 60 percent of the state-owned bridges in good or excellent condition, and in accordance with FHWA's performance measures, have no more than 10 percent of all NHS bridges, based on deck area, designated as SD. Based on the scenarios in the bridge management system, the Bridge Program projects an annual funding shortfall of $30 million in order to meet these goals.

WYDOT's goals are to maintain at least 60 percent of the state-owned bridges in good or excellent condition and have less than 10 percent of NHS bridges designated as SD.

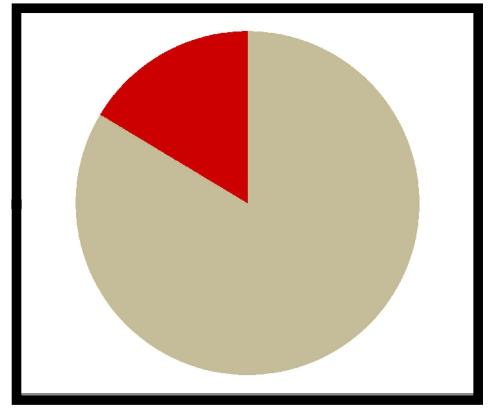
Stucturally Deficient (SD) Bridge Structures

Bridge Structures on State Owned Roads



Stucturally Deficient
All State Owned Structures 2014

Percent of Total Structures



NOT Stucturally Deficient - 80.4%

Structually Deficient - 19.6%

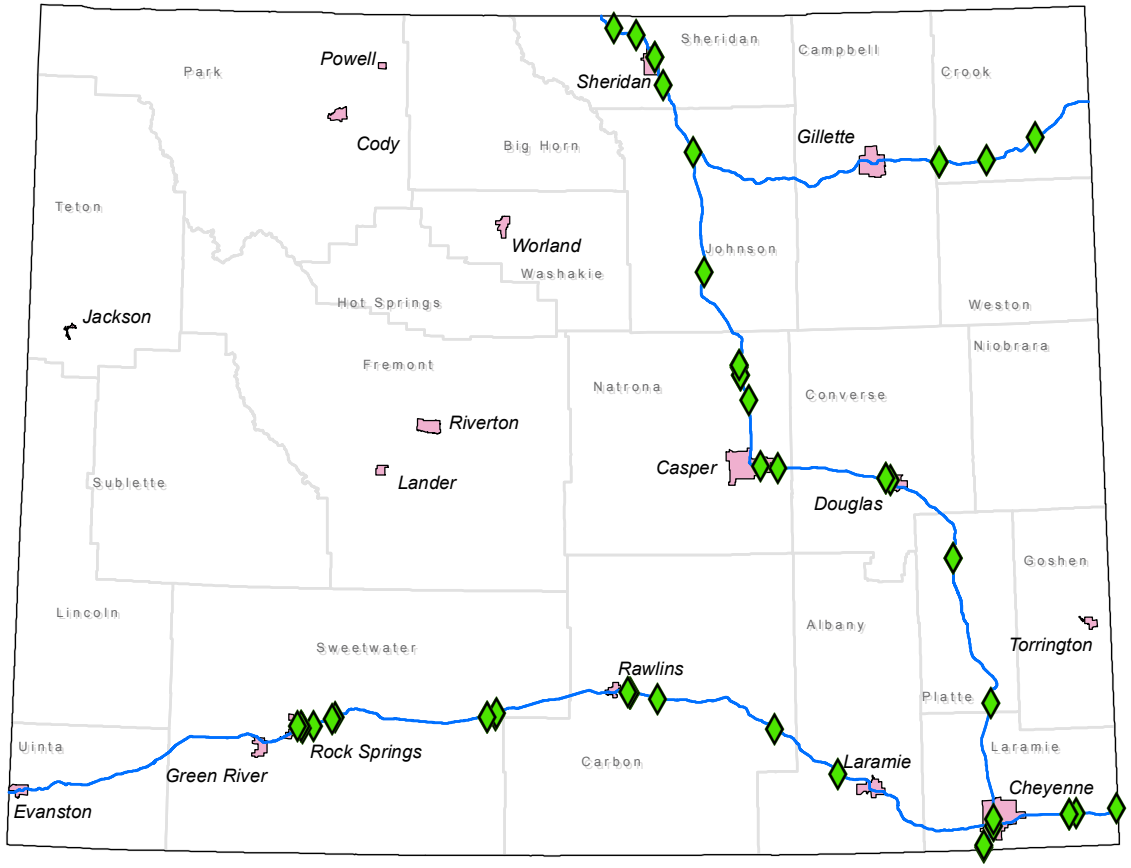
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

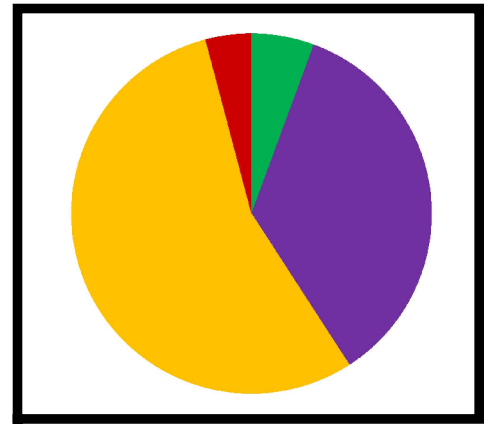
Interstate Bridge Classification - EXCELLENT 2014

Bridge Structures on State Owned Roads



WBI Classification

Interstate Bridge Classification % - for All Interstate Structures 2014



Excellent - 6%

Good - 35%

Fair - 55%

Poor - 4%

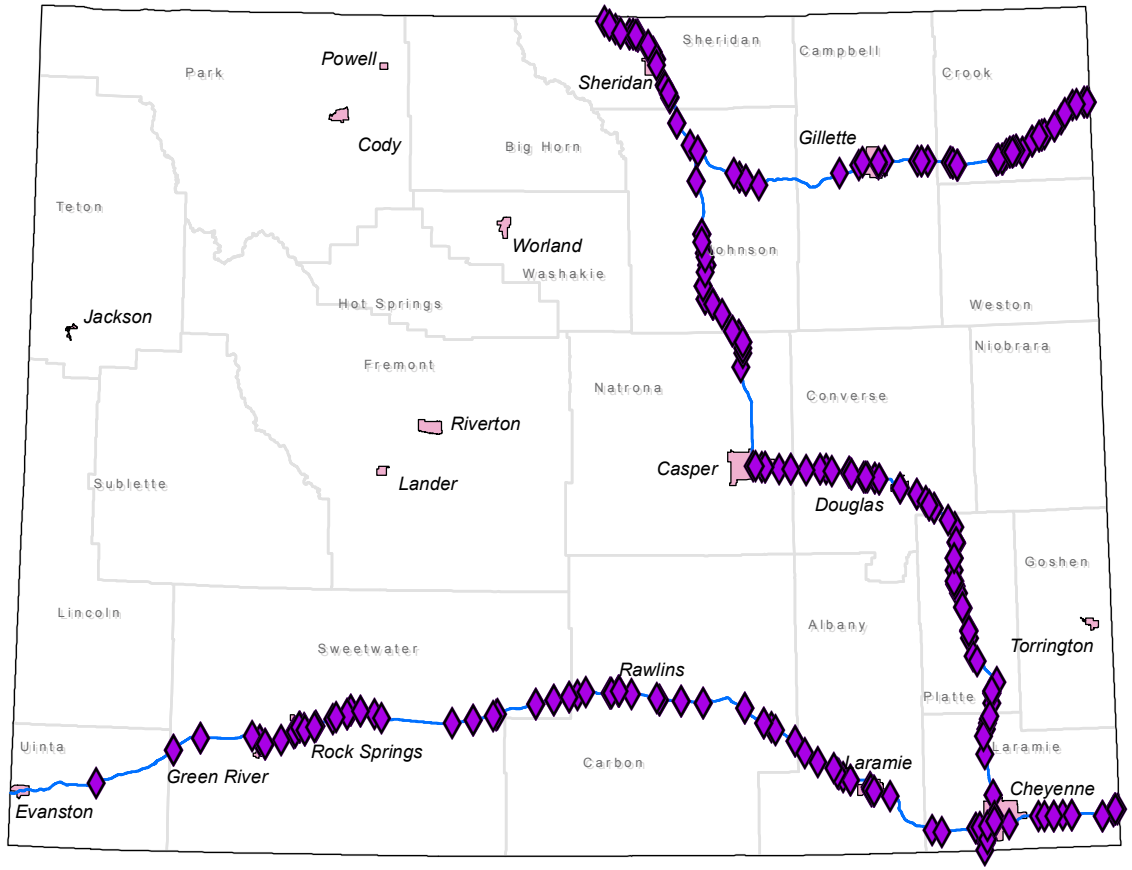
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

