NEVADA DOT

NEVADA DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY PRESERVATION REPORT

February 2015

State of Nevada

Department of Transportation

State Highway Preservation Report

Report to the 2015 Legislature
As Required by Nevada Revised Statute 408.203 (3)

February 2015
(Biennium 2013-2014)

Nevada Revised Statute 408.203(3)

The director of the Nevada Department of Transportation shall report to the Legislature by February 1 of odd-numbered years the progress being made in the Department's 12-year plan for the resurfacing of state highways. The report must include an accounting of revenues and expenditures in the preceding two fiscal years, a list of the projects which have been completed, including mileage and cost, and an estimate of the adequacy of projected revenues for timely completion of the plan.

State of Nevada

Department of Transportation

Mission

The Department provides a better transportation system for Nevada through unified and dedicated efforts.

Vision

The Department is the nation's leader in delivering transportation solutions, improving Nevada's quality of life.

Values

The efforts of Department employees to attain the Department goals will be governed by the following Department's Core Values:

Integrity – Doing the right thing
Honesty – Being truthful in our actions and our words
Respect – Treating others with dignity
Commitment – Putting the needs of the Department first
Accountability – Being responsible for our actions

Goals

The fulfillment of the Mission of the Department is to be attained within the guidelines of the Department's seven Strategic Plan Goals. They are:

To optimize safety
To be in touch with and responsive to our customers
To innovate
To be the employer of choice
To deliver timely and beneficial projects and programs
To effectively preserve and manage our assets
To efficiently operate the transportation system

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EXECUTIVE SUMMARY

The Nevada Department of Transportation (NDOT) publishes the *State Highway Preservation Report* biennially to summarize the work performed and anticipated workload required to preserve the state-maintained roadway network and bridge infrastructure assets. This report provides the Nevada Legislature with 2013-2014 information that can be used to determine whether future revenues are adequate to maintain and preserve the infrastructure assets at a feasible and acceptable level.

NDOT is responsible for maintaining 5,393 centerline miles of roads and 1,154 bridges. Although the state-maintained roadway network consists of only 20% of the roads in Nevada, the network is overwhelmingly important as 52% of all automobile traffic and 82% of all heavy truck traffic travel on these roads.

The shortage of highway preservation funding is not new or even unique to Nevada. Transportation infrastructure funding, including highway preservation funding, is in short supply nationwide. The only dedicated highway revenue source in Nevada is fuel tax, which was last increased in 1992. The Nevada Legislature has recognized the need to invest in transportation and passed legislation that generated additional highway revenue from sources such as property taxes and room taxes. A safe, efficient, and reliable roadway network is important, and it promotes the general welfare of all the people in the State of Nevada. Adequate preservation funding is necessary since deteriorated roads and bridges can impede the general economic and social progress of the State. Investment in infrastructure will boost market economy, advance travel and trade, and provide a legacy from which future generations can prosper.

Pavement preservation and bridge preservation for fiscal years 2013 and 2014 were both analyzed and presented in this report. Major findings and conclusions are summarized in Pavement Preservation Synopsis and Bridge Preservation Synopsis.

PAVEMENT PRESERVATION SYNOPSIS

NDOT's Pavement Management System (PMS) is used to maintain and improve the condition of the entire state-maintained roadway network. This network consists of a 5,393 mile inventory that is classified into five separate road prioritization categories. Each road prioritization category consists of pavements that share similar rates of deterioration and require similar timing for maintenance and rehabilitation repair work. The pavement in each road prioritization category is objectively rated and quantified using the Present Serviceability Index (PSI) pavement condition rating system. This rating system is divided into six sections that correspond to pavement in very good, good, fair, mediocre, poor, and very poor or failed condition.

Various maintenance and rehabilitation repair strategies are constructed to improve pavement condition. Maintenance repair strategies include work such as chip seals, filling potholes, and patching. Rehabilitation repair strategies include work such as asphalt overlays and recycling methods. The cost and construction timing for the various repair strategies are significantly different and contingent on the pavement condition at the time of the repair. There is a significant cost saving when pavement is proactively rehabilitated in fair condition as compared to reactively reconstructed in very poor condition. Repair work costs as much as six times more for major reconstruction when pavement is in very poor or failed condition as compared to the less invasive rehabilitation techniques that can be used when pavement is in fair or better condition.

A $270M expenditure was invested for maintenance and rehabilitation repair work in fiscal years 2013 and 2014. This expenditure included $182M investment of federal funds, $85M investment of state funds, and $2M investment of funds from other sources. Over $241M of repair work was contracted out to private contractors and $28M of repair work was performed by NDOT Maintenance personnel. The $241M of contracted repair work restored 392 miles of pavement to acceptable condition levels. Maintenance repair work was accomplished on 274 miles of pavement, and rehabilitation repair work was constructed on 118 miles of pavement.

The PSI pavement condition rating for each road prioritization category was presented. This rating system was used to determine if long-term pavement preservation expenditures were adequate enough to maintain or improve the roadway network to acceptable condition levels. Long-term funding has not been adequate. It is anticipated that the overall average condition of the state-maintained roadway network will deteriorate from fair condition into mediocre condition within the near future.

A pavement condition goal was established to provide a measure of the effectiveness of the maintenance and rehabilitation repair work constructed on state roads. The goal to maintain a minimum of 95% of roads in fair or better condition was approved for each road prioritization category. Only road prioritization categories 1, 2, and 3 currently exceed the established pavement condition goal. The goal was not met for road prioritization categories 4 and 5 roads.

The backlog of pavement rehabilitation work was calculated for the roadway network. The amount of funds necessary to eliminate the total backlog of pavement rehabilitation work was estimated at $661.9M. Included in the $661.9M backlog is 1,280 miles of deficient pavement with estimated costs for repair work that range from $0.5M to $0.6M per mile. The backlog was determined using the established condition goal to maintain a minimum of 95% of roads in fair or better condition. Although the current backlog is lower than previously reported estimates, its significance is not less noteworthy.

An estimate of the adequacy of projected revenues for the timely completion of the resurfacing plan was ascertained. Projected revenues were not adequate and an additional expenditure of $191M is required each year in addition to the long-term average expenditure of $132M per year. Projected revenue of $323M is required each year to maintain the roadway network at 2014 PSI pavement condition levels. The $323M per year expenditure does not include the funds necessary to reduce the $661.9M backlog of pavement rehabilitation work.

The progress in the 12-year plan for resurfacing of state highways was examined and three different budget scenarios were investigated. The investigation included the comparison of the predicted percentage of roads in fair or better condition for years 2015 through 2028 with three different budget scenarios of $132M, $323M, and $378M per year expenditures for pavement preservation repair work.

- The first budget scenario included an average $132M per year expenditure for pavement preservation repair work since this budget is the actual average expenditure for pavement preservation work from 2009 through 2014. The $132M per year budget scenario would result in the average percentage of roads in fair or better condition to deteriorate from 75% to less than 50% of roads in fair or better condition by the year 2028. Moreover, the $661.9M backlog of pavement rehabilitation work would substantially increase over time.
- The second budget scenario consisted of an average $323M per year expenditure for pavement preservation repair work. The $323M per year budget scenario would result in a stagnant pavement condition of 75% of roads in fair or better condition for years 2015 through 2028. Furthermore, the backlog of rehabilitation work would not be reduced or eliminated.
- The third budget scenario contained an average $378M per year expenditure for pavement preservation repair work through the year 2026. The $378M per year budget scenario would incrementally improve the condition of the entire roadway network from 75% to 95% of roads in fair or better condition. Additionally, the backlog of pavement rehabilitation work would be completely eliminated. FIGURE E1 illustrates the comparison of the predicted percentage of roads in fair or better condition with three different funding options including $132M, $323M, and $378M per year expenditures for pavement preservation repair work.

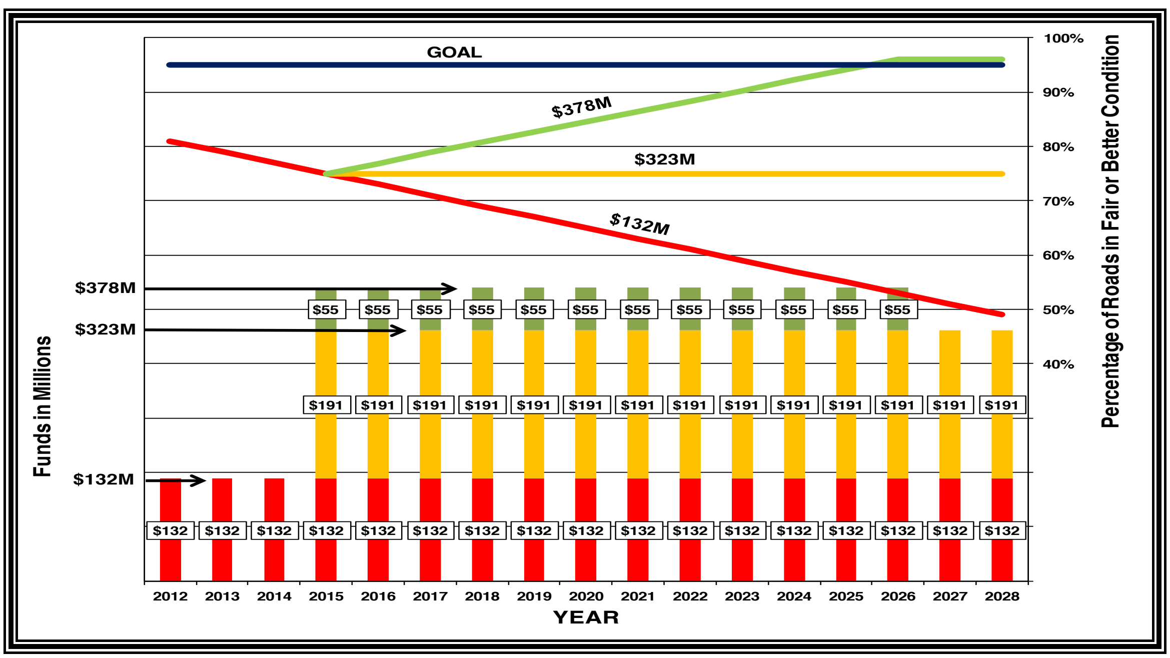


FIGURE E1. Future State-maintained Roadway Network Funding Options

BRIDGE PRESERVATION SYNOPSIS

The Nevada Department of Transportation is responsible for inspecting and reporting the condition of all the bridges open to the public in Nevada, except bridges on federal lands. There are currently 1,952 public bridges in NDOT bridge inventory. NDOT maintains 1,154 bridges; county and city governments maintain 733 bridges; other local agencies maintain 49 bridges; private entities maintain 10 bridges; and other state agencies maintain 6 bridges. The bridge inventory data, together with other factors, allow NDOT to identify preservation priorities and monitor the state's effort to maintain bridges in a structurally sound, functional, and safe condition.

The "Sufficiency Rating" is a numerical rating used to assess the overall condition of a bridge and assists in the prioritization of bridge preservation efforts. Generally, bridges with Sufficiency Ratings more than 80 are considered "good", ratings of between 50 and 80 can be considered "fair", and ratings less than 50 are considered "poor". Of the 1154 bridges maintained by NDOT, only 7 or 0.6% have a Sufficiency Rating less than 50 and are considered to be in poor condition.

Structures with low condition or load ratings may be classified as "Structurally Deficient." Structurally Deficient bridges are not necessarily unsafe or dangerous. Rather, these bridges become a priority for corrective measures, and may be posted to restrict the weight of vehicles using them. If a deficiency is determined to be severe, or the load carrying capacity is extremely low, the bridge would be closed to protect the travelling public. Of the bridges maintained by NDOT, only 15 or 1.3% are considered to be Structurally Deficient.

Currently, Nevada bridge conditions compare very favorably to the bridge conditions in many other states, even though more than half of NDOT's bridges are over 40 years old. However, since older bridges generally have a useful service life of about 50 years, many of NDOT's bridges will require more rehabilitation and replacement in the near future.

When bridges deteriorate and require closure, the resulting detours can be very disruptive to traffic. In both rural and urban bridge closures, the user costs due to travel delays or additional crashes will often be quite significant until the bridge is reconstructed or repaired. User costs due to delay or crashes can be in the hundreds of thousands of dollars per day. The importance of bridge maintenance and rehabilitation cannot be overemphasized.

The Nevada Department of Transportation spent a total of approximately $33 million in fiscal years 2013 and 2014 on bridge preservation. NDOT spending for bridge preservation the previous two years was approximately $22 million total. The increased spending on bridge corrective maintenance, rehabilitation, seismic retrofit, and replacement the last two fiscal years decreased the backlog of bridge work by over $5 million. However, decreases in funding are expected to reduce future bridge preservation funding below the current need of approximately $15 million a year to about $11 million a year.

While the anticipated decrease in bridge preservation funding will increase the backlog of bridge work, a much greater funding deficiency is likely to occur because of the age of NDOT's bridges. Many of NDOT's bridges are approaching the end of their useful life and the need for bridge preservation funds is expected to increase greatly over the next decade. The majority of the increase in bridge preservation funds needed is an increase in the replacement of old bridges.