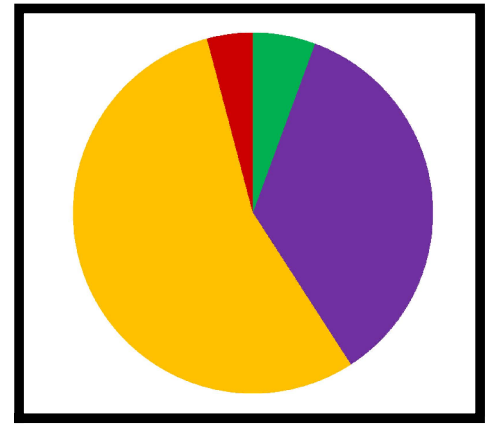
Interstate Bridge Classification - GOOD 2014

Bridge Structures on State Owned Roads



WBI Classification

Interstate Bridge Classification % - for All Interstate Structures 2014



Excellent - 6%

Good - 35%

Fair - 55%

Poor - 4%

Date: 2014

Source: WYDOT Bridge Program

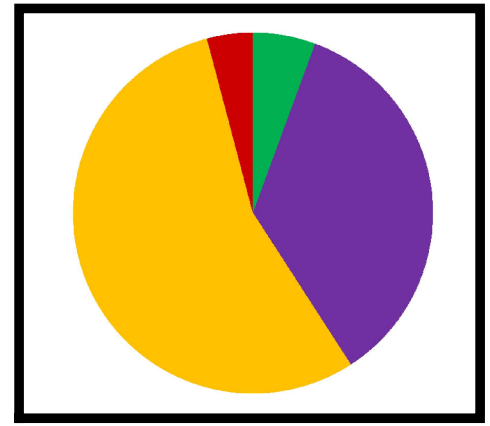
Wyoming Bridge Index (WBI) Classification

Interstate Bridge Classification - FAIR 2014

Bridge Structures on State Owned Roads

WBI Classification

Interstate Bridge Classification % - for All Interstate Structures 2014



Excellent - 6%

Good - 35%

Fair - 55%

Poor - 4%

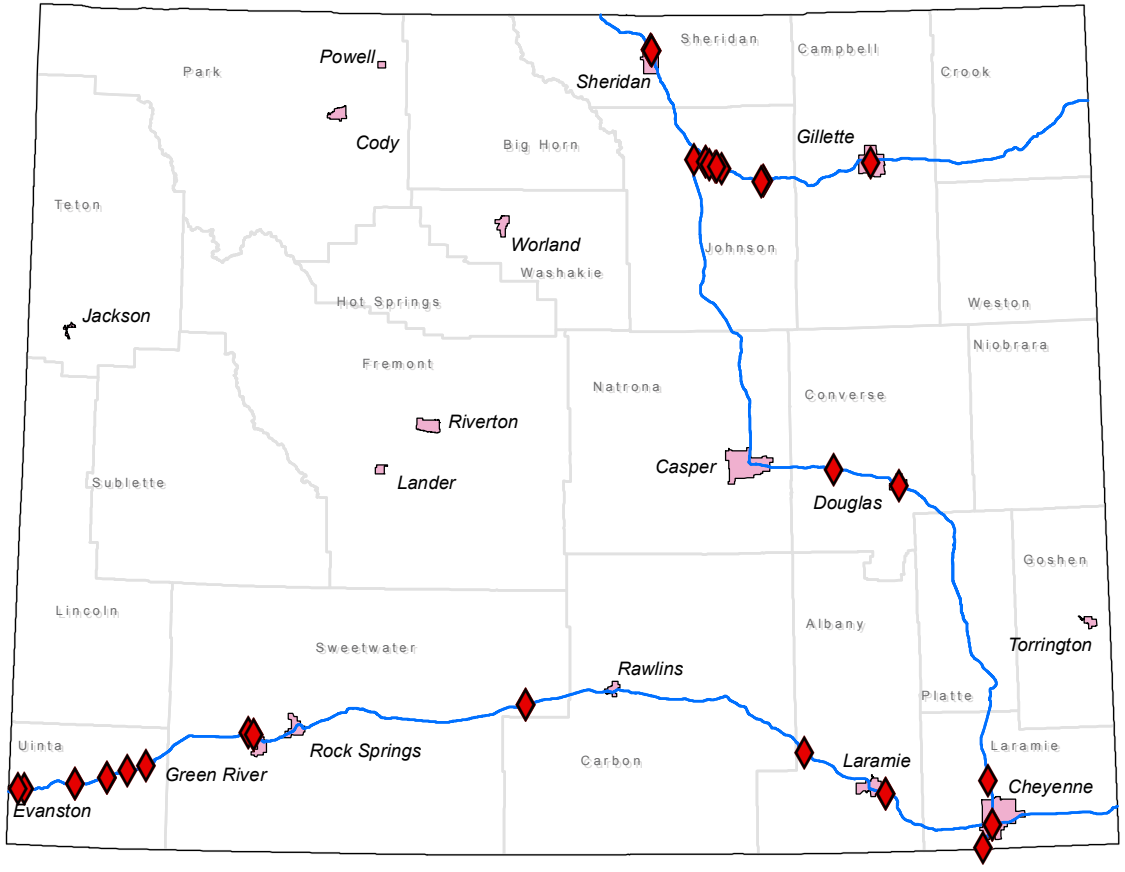
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

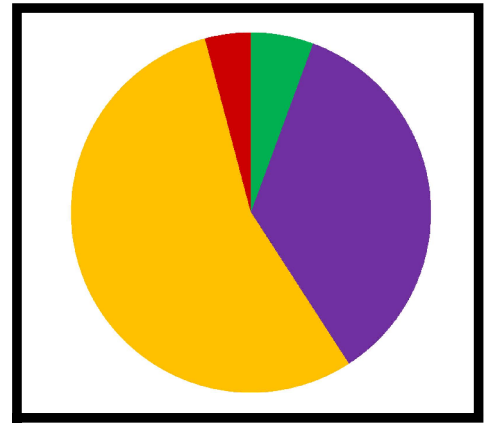
Interstate Bridge Classification - POOR 2014

Bridge Structures on State Owned Roads



WBI Classification

Interstate Bridge Classification % - for All Interstate Structures 2014



Excellent - 6%

Good - 35%

Fair - 55%

Poor - 4%

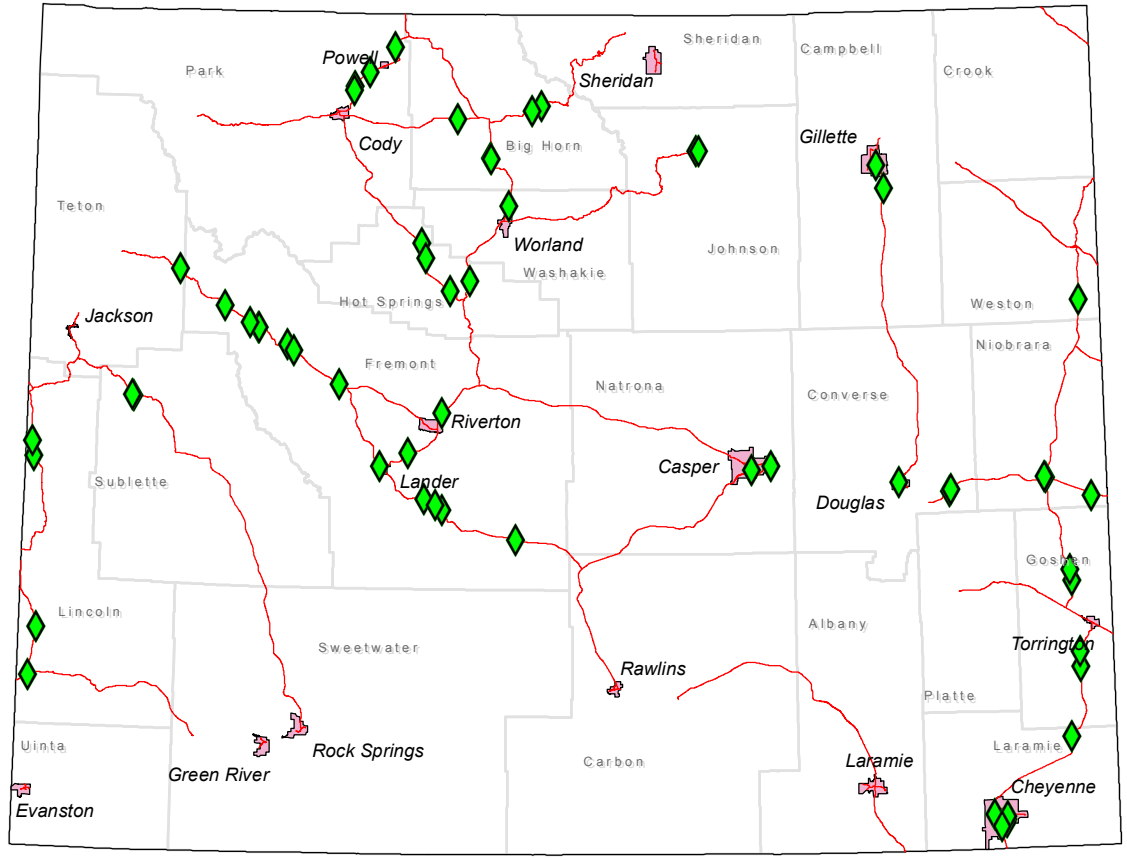
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