Since NDOT already has 339 bridges over 50 years old, the current practice of replacing approximately 1 bridge a year is a replacement rate of less than 0.3% of the bridges over 50 years old. A replacement rate of 2% a year necessary to replace the bridges over 50 years old bridges before they reach 100 years old. If a 2% annual replacement rate is reached in ten years and is maintained for another ten years the number of bridges over 50 years old will begin to stabilize. Twenty years from now NDOT would have approximately 580 bridges over 50 years old and would be replacing 12 bridges each year.

NDOT's current backlog of bridge preservation work is approximately $119 million. Under the current funding plan, the $119 million backlog is expected to gradually increase to $338 million in FY 2027. Increased spending in bridge corrective maintenance, rehabilitation, and replacement is necessary to preserve NDOT's bridge assets and to avoid costly bridge closures and emergency bridge replacements.

If bridge preservation spending is increased to match the forecast costs shown in FIGURE E2, the current backlog of bridge work can be maintained. If the funding is gradually increased as shown over the next ten years, the forecast bridge preservation cost is expected to level off at approximately $48 million per year.

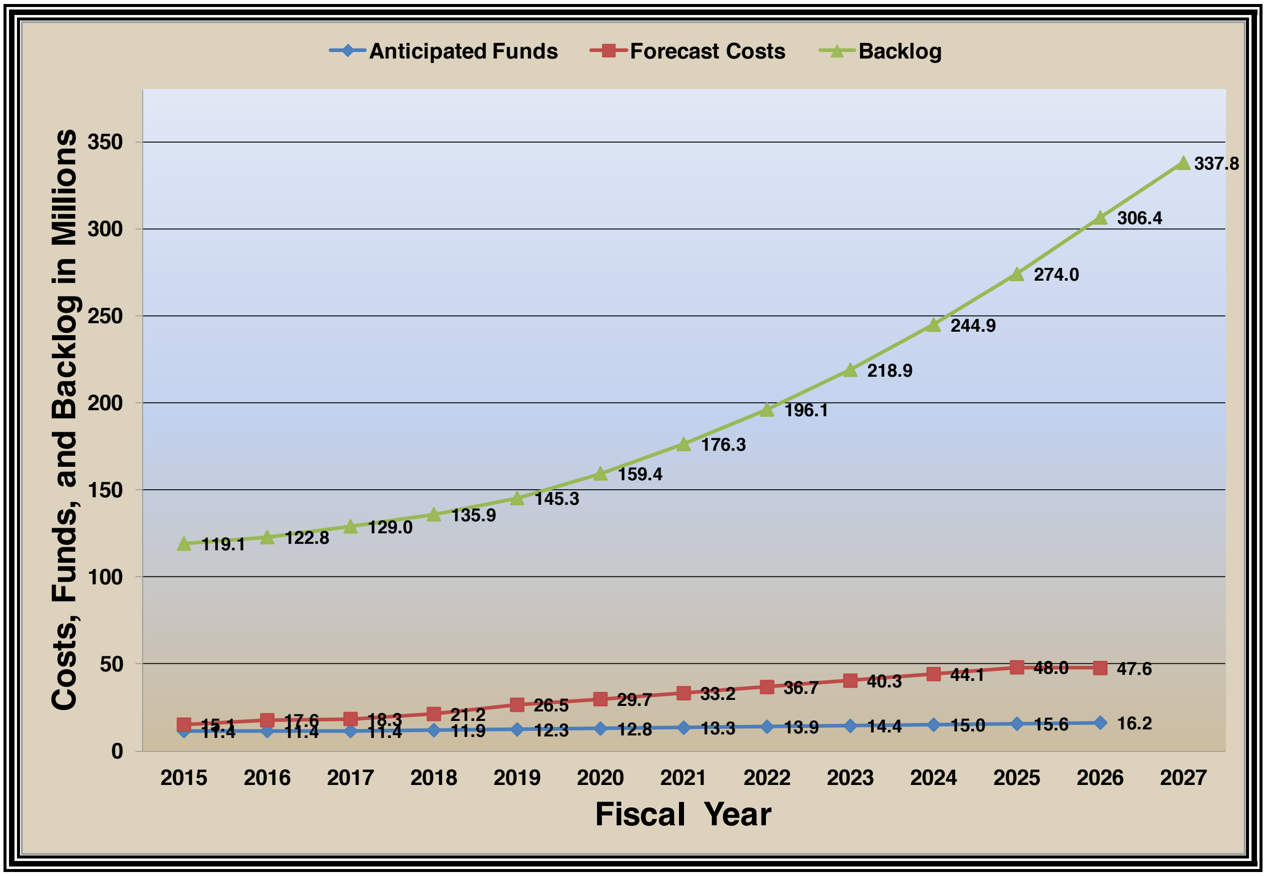


FIGURE E2. Anticipated Costs, Funds and Backlog of Bridge Preservation Work

PAVEMENT PRESERVATION

INTRODUCTION

The Nevada Department of Transportation's (NDOT's) effort to preserve the state-maintained roadway network is summarized in this report. This roadway network consists of only 20% of the roads in Nevada. However, the roadway network is overwhelmingly important and considered to be one of the state's most valuable assets. Approximately 52% of all traffic and 82% of all heavy trucks travel on state-maintained roads. The following discussion will explain how NDOT uses its available pavement preservation funds to maintain and rehabilitate the roadway network for the benefit of all Nevadans.

THE PAVEMENT MANAGEMENT SYSTEM

The Pavement Management System (PMS) includes the entire inventory of the state's existing pavement assets and condition. The primary objective of the PMS is to maintain and improve the condition of the roadway network while maximizing pavement performance through the practical use of available funds. NDOT's management of the pavement inventory allows maintenance and rehabilitation repair work to be prioritized in an objective and systematic manner. The PMS improves the efficiency of decision making, provides assessment on the consequences of decisions through comparative analysis, and ensures consistency of network and project level activities and results.

ROADWAY NETWORK INVENTORY

The state-maintained roadway network consists of 5,393 centerline miles of roads. Centerline miles are miles that indicate the length of the road, regardless of the number of lanes within each mile. In order to effectively manage 5,393 miles of roads, the roadway network is classified into five separate road prioritization categories. These road categories are based on heavy truck equivalent single axle loads (ESALs), average daily traffic (ADT), and federal guidelines for highway classification descriptions. The roads within each category have similar in-place pavement thicknesses, similar rates of deterioration, and similar timing for maintenance and rehabilitation repair work.

TABLE 1 lists the five separate road prioritization categories and corresponding descriptions. Also listed are several examples of easily recognized roads throughout the state to assist with understanding the significance of the descriptions. Additionally, FIGURE 1 is a map that highlights the state-maintained roadway network inventory identified by NDOT's five road prioritization categories.

TABLE 1. NDOT's Road Prioritization Categories

Road Prioritization Category	[1]Description	Examples
1	Controlled Access Roads	IR015, Clark County IR580, Washoe County IR080, Elko County
2	ESAL > 540 or ADT > 10,000	SR146, St. Rose Parkway, Clark County US050, Lincoln Highway, Carson City SR227, Fifth Street, Elko County
3	540 ≥ ESAL > 405 or 1,600 < ADT ≤ 10,000 + NHS	SR157, Kyle Canyon Road, Clark County SR028, Lake Tahoe Area, Douglas County SR225, West Urban Limits of Elko, Elko County
4	405 ≥ ESAL > 270 or 400 < ADT ≤ 1,600	SR158, Deer Creek Road, Clark County SR206, Foothill Road/Genoa Lane, Douglas County SR228, Jiggs Road, Elko County
5	ADT ≤ 400	SR156, Lee Canyon Road, Clark County SR121, Dixie Valley Road, Churchill County SR229, Secret Pass Road, Elko County

[1]ESAL is an acronym for "Equivalent Single Axle Load." This engineering concept is the basis for the method used to quantify the standard loading of trucks and count the heavy trucks that travel on roads.
ADT is an acronym for "Average Daily Traffic." The PMS includes the ADT data, as provided by NDOT's Traffic Division, for every road in the state-maintained roadway network.
NHS is an acronym for the "National Highway System." The NHS consists of roads important to the nation's economy, defense, and mobility as defined by the United States Department of Transportation.

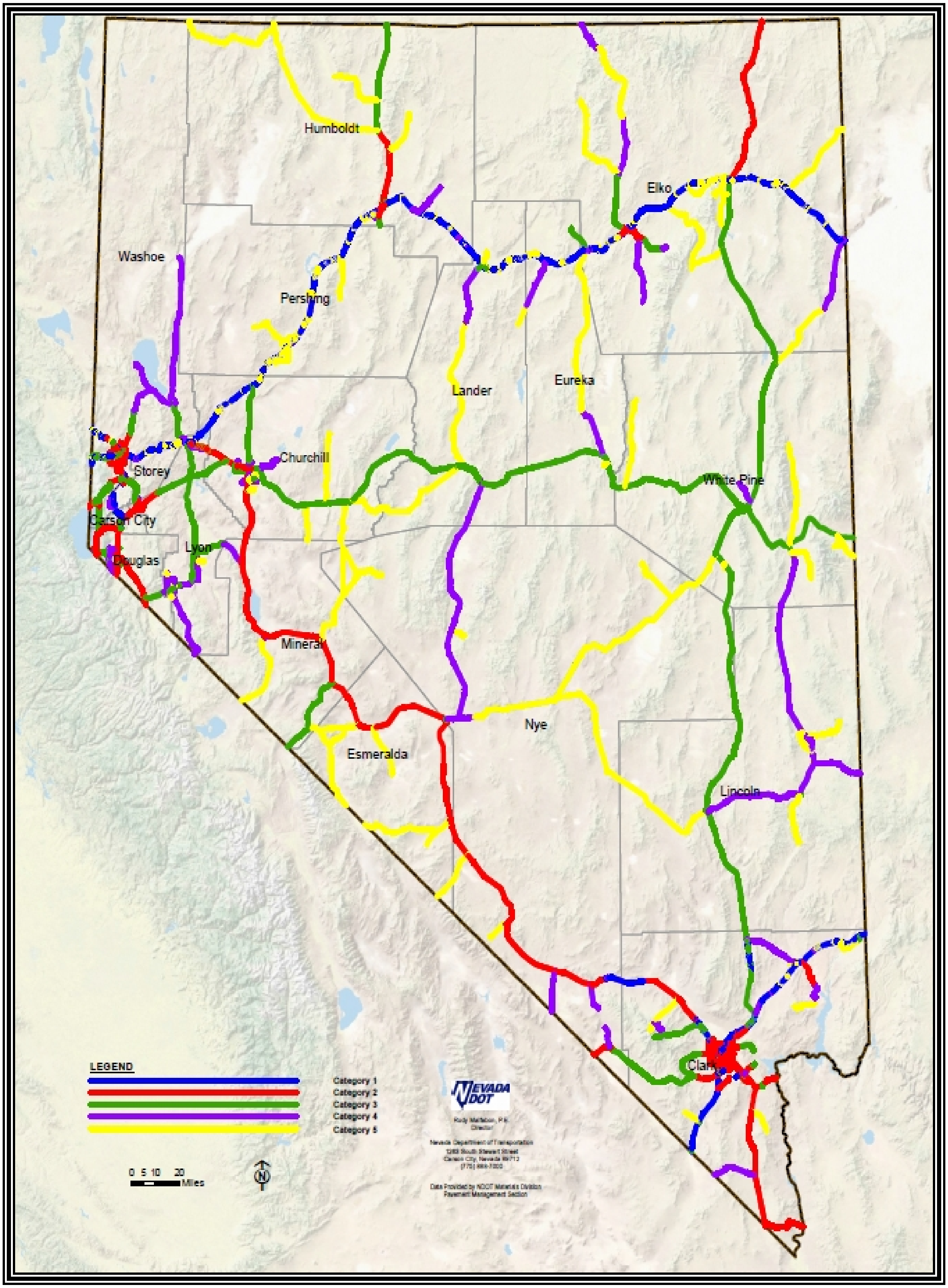


FIGURE 1. Roadway Network Inventory Identified by Road Prioritization Categories

There are numerous methods used to classify roads. The United States Department of Transportation (USDOT) classifies roads for national purposes, and every state department of transportation classifies road inventory using methods that complement each unique PMS. TABLE 2 compares the USDOT's method for classifying roads with NDOT's method for classifying roads as described in TABLE 1. This comparison was developed so that individuals familiar with national classification terminology can correlate the associated NDOT road prioritization categories.

TABLE 2. Comparison of the USDOT and NDOT Road Classification Systems

USDOT's Functional Classification Category	Description	Examples	NDOT's Road Prioritization Category
1	Interstate	Interstates are the highest classification of arterials and were designed and constructed with mobility and long-distance travel in mind.	1
2	Principal Arterial – Other Freeways and Expressways	The roads in this classification have directional travel lanes and are usually separated by some type of physical barrier. Access and egress points are limited to on-ramp and off-ramp locations, or a very limited number of at-grade intersections.	1 and 2
3	Principal Arterial - Other	The roads in this classification serve major centers of metropolitan areas, provide a high degree of mobility, and can also provide mobility through rural areas.	2
4	Minor Arterial	Minor arterials link cities, larger towns, and other traffic generators such as resorts.	3 and 4
5	Major Collector	Major collector roads provide service to any county seat not on an arterial route, to the larger towns not directly served by higher systems, and to traffic generators of equivalent intra-county importance such as shipping points, parks, important mining, agricultural areas, and more.	4 and 5
6	Minor Collector	Minor collectors distribute and channel trips between local roads and arterials, usually over a distance of less than three-quarters of a mile.	*Not Applicable
7	Local	Local roads are not intended for use in long distance travel, except at the origin or destination end of the trip, due to their provision of direct access to abutting land.	*Not Applicable

*Nevada's state-maintained roadway network serves the broad expanse within the state's boundaries. Several USDOT classifications are developed to describe local county and city roads that are limited for use in long distance travel and do not encompass the types of roads for which NDOT is responsible.