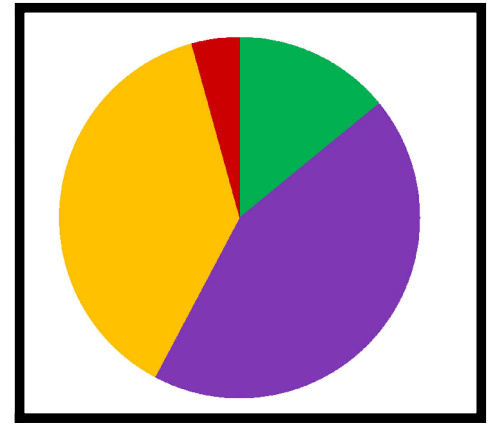
Non-Interstate NHS Bridge Classification - EXCELLENT 2014

Bridge Structures on State Owned Roads



WBI Classification

Non-Interstate NHS Bridge Classification % - for All Non-Interstate NHS Structures 2014



Excellent - 14%

Good - 44%

Fair - 38%

Poor - 4%

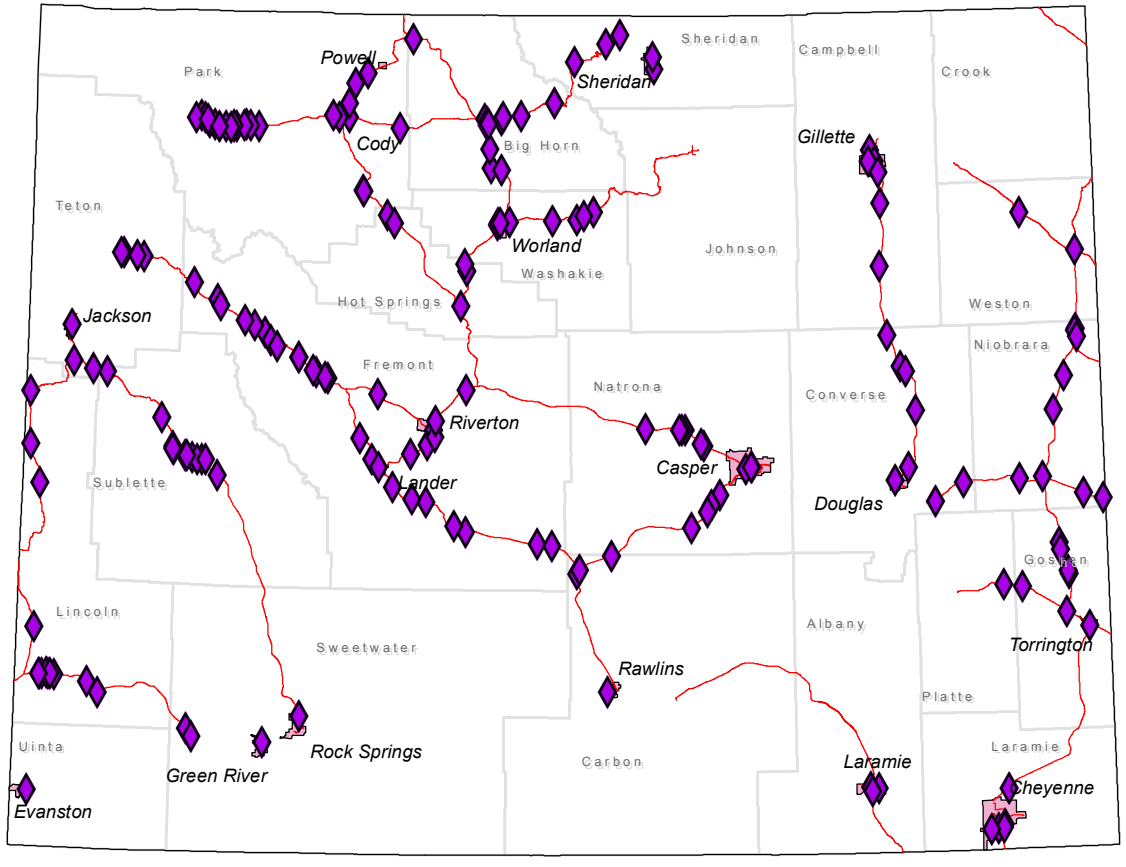
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

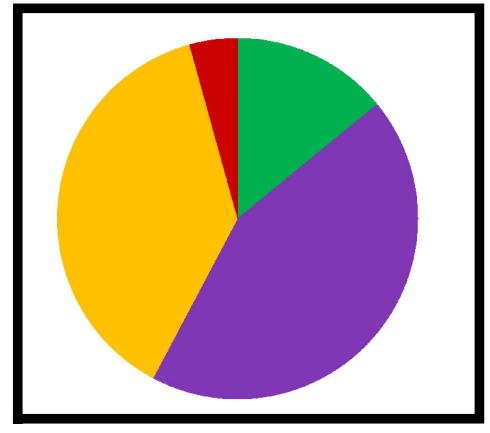
Non-Interstate NHS Bridge Classification - GOOD 2014

Bridge Structures on State Owned Roads



WBI Classification

Non-Interstate NHS Bridge Classification % - for All Non-Interstate NHS Structures 2014



Excellent - 14%

Good - 44%

Fair - 38%

Poor - 4%

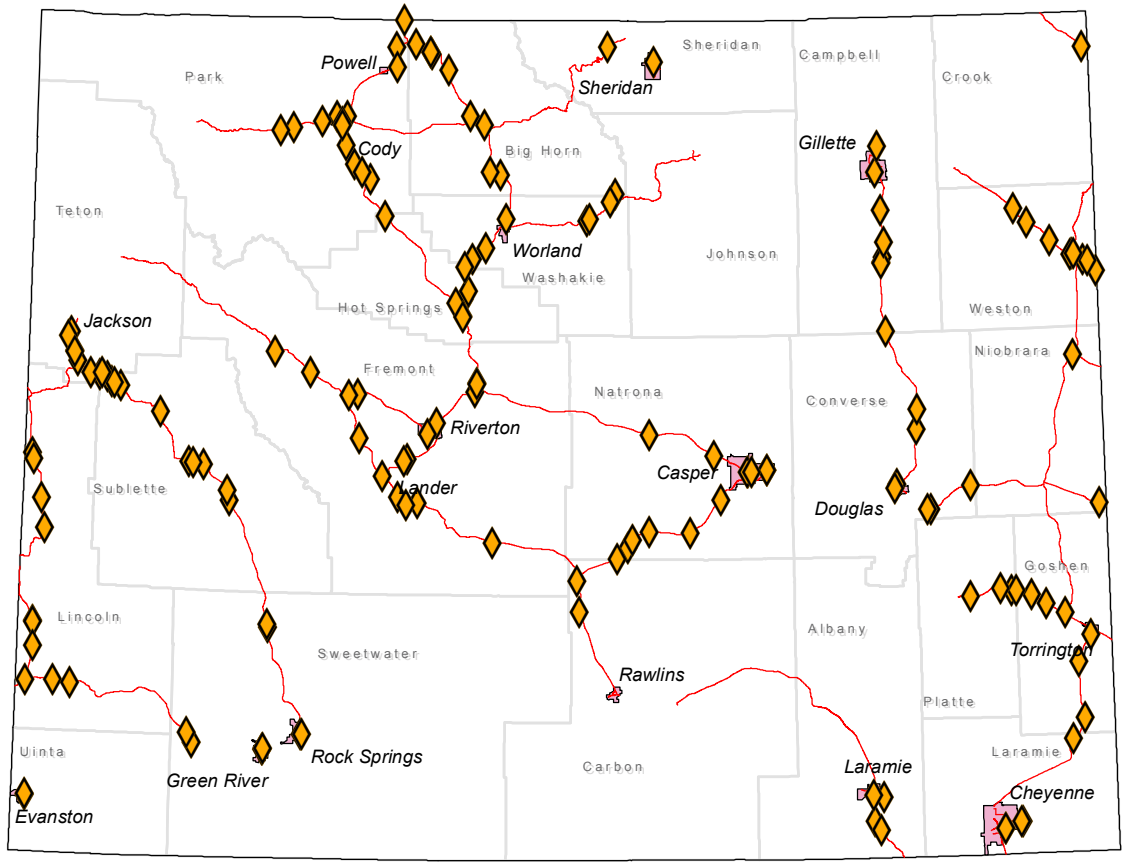
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