PAVEMENT CONDITION RATING SYSTEM

The concept that pavement should provide a smooth, comfortable, and safe ride for travelers requires a pavement condition rating system that includes all attributes important to travelers. These attributes include travelers' responses to motion and appearance as demonstrated by a smooth riding surface that is without cracking, patching, or potholes. A pavement condition rating system has been developed that objectively measures all the attributes that are important to travelers. This rating system is called the Present Serviceability Index (PSI).

The PSI pavement condition rating system is calculated using pavement roughness measurements and mathematical formulas that quantify pavement distresses such as cracking, raveling, rutting, and potholes. These measurements and formulas are combined and standardized into an objective rating scale numbered from zero to five. Pavement rated from four to five is interpreted as pavement in new or very good condition with a smooth surface that is without distress or irregularities. Pavement rated less than two is interpreted as pavement in very poor or failed condition which has the roughest of surface that is no longer navigable at the posted speed limit. The PSI pavement condition rating system is used to quantify the pavement condition for each road within the state-maintained roadway network.

FIGURE 2 demonstrates how the PSI pavement condition rating system is divided into six sections that correspond to pavement in very good, good, fair, mediocre, poor, and very poor or failed condition. Descriptions include pictures of what pavement would typically look like in each condition as well as a discussion of the various stages of disrepair as pavement deteriorates over time.

Pavement Condition	PSI Rating Scale	Description of Pavement Condition
Very Good	5.00 to 4.00	 Pavement in very good condition has an excellent, very smooth ride quality and is without any pavement distress. Pavement is in new condition.
Good	3.99 to 3.50	 Pavement in good condition has a very smooth ride quality and begins to show minor distresses that are typically environmental rather than load related. Distresses include minor non-wheelpath longitudinal and transverse cracks as well as minor surface raveling. Pavement in good condition can especially benefit from preventive maintenance such as crack sealing and surface treatments such as chip, slurry, and scrub seals. Surface treatments reduce pavement deterioration and protect the pavement structure from water infiltration and weathering.

FIGURE 2. PSI Rating System and Corresponding Pavement Condition

Pavement Condition	PSI Rating Scale	Description of Pavement Condition
Fair	**3.49 to 3.00**	 Pavement in fair condition has a good ride quality except noticeable environmental distress has developed. Non-wheelpath longitudinal and transverse cracks are frequent. There is light surface oxidation and weathering. Structural distress in the form of ruts and fatigue cracks begin to occur. Pavement in fair condition is candidate for a surface treatment such as micro-surfacing or double chip seal, and possibly a two inch overlay. An overlay applied on pavement in this condition will prevent the formation of more severe structural distress.
Mediocre	**2.99 to 2.50**	 Pavement in mediocre condition has a barely acceptable ride quality and has accumulated significant environmental and structural distresses. Pavement has non-wheelpath longitudinal cracking and transverse cracks so closely spaced that block cracks develop. Ruts and fatigue cracks are present. Pavement in mediocre condition is candidate for three inch or thicker overlays and may require patching before the new overlay is placed. Pavement structural deterioration is evident.

FIGURE 2. PSI Rating System and Corresponding Pavement Condition (Continued)

Pavement Condition	PSI Rating Scale	Description of Pavement Condition
Poor	2.49 to 2.00	 Pavement in poor condition has a poor ride quality and has accumulated large amounts of environmental and structural related distresses. The non-wheelpath longitudinal and transverse cracks are severe. The surface is weathered, rutted, and fatigue cracks are widespread. Lower volume roads are candidates for thick overlays or cold in-place recycling (CIR) and overlay repair. Higher volume roads will require reconstruction such as a full-depth recycling and overlay repair.
Very Poor or Failed	< 2.00	 Pavement in very poor condition has a very poor ride quality and has accumulated significant environmental and structural distresses. The surface is pitted and there are wide non-wheelpath longitudinal and transverse cracks. Networked, spalled fatigue cracks and deep ruts are prevalent. The deterioration is so advanced potholes are frequent. The road is no longer navigable at the posted speed limit. Pavement in this condition requires constant maintenance activity such as patching and filling potholes. Citizen complaints are common. This pavement always requires full-depth reconstruction and recycling the road may not be an option.

FIGURE 2. PSI Rating System and Corresponding Pavement Condition (Continued)

PAVEMENT MAINTENANCE AND REHABILITATION STRATEGIES

Pavement service life is a function of many parameters. The parameters of most consequence are the smoothness of the road and the amount of heavy truck loads that the pavement is expected to experience. New pavement has excellent characteristics such as a very smooth ride without any surface distress or defects. Limited funds are needed for pavement in new condition. However, the smooth ride will gradually become rough due to cracks, distress, or other types of defects as the pavement deteriorates. Therefore, it becomes necessary to spend an increasing amount of funds in order to maintain or rehabilitate the pavement to an acceptable condition level as the pavement deteriorates over time. The types and extents of distress or defects, along with the severity of the pavement roughness, determine what types of repair strategies are required for maintenance and rehabilitation repair work.

Pavement preservation repair strategies are designated as either maintenance or rehabilitation. Maintenance repair strategies are applied early in the pavement service life when the ride quality is in good condition, or applied when the pavement needs protection. Maintenance repair strategies do not improve the load bearing capacity of the pavement. Examples of maintenance repair strategies include fog seals, crack sealing, chip seals, slurry seals, filling potholes, and patching. Rehabilitation repair strategies are constructed when the pavement is in fair or worse condition to prevent further deterioration, and to improve the load bearing capacity of the pavement. Examples of rehabilitation repair strategies include plantmix overlays, cold in-place recycling with plantmix overlay, and full depth recycling with plantmix overlay. The effective scheduling and budgeting for pavement preservation repair strategies are important components of a successful PMS.

FIGURE 3 exhibits the construction timing for maintenance and rehabilitation repair strategies based on the PSI pavement condition rating system. Maintenance repair strategies are typically applied when a pavement has a PSI rating of 3.50 or more. Rehabilitation repair strategies are commonly constructed when a pavement has a PSI rating of 3.49 or less. The construction timing for maintenance and rehabilitation repair strategies changes for each road prioritization category.