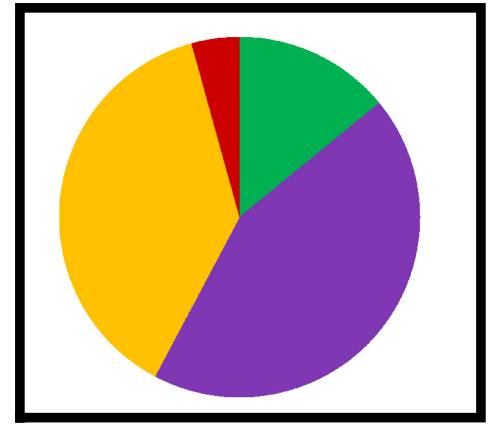
Non-Interstate NHS Bridge Classification - FAIR 2014

Bridge Structures on State Owned Roads



WBI Classification

Non-Interstate NHS Bridge Classification % - for All Non-Interstate NHS Structures 2014



Excellent - 14%

Good - 44%

Fair - 38%

Poor - 4%

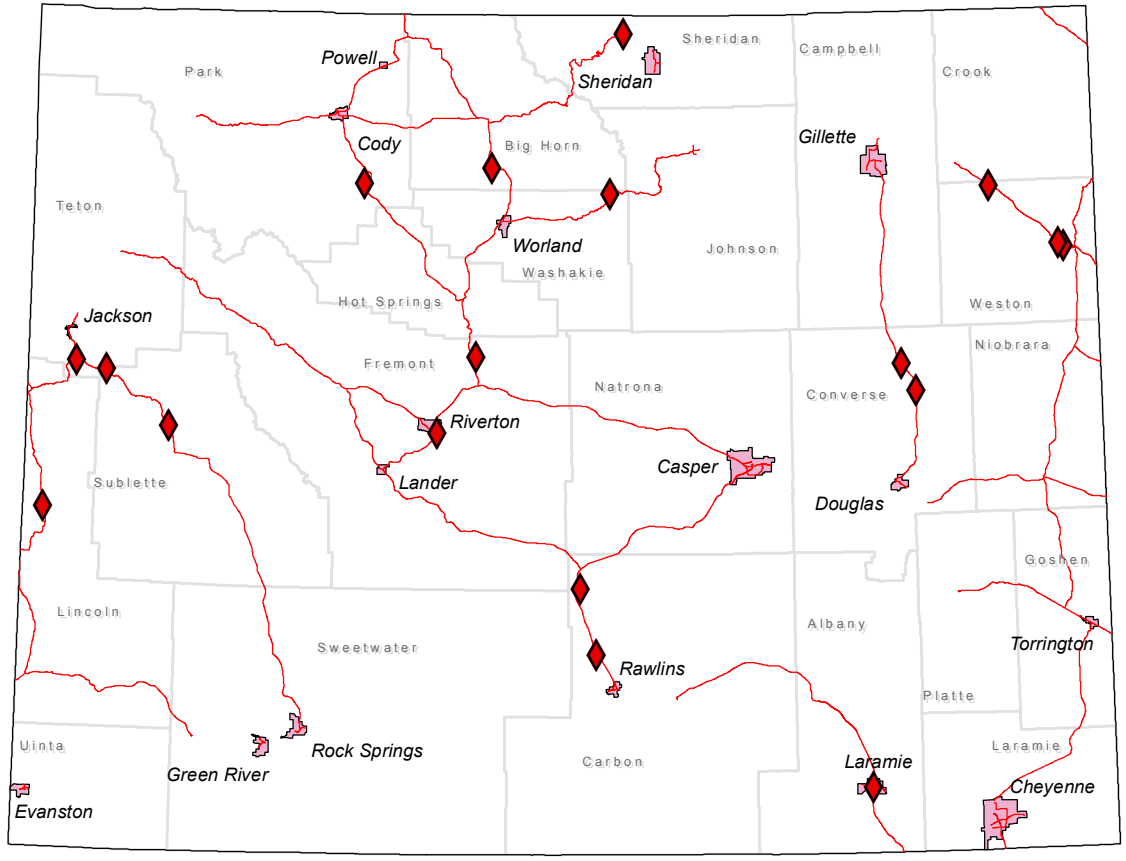
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

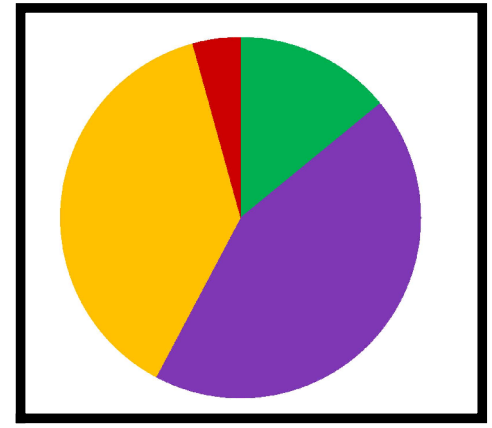
Non-Interstate NHS Bridge Classification - POOR 2014

Bridge Structures on State Owned Roads



WBI Classification

Non-Interstate NHS Bridge Classification % - for All Non-Interstate NHS Structures 2014



Excellent - 14%

Good - 44%

Fair - 38%

Poor - 4%

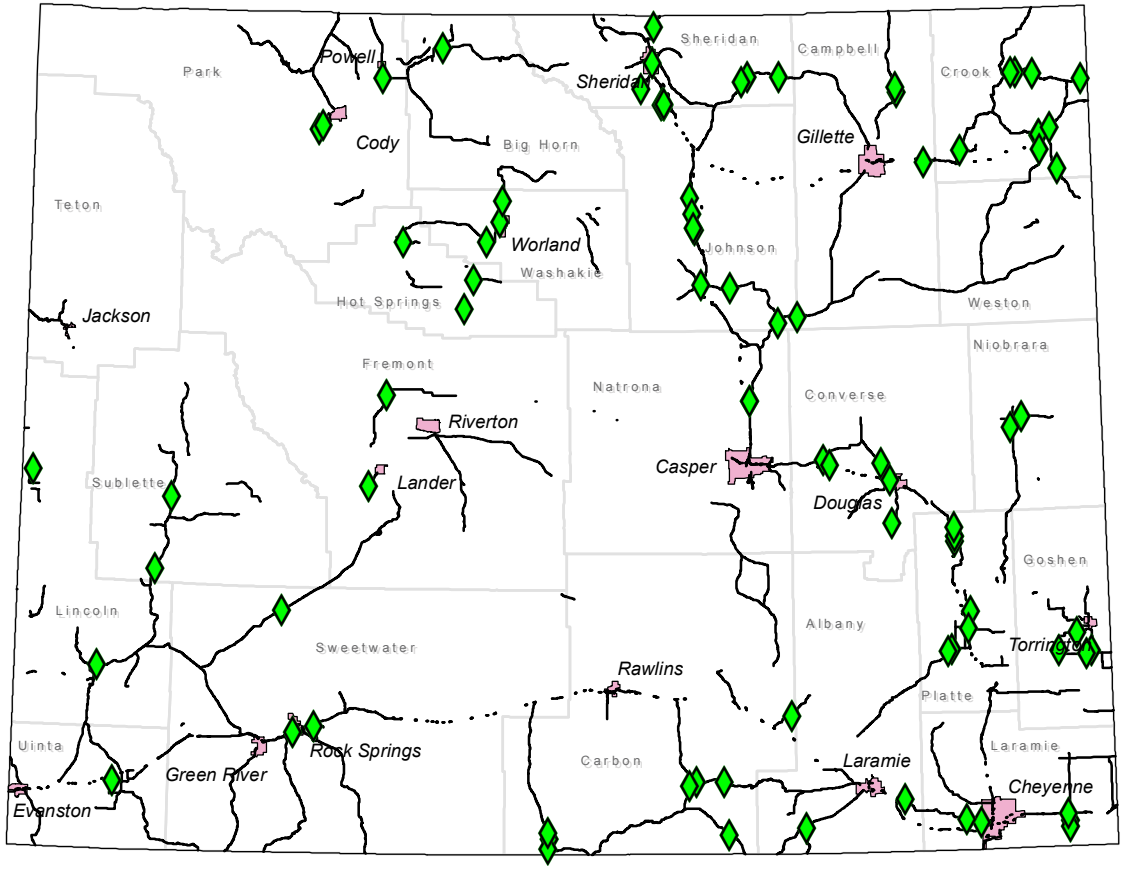
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