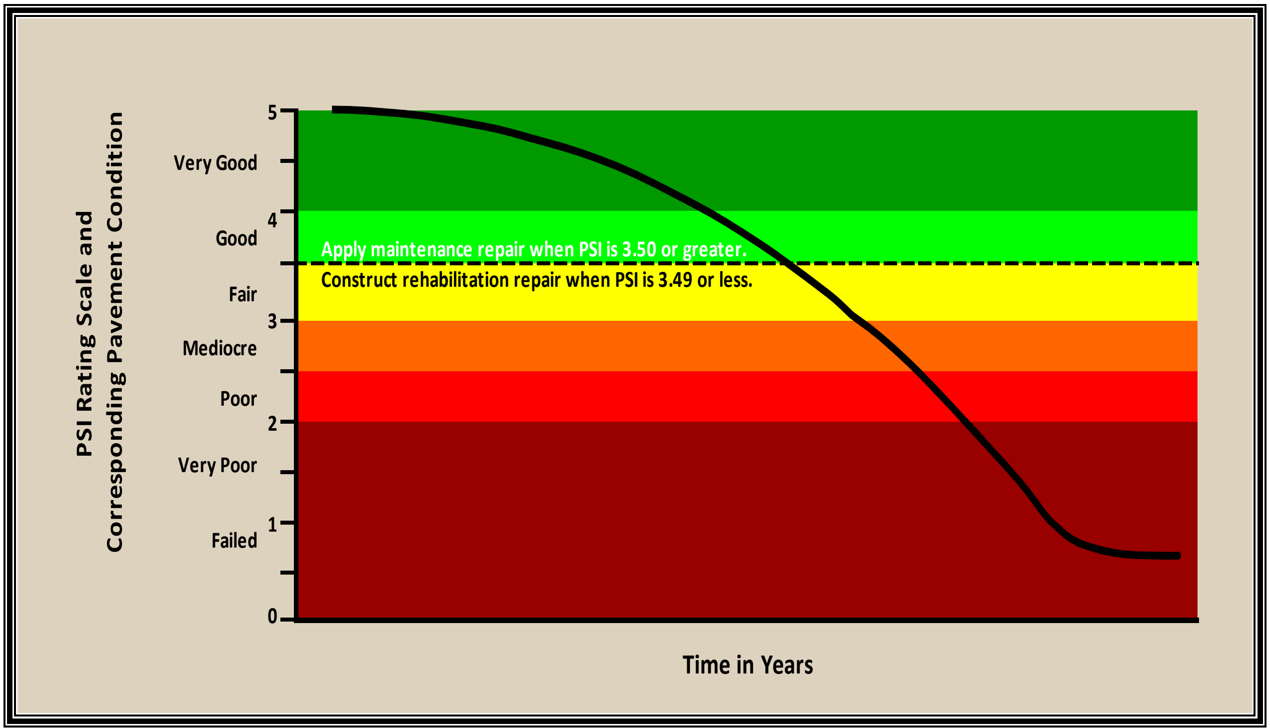


FIGURE 3. Timing for Repair Strategies Based on PSI Rating System

The funds needed for the repair work required to improve roads to acceptable condition levels when pavement is in poor or worse condition are far greater than the funds needed for the repair work when pavement is in fair or better condition. FIGURE 4 shows the timing for the cost saving between proactive pavement rehabilitation and reactive major reconstruction based on the PSI pavement condition rating system. Project expenditures will significantly increase when pavement is allowed to deteriorate from fair condition into very poor or failed condition. Repair work costs as much as six times more for major reconstruction when pavement is in very poor or failed condition as compared to the less invasive rehabilitation techniques that can be used when pavement is in fair or better condition.

NDOT proactively investigates opportunities to use resources wisely by repairing pavement in fair condition before the pavement deteriorates into worse, and thus more costly to repair condition. This philosophy of proactively constructing rehabilitation repair strategies lowers pavement life-cycle costs and better serves the taxpaying public.

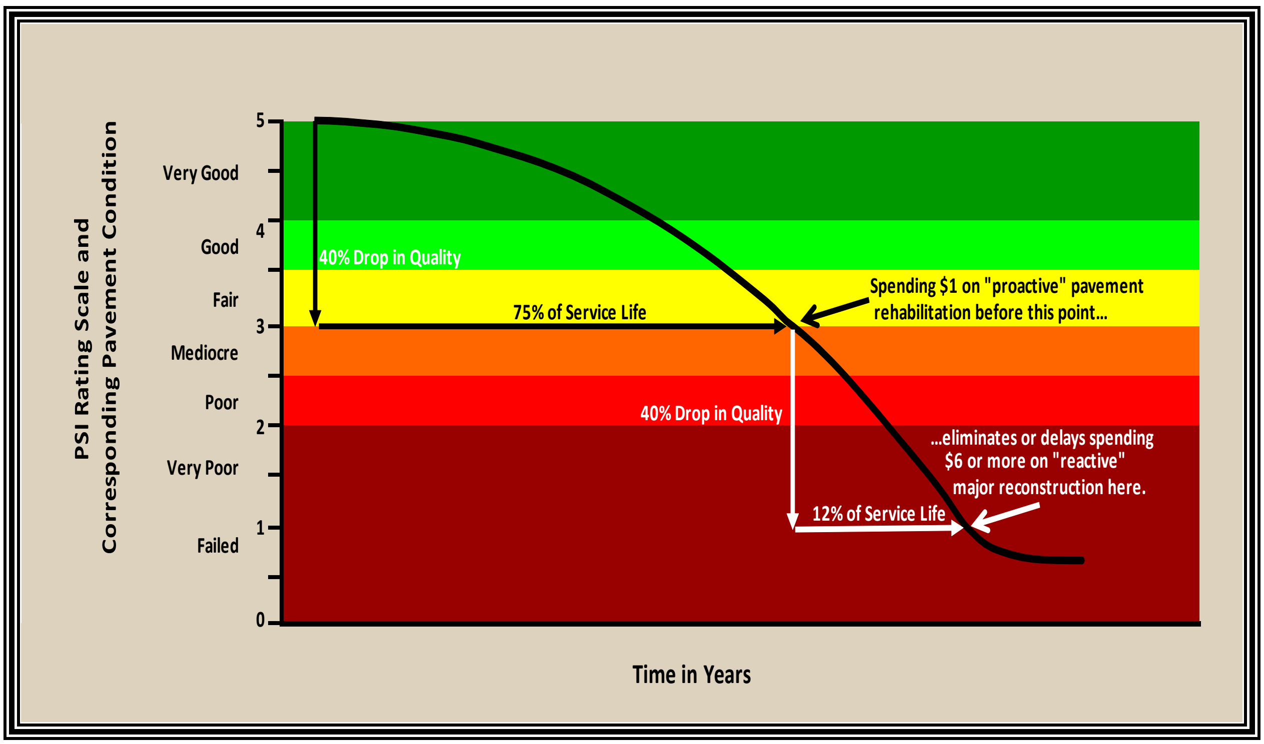


FIGURE 4. Timing for Proactive and Reactive Pavement Rehabilitation Expenditures

REVENUE AND EXPENDITURE

The pavement maintenance and rehabilitation repair work that is performed on the state-maintained roadway network is primarily funded by the federal government and State of Nevada highway-user revenue. This federal and state revenue generally consists of vehicle fuel tax and registration fees.