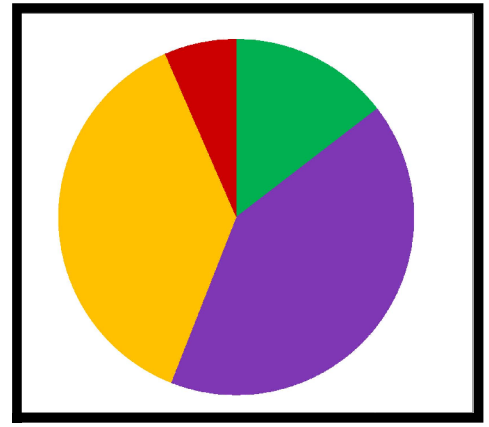
Non-NHS Bridge Classification - EXCELLENT 2014

Bridge Structures on State Owned Roads



WBI Classification

Non-NHS Bridge Classification % - for All Non-NHS Structures 2014



Excellent - 15%

Good - 41%

Fair - 37%

Poor - 7%

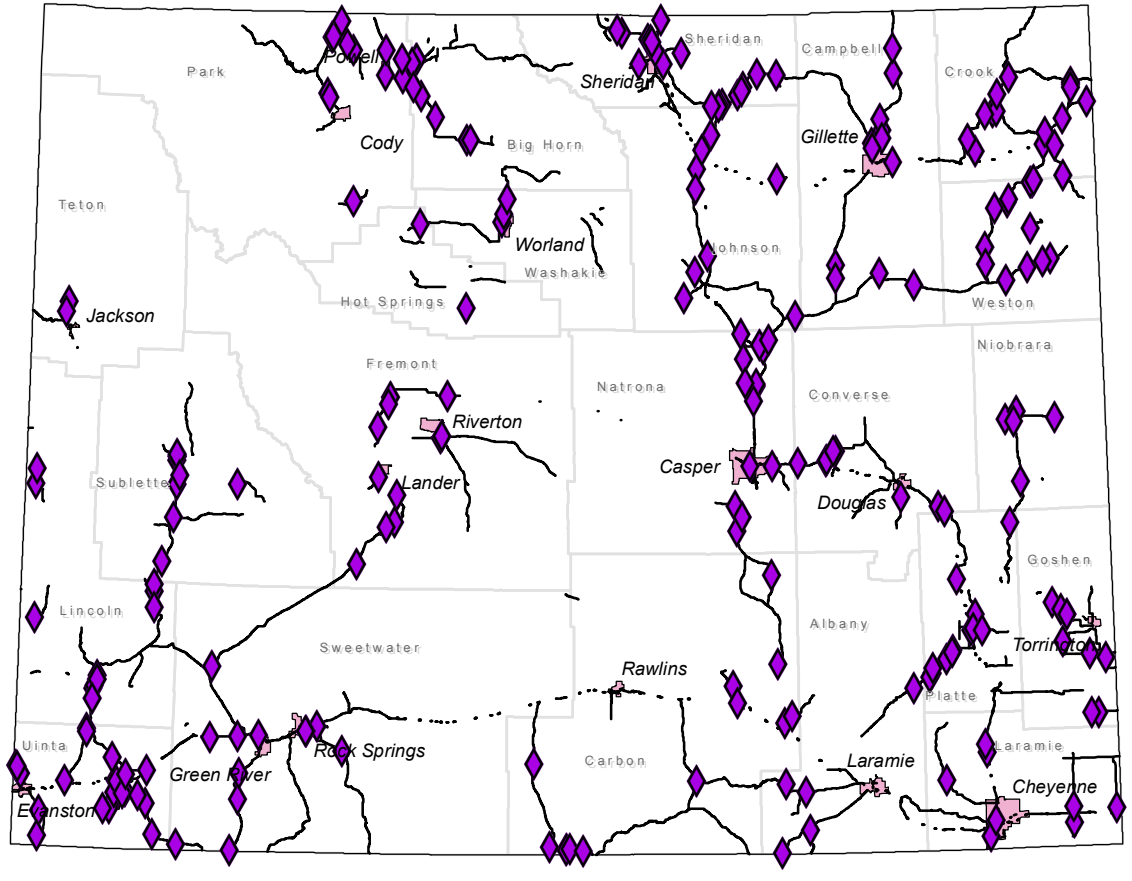
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

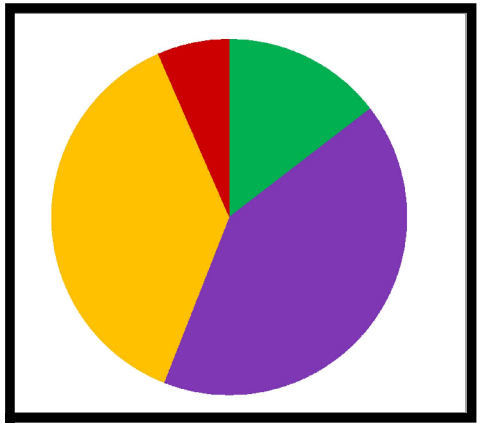
Non-NHS Bridge Classification - GOOD 2014

Bridge Structures on State Owned Roads



WBI Classification

Non-NHS Bridge Classification % - for All Non-NHS Structures 2014



Excellent - 15%

Good - 41%

Fair - 37%

Poor - 7%

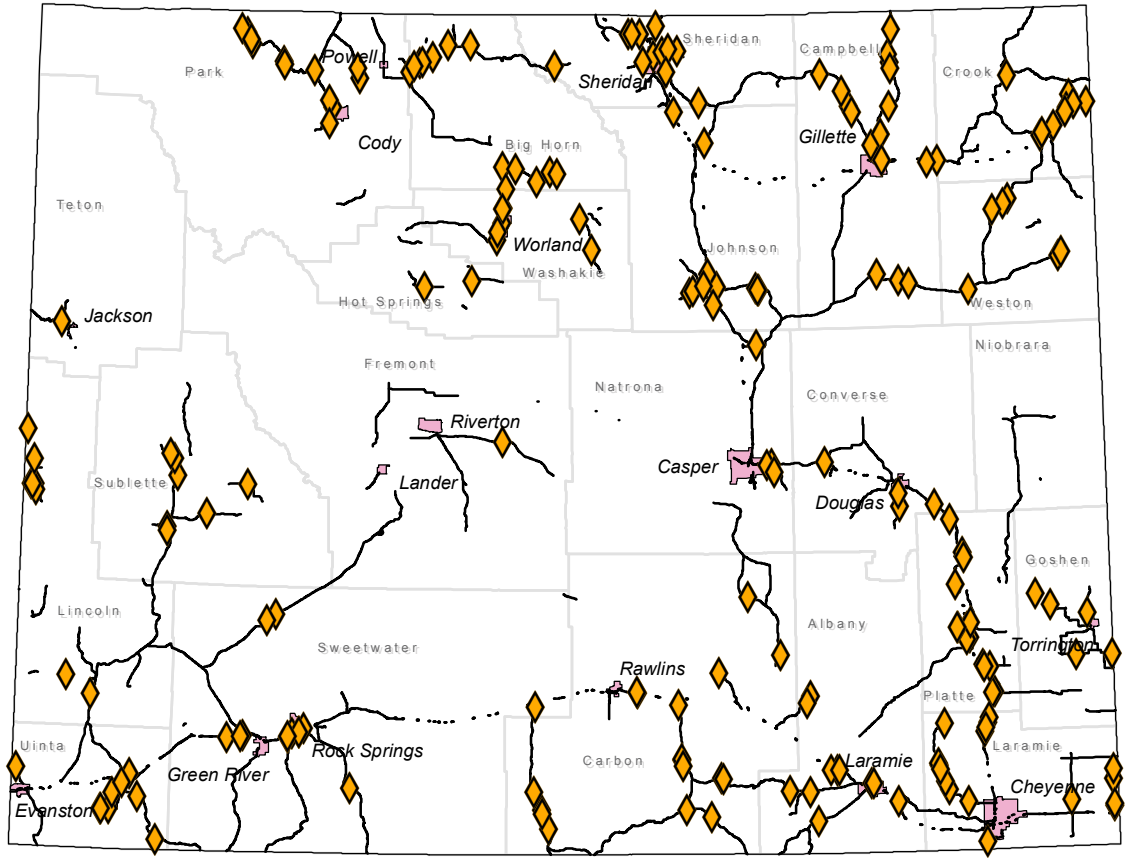
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