The vehicle fuel tax collected by the federal government is funneled into the Federal Highway Trust Fund. Thereafter, the tax is reallocated back to the states according to the provisions in the Moving Ahead for Progress in the 21st Century Act (MAP-21) and various other appropriation bills. Motor vehicle license and registration fees along with excise taxes that the state collects are deposited into the State Highway Fund. Revenue from the State Highway Fund is allocated to NDOT and used for the maintenance and rehabilitation repair work on state roads.

There were approximately $270,187,268 invested for maintenance and rehabilitation repair work on the state-maintained roadway network during fiscal years 2013 and 2014. This expenditure included an $182,377,714 investment of federal funds, an $85,640,422 investment of state funds, and a $2,169,132 investment of funds from other sources. Other funding sources include support by local city and public works agencies as well as private utility and telecommunication enterprise with vested interest in localized areas.

There were $241,507,268 of road repair work contracted out to private contractors and $28,680,000 of road repair work performed by NDOT Maintenance personnel. Maintenance preservation repair work was accomplished by both private road contractors and NDOT personnel. The rehabilitation repair work was solely accomplished by private road contractors. FIGURE 5 displays the funding sources and construction expenditures information that includes both maintenance and rehabilitation repair work for fiscal years 2013 and 2014.

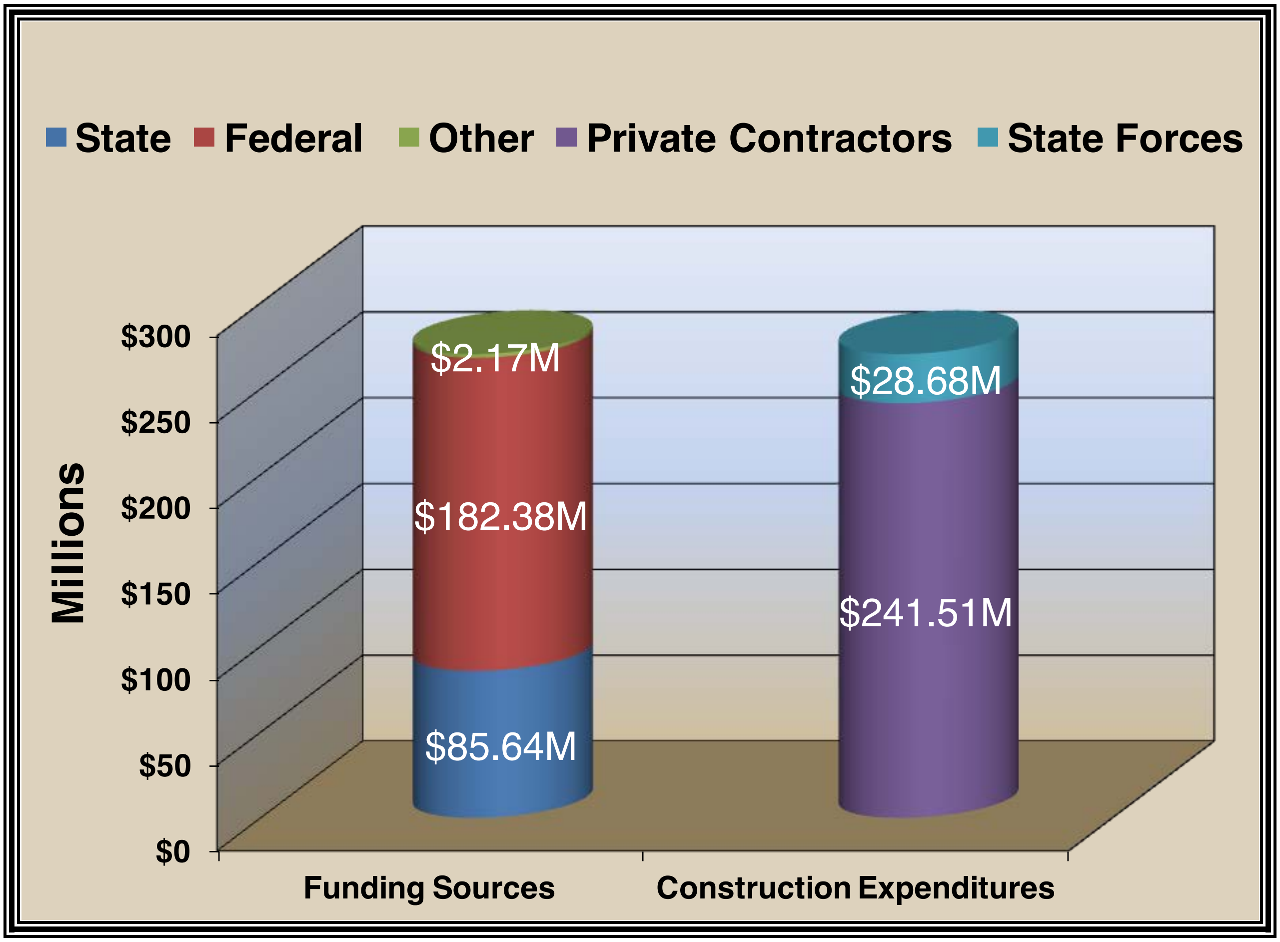


FIGURE 5. Funding Sources and Construction Expenditures

NDOT advertised $241,507,268 of contract maintenance and rehabilitation pavement repair work during fiscal years 2013 and 2014. This obligated expenditure improved 392 miles of roads to acceptable condition levels. TABLE 3 contains a financial summary of the advertised maintenance and rehabilitation repair work that was accomplished on the state-maintained roadway network during fiscal years 2013 and 2014, along with the corresponding mileage that was improved.

TABLES 4 and 5 are lists of the specific rehabilitation projects that were advertised during fiscal years 2013 and 2014. Maps were created to show the statewide locations where the rehabilitation projects were constructed. FIGURE 6 features the locations where fiscal year 2013 rehabilitation projects were built. FIGURE 7 highlights the locations where fiscal year 2014 rehabilitation projects were completed.