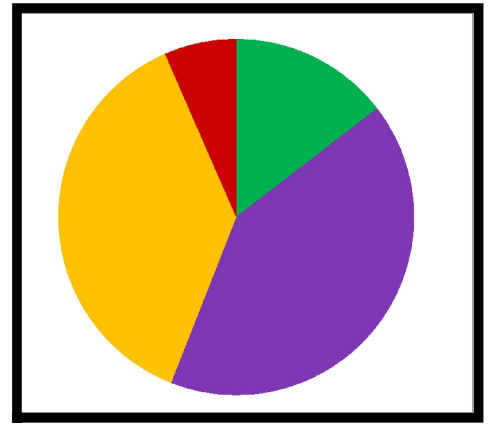
Non-NHS Bridge Classification - FAIR 2014

Bridge Structures on State Owned Roads



WBI Classification

Non-NHS Bridge Classification % - for All Non-NHS Structures 2014



Excellent - 15%

Good - 41%

Fair - 37%

Poor - 7%

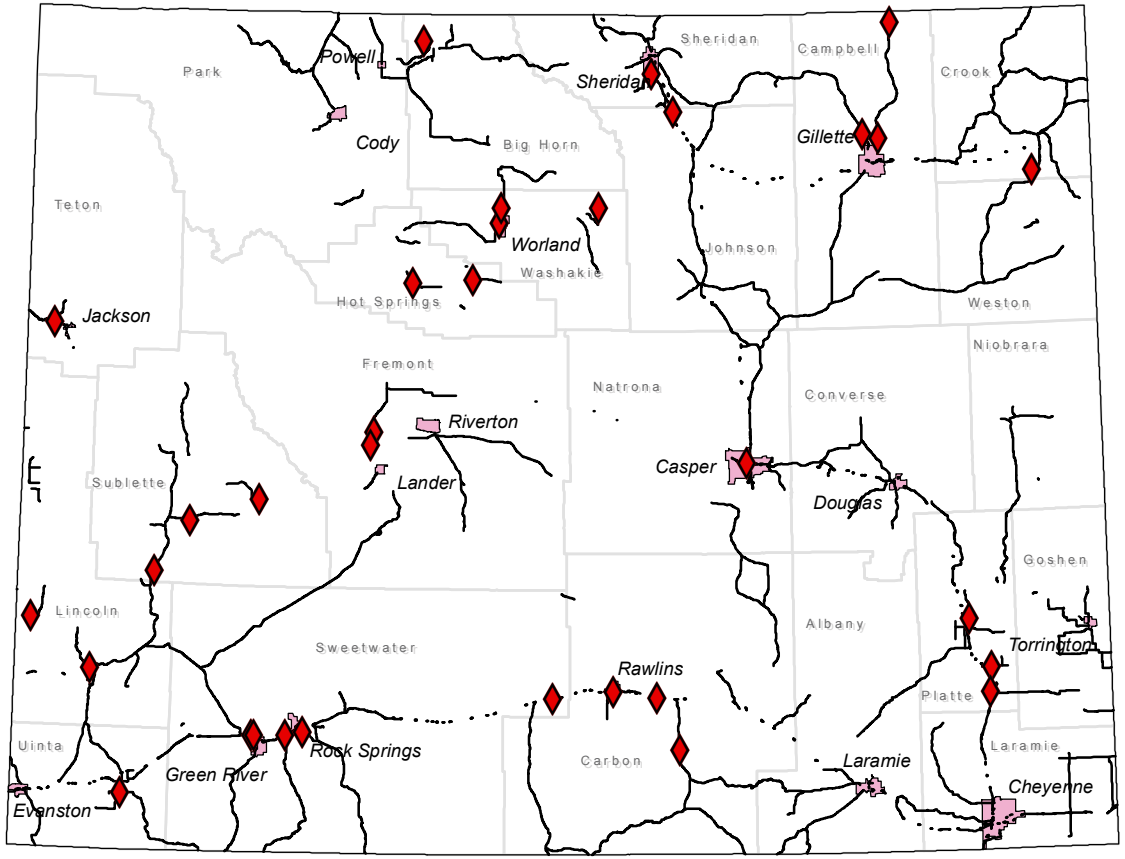
Date: 2014

Source: WYDOT Bridge Program

Wyoming Bridge Index (WBI) Classification

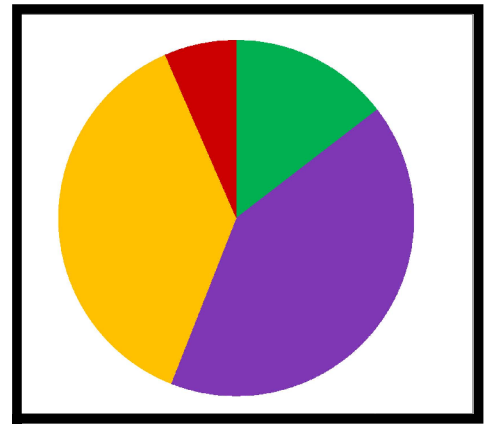
Non-NHS Bridge Classification - POOR 2014

Bridge Structures on State Owned Roads



WBI Classification

Non-NHS Bridge Classification % - for All Non-NHS Structures 2014



Excellent - 15%

Good - 41%

Fair - 37%

Poor - 7%

Date: 2014

Source: WYDOT Bridge Program

V. Financial Plan: Statewide Transportation Improvement Program

WYDOT uses a corridor based system for high level analysis of Wyoming's transportation network. The major connecting routes (Rawlins to Jackson or Evanston to Pine Bluffs for example) are analyzed as contiguous routes to determine the deficiencies/needs of each individual sub-segment that makes up the corridor. This is used to determine which items in a given segment may be causing an impediment to the safe, efficient flow of traffic in the state. A corridor based system revolves around the idea of creating a uniform and consistent travelling experience when travelling from one location to another. Asset Management is used to optimize individual rehabilitation strategies (capital improvement projects) to the corridor analysis based on the physical needs of the corridor. Through an extensive public involvement process, with input from engineering studies, Asset Management, Long Range Corridor Plans, and the approval of the Transportation Commission, capital improvement projects are combined to create the STIP. The STIP is more than an accounting document; it is a snapshot of construction projects, and their anticipated funding expenditures.

The STIP is a six-year, fiscally constrained program that documents WYDOT's investment plan for the management of Wyoming's transportation assets. Actual funding levels may vary due to changes in Congressional appropriations as well as State appropriations. The STIP also forms the framework to ensure future spending will meet the goals established by the management systems.

Since both the nature of the projects and funding is dynamic and subject to many sources of change, the STIP is inherently fluid. WYDOT utilizes recommendations from the Pavement Management System, Bridge Management System and Safety Management System to assist in programming projects to meet performance measures. Some of the challenges faced by WYDOT are funding changes, increased construction costs, right-of-way acquisition, environmental issues and cost volatility for construction materials. WYDOT attempts to account for cost volatility by calculating an annual inflation rate when generating project costs.

WYDOT expects funding levels to remain flat for the foreseeable future. But there is a strong possibility future funding levels will decrease.

For the years 2015 through 2020, WYDOT anticipates the annual highway construction funding to average $246 million per year, based on current revenue projections. An additional $100 million per year is committed by Federal or State rules, regulations or policies for projects that are not managed by PMS, BMS or the other asset management systems. Of that $100 million, approximately $57 million goes to planning and research, preliminary engineering, right-of-way, royalties, Industrial Road projects, and other mandated programs. The remaining $43 million is used for railroad/highway crossings, off-system bridge work, local projects, etc. WYDOT has the ability to reallocate approximately $8.5 million of the $43 million to projects that are managed by the management systems, if the Transportation Commission deemed it necessary.

Currently 82.5% of WYDOT's construction funding is being spent on pavement, maintenance, bridge, and safety.

Roughly two-thirds of all highway projects are funded with federal highway funds, while one-third are funded by state funds.

VI. Investment Plan

WYDOT tracks the planned and actual expenditure of construction funds by percentage of each project falling into nine asset categories. The asset categories are listed below:

Pavement: This includes all roadway surfacing.

Bridge: This includes all bridges that are on or off of the state owned highway system.

Safety: These are items that affect the safety of the transportation system: such as guardrail, side slopes, signs, etc.

Mobility: Items could include additional lanes, intersection improvements for traffic flow, turning lanes, etc.

Environmental Sustainability: Air quality improvements, wetland banking, animal-vehicle crash mitigation, archeological and historical preservation, etc.

Community Development: Items that enhance community livability such as sidewalks, ADA upgrades, pathways, etc.

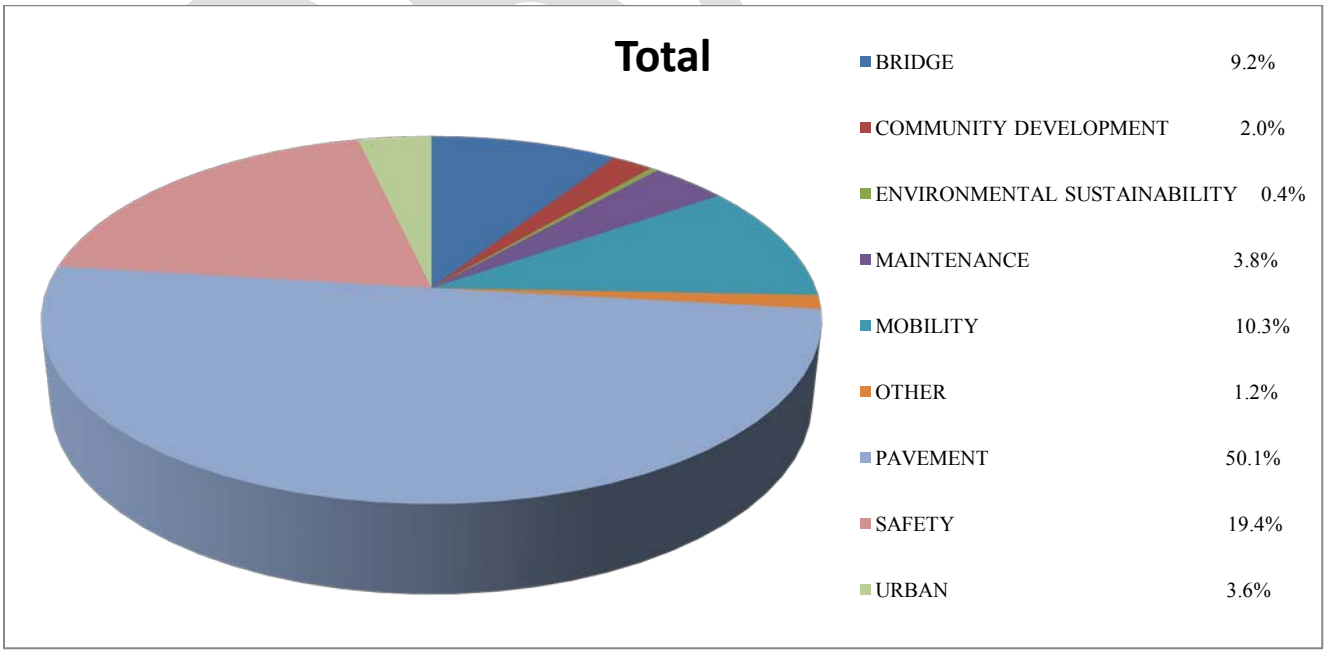
Urban: Transportation related items within an urban boundary.

Maintenance: Items for the general maintenance of the roadways such as fencing, sign or guardrail replacement, crack sealing, pothole patching, snow removal, etc.

Other: Other non-defined items.

Funding is distributed to the various categories based on asset management system recommendations. As the projects progress through the design process and then construction, the asset categories are tracked and updated as changes occur. This is done to monitor compliance with the asset management recommendations. If funding is increased for a given asset category, a like amount of funding has to be removed from the other asset categories.

Shown below are the approximate investment distributions for each of the nine asset categories.



Valuation: WYDOT uses the modified GASB 34 (Governmental Accounting Standards Board 34) standard method for valuation of infrastructure assets. The official WYDOT Financial Statements, dated September 30, 2012, show WYDOT's Infrastructure assets valued at $5,104,059,915 and Infrastructure Work in Progress (W.I.P) valued at $213,280,234 (which includes the WYOLINK communication system costs). The Infrastructure Assets can be broke down into: Land (Right of Way) $69,246,068, Bridges $842,242,731 and Roadways $4,134,229,148. It must be noted that GASB 34 values are based on historical acquisition/construction costs and do not reflect current market valuation or replacement cost.

VII. Risks to Wyoming Transportation System

Risk can be defined as:

A probability or threat of damage, injury, liability, loss, or any other negative occurrence that is caused by external or internal vulnerabilities, and that may be avoided through preemptive action.

Sound risk based asset management, for any field of study, takes into consideration the prospect of hazards and uncertainty while taking preemptive action to mitigate potential failures. FHWA's series of reports on risk, produced in 2012 and 2013, guide the evaluation of risk in asset management. Report 1, titled *Risk-Based Transportation Asset Management: Evaluating Threats, Capitalizing on Opportunities* suggests three levels of risk exist. The highest level of risk is titled "Agency" risk, whose responsibility is that of the Executives. The second level is "Program" risk, which are "Risks that are common to clusters of projects, programs, or entire business units". The third level is "Project" risk, which relates to risks involved in individual projects. WYDOT is using the TAMP to describe Program level risks, and the threats and opportunities that occur at the system level. Individual events like flooding, earthquakes, and landslides are not within the scope of this document, but are considered during the design of individual reconstruction projects.

Funding Risks to WYDOT Bridges and Pavements

The greatest known risk to Wyoming's transportation network is the lack of adequate funding to preserve and maintain the existing infrastructure and an inability to expand the system to meet future needs. WYDOT's Pavement Management System indicates an additional $34 million per year is required to maintain existing pavement conditions. Analysis by the Bridge Program indicates an additional $30 million per year is required to address Wyoming's bridge needs. Based on forecasts from the bridge and pavement models, an additional $64 million annually is needed just to maintain the state highway and bridge systems in their current condition and meet MAP-21 goals. The additional $64 million does not include any funding needed to meet safety needs. Also, the additional $64 million does not take into consideration future increases in traffic which will cause increased deterioration rates and decreased levels of service.

Currently, the biggest risk to Wyoming's Highways is a possible future reduction in Federal funding due to trust fund shortfalls.

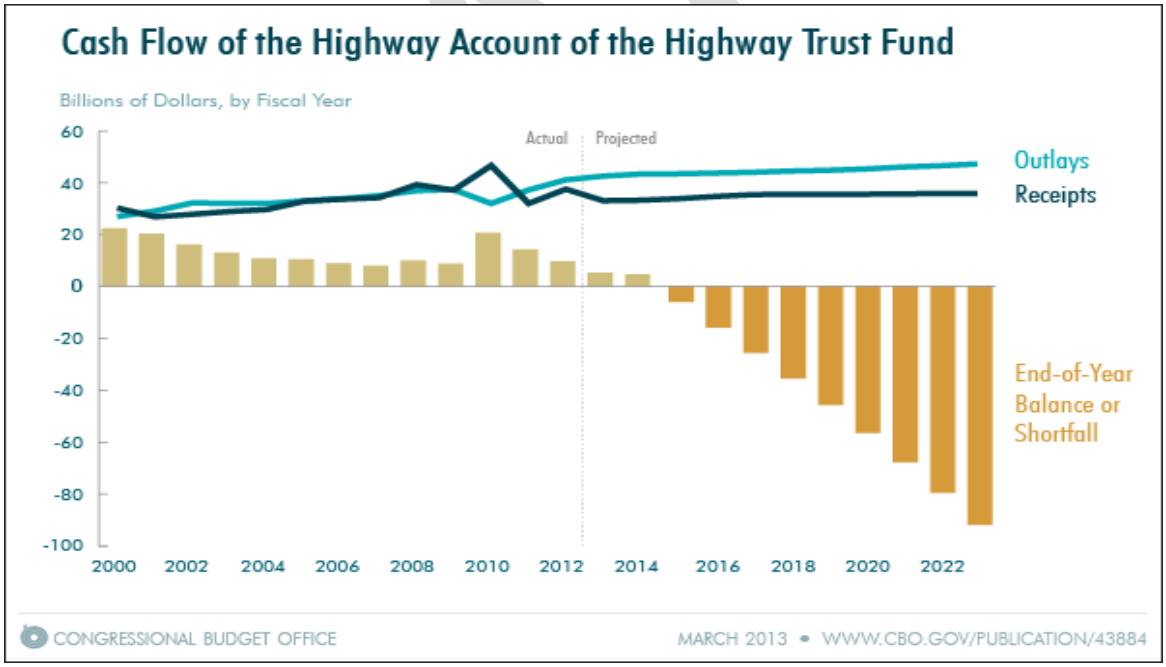
In 2013 WYDOT began receiving additional state funding in the form of a 10 cent per gallon fuel tax increase (approximately $47.5 million a year). Forty million dollars of the new fuel tax funding is being applied to Wyoming's non-Interstate highways. This additional funding is split, between highways on and off the NHS, based on traffic levels. The remaining $7-7.5 million of fuel tax funding is being used to enhance the condition of the state's bridges. An additional