TABLE 3. Advertised Pavement Repair Work for Fiscal Years 2013 and 2014

Fiscal Year	Contract Maintenance Repair Work Expenditure and Mileage	Contract Rehabilitation Repair Work Expenditure and Mileage	Total Contract Maintenance and Rehabilitation Repair Work Expenditure and Mileage
2013	$17,386,000	$123,657,522	$141,043,522
	64 Miles	64 Miles	128 Miles
2014	$19,496,131	$80,967,615	$100,463,746
	210 Miles	54 Miles	264 Miles
Biennium Total	$36,882,131	$204,625,137	$241,507,268
	274 Miles	118 Miles	392 Miles

TABLE 4. List of Rehabilitation Projects Advertised in Fiscal Year 2013

FISCAL YEAR 2013					
Contract Number	**County**	**Mileposts**	**Length in Miles**	**Road Category**	**Cost**
3524	Humboldt	0.11 - 12.01	11.90	1	$27,802,509
LOCATION: I-80 FROM THE BEGINNING OF PCCP, 0.112 MILES EAST OF THE PE/HU COUNTY LINE, TO 0.345 MILES EAST OF THE TRAILING EDGE OF H-1256 AT THE W STRIP GRADE SEPARATION.					
SCOPE: RUBBLIZE, 1.5" STRESS RELIEF COURSE, 5" PLANTMIX BITUMINOUS SURFACE, WITH 0.75" OPEN-GRADED COURSE.					
3525	Eureka	2.79 - 15.73	12.94	1	$10,876,167
LOCATION: I-80 FROM 0.771 MILES EAST OF THE TRAILING EDGE OF I-883 TO THE BEGINNING OF ASPHALT, 0.846 MILES WEST OF EMIGRANT PASS INTERCHANGE.					
SCOPE: DOWEL BAR RETROFIT, PROFILE GRIND, SAW AND SEAL JOINTS.					
3533	Eureka Elko	15.74 - 25.70 0.00 - 1.09	11.06	1	$16,124,879
LOCATION: I-80 FROM BEGINNING OF ASPHALT PAVEMENT, 0.846 MILES WEST OF EMIGRANT PASS INTERCHANGE TO 1.097 MILES EAST OF THE EU/EL COUNTY LINE.					
SCOPE: 2" MILL, 1" PLANTMIX BITUMINOUS SURFACE (TYPE 3), 3" PLANTMIX BITUMINOUS SURFACE (TYPE 2C) WITH 0.75" OPEN-GRADED COURSE; PAVED CROSSOVER; CHAIN UP AREAS; AND WORK AT BEOWAWE INTERCHANGE.					
3540	Elko	7.50 – 9.33	1.83	1	$29,756,999
LOCATION: I-80 AT THE CARLIN TUNNELS					
SCOPE: REPAIR TUNNEL, RENOVATE DRAINAGE SYSTEM AND IMPROVE LIGHTING; PERFORM WORK ON STRUCTURES B-1066 E/W, B-1111 E/W, B-1112 E/W, B-1113 E/W; REPAIR PCCP WITH NEW ASPHALT SURFACE FROM MP EL 7.50 TO EL 9.33 (PACKAGE 2).					
3546	Clark	69.91 - 95.49	26.02	1, 4, and 5	$39,096,968
LOCATION: I-15 FROM 0.103 MILES NORTH OF DRY LAKE ROAD TO 1.602 MILES NORTH OF LOGANDALE/OVERTON INTERCHANGE; FRCL10 ON THE WEST SIDE OF HIDDEN VALLEY INTERCHANGE FROM THE WEST CATTLEGUARD THEN 0.081 MILES WEST (0.081 MILES CAT 5 ROAD); FRCL11 AT THE MOAPA VALLEY INTERCHANGE WEST OF I-15 FROM 0.460 MILES SOUTH OF SR168 (0.186 MILES CAT 5 ROAD); FRCL17 AT THE I-15 CRYSTAL INTERCHANGE TO 0.338 MILES WEST (0.171 MILES CAT 4 ROAD).					
SCOPE: I-15: 3" MILL, 3" PLANTMIX BITUMINOUS SURFACE, WITH 0.75" OPEN-GRADED COURSE AND CONSTRUCT 2.5 MILE TRUCK CLIMBING LANE NORTHBOUND; FRCL10: 2" MILL, 2" PLANTMIX BITUMINOUS SURFACE, WITH SEAL COAT; FRCL11: 3" MILL, 3" PLANTMIX BITUMINOUS SURFACE, WITH SEAL COAT; FRCL17: 2.75" MILL, 2" PLANTMIX BITUMINOUS SURFACE, WITH 0.75" OPEN-GRADED COURSE; CONSTRUCT TRIPLE 5'x12'x54' RCB.					

TABLE 5. List of Rehabilitation Projects Advertised in Fiscal Year 2014

<table>
<tr><th colspan="6">FISCAL YEAR 2014</th></tr>
<tr><th>Contract Number</th><th>County</th><th>Mileposts</th><th>Length in Miles</th><th>Road Category</th><th>Cost</th></tr>
<tr><td>3550</td><td>Elko</td><td>0.00 - 6.73
21.88 - 25.47
27.33 - 29.74</td><td>12.73</td><td>2</td><td>$22,059,179</td></tr>
<tr><td colspan="6">LOCATION: SR227 FROM IDAHO STREET TO 0.15 MILES SOUTH OF JIGGS RD MP 00.000-6.730; SR535 FROM THE SOUTH CATTLEGUARD AT THE WEST ELKO INTERCHANGE TO 5TH SREET MP 21.880-25.470; SR225 FROM IDAHO STREET TO CATTLE DRIVE MP 27.330-29.740.</td></tr>
<tr><td colspan="6">SCOPE: 2" MILL, 2" PLANTMIX BITUMINOUS SURFACE WITH OPEN-GRADED COURSE AND 3-3/4" MILL, 1" STRESS RELIEF COURSE, 2" PLANTMIX BITUMINOUS SURFACE WITH OPEN-GRADED COURSE; LANDSCAPING DESIGN AND REPAIRING BRIDGE STRUCTURES I-904 AND G-1414.</td></tr>
<tr><td>3558</td><td>Washoe</td><td>8.17 - 17.88 (Cat 3)
17.88 - 23.05 (Cat 2)
23.05 - 24.41 (Cat 3)</td><td>16.24</td><td>2 and 3</td><td>$11,587,287</td></tr>
<tr><td colspan="6">LOCATION: SR431 MT ROSE HWY FROM 0.11 MILES EAST OF THE MT ROSE SUMMIT TO US395.</td></tr>
<tr><td colspan="6">SCOPE: 2-1/2" MILL, 2-1/2" PLANTMIX BITUMINOUS SURFACE WITH OPEN-GRADED COURSE.</td></tr>
<tr><td>3559</td><td>Humboldt</td><td>29.28 - 42.44</td><td>13.68</td><td>1, 4, and 5</td><td>$11,392,156</td></tr>
<tr><td colspan="6">LOCATION: I-80 FROM 1.474 MILES WEST OF THE GOLCONDA INTERCHANGE FROM THE CROSSOVER