general fund appropriation of $23 million is applied only to Non-NHS state highways. Based on the 2015-2020 STIP revenue projections, WYDOT anticipates an average of $289 million annually for use on highway construction and maintenance projects. Approximately two-thirds of these funds are federal highway funds and one-third is state funds.

The current Federal Highway bill, MAP-21, expires September 30, 2014. Future federal funding levels are uncertain until a new Federal Highway bill is passed (or the current bill is reauthorized). There is a good possibility that federal construction funding could be dramatically reduced in the near future.

According to the Congressional Budget Office, there will be a budget shortfall in the highway trust fund starting in fiscal year 2015. According to the Snapshot of the Highway Trust Fund dated March 14, 2013:

> CBO projects that, starting in 2015, the highway account of the Highway Trust Fund will have insufficient revenues to meet its obligations, resulting in steadily accumulating shortfalls. That projection is based on two assumptions: that the taxes whose receipts are allocated to the highway account will continue at their current rates (most of those taxes are scheduled to expire at the end of September 2016) and that federal funding for highways will increase at CBO's projected rate of inflation. To avoid such shortfalls, lawmakers would have to enact legislation to reduce highway funding, increase dedicated tax receipts, transfer money from the general fund of the Treasury to the Highway Trust Fund (as has occurred in recent years), or undertake some combination of those approaches.



Even with maintenance of federal funding at current levels, the level of service provided by federal expenditures will decrease due to inflation.

WYDOT has analyzed the impact a 30 percent reduction in federal funding, with no corresponding increase in state funding to offset the lost federal funds, would have on the state. The result is that WYDOT's overall construction budget would be reduced by an average of 18 percent per year in total dollars. Therefore, the current $246 million expended annually for construction projects would drop to

approximately $202 million. If Wyoming actually experiences a 30 percent drop in federal funding, reduced levels of service would need to be evaluated and used to set new lower performance goals.

A $44 million annual drop in funding, due to a decrease in Federal Highway Trust Fund funding levels cannot be made up by moving funds from other asset categories. All other asset categories (categories other than pavement, bridge, maintenance and safety), contain funding of just over $51 million dollars. However, most of those funds are expenditures directed by Congress. WYDOT is unable to use the funds for anything other than what they are currently being spent on. For example, most of the environmental sustainability asset category is made up of Congestion Mitigation and Air Quality (CMAQ) funds, the community development asset category with the Transportation Alternative Program funds; these funds cannot be used on pavement or bridges. A "bare bones" expectation is that 80 percent of a $44 million funding reduction would have to be cut from Pavement and Bridges.

Utilizing analytical software, in house expertise and inspection processes; WYDOT is utilizing *programmatic risk analysis* to minimize potential deterioration of the transportation network by emphasizing preventative efforts. The Pavement Management System utilizes specialized software to determine future pavement conditions for various preventative maintenance and rehabilitation strategies that integrate budget data into the analysis to determine the best ratio of project types based on given monetary constraints.

Risks to WYDOT Bridge

Risk is central to the bridge analysis. The risk rating is one of four components in the WBI index and is divided into seven elements. The seven elements that make up the WBI risk rating are:

1. **Scour Adequacy -** Structures that are not properly designed to handle scour events are vulnerable to failure.
2. **Fracture Critical Members -** Structures that have fracture critical members are vulnerable to failure if one of these members fails.
3. **Under-clearances** - Structures with substandard horizontal or vertical under clearances are vulnerable to impact and possible failure.
4. **Posting** - If the structure is posted for limited truck loading, it can be vulnerable to failure.
5. **Waterway Adequacy** - Structures with inadequate waterway openings are prone to overtopping, scour, and damage from debris and are therefore vulnerable to failure.
6. **Channel & Channel Protection** - Structures with inadequate channel protection (such as riprap) are vulnerable to failure by scour.
7. **Seismic Adequacy** - Structures not properly designed for possible seismic events are vulnerable to failure.

Risks to WYDOT Pavements

FHWA's Report 4, *Risk-Based Transportation Asset Management: Managing Risks to Networks, Corridors, and Critical Structures* suggests that the act of classifying routes by importance based on economic generators, traffic counts, or near population centers is in fact a form of risk management. WYDOT makes trade-offs in its management of pavement condition based on Interstate, Non-Interstate NHS, and Non- NHS in recognition of the fact that more risk is being taken on the lower trafficked Non-NHS roads and therefore, allows their overall condition to be lower than the others.

A secondary risk of the pavement preservation strategy is based on the concept that it is cheaper to keep good pavements good. This translates into the accepted risk that roads in poor condition, while they technically remain poor, will often continue to deteriorate and will become rougher, have deeper ruts, and more cracking. All reasonable current funding scenarios do not allow for the higher cost rehabilitation of pavements rated as poor, and it is recognized that they must be sacrificed in order to maintain the higher priority system.

Resilience: Presidential Policy Directive 21 (PPD-21): Critical Infrastructure Security and Resilience defines resilience as the ability to prepare for and adapt to changing conditions, and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents.

Critical infrastructure must be secure and able to withstand and rapidly recover from all hazards. Achieving this requires integration with the national preparedness system across prevention, protection, mitigation, response, and recovery.

The 2013 National Infrastructure Protection Plan calls for resiliency to:

- Identify, deter, detect, disrupt, and prepare for threats and hazards to the Nation's critical infrastructure;
- Reduce vulnerabilities of critical assets, systems, and networks; and
- Mitigate the potential consequences to critical infrastructure of incidents or adverse events that do occur

Wyoming's highway network was not defined as a critical infrastructure as defined in the PATRIOT Act and PPD-21. However, WYDOT recognizes that the fundamentals of resiliency apply to all levels of infrastructure and an individual failure may result in severe local economic hardship.

Nearly all of the threats and hazards to the highways in Wyoming are believed to be natural, and normally are broken into two categories; extreme weather and geological. Extreme weather includes flooding, blizzards, high wind, and snow slides. Future climate change predictions are being reviewed for application to WYDOT design properties. Geological events include earthquakes, ground subsidence, landslides, and rock falls. Resilience in bridges is covered by the risk analysis performed, including the seismic ability and scour potential. Pavements do not currently have resiliency measures for natural or man-made events due to the rapid methods of temporary repairs that are currently available.

VIII. Asset Management Process Enhancement

Wyoming purchased an enterprise resource program that went live in 2006. One of the primary selection criteria was to facilitate an asset management process. Soon after that the State Planning Engineer was appointed the primary asset management program manager. The Planning Program re-organized to include an Asset Manager Coordinator in the Programming Division. WYDOT has made a concerted effort since 2006 in understanding and moving the Department forward in this pursuit by heavily engaging asset management principles at the state and national level through training and presentations.

It was pointed out in the Investment Plan chapter of this document that WYDOT spends almost 79 percent of the contract construction budget on three asset categories; pavement, bridge, and safety. This document does not address the infrastructure deterioration and improvement plan for the safety related items. Safety infrastructure has an indirect affect on reducing fatalities and serious injuries, another of WYDOT's goals. The next slated improvement of the TAMP is the infrastructure that relates directly with highway safety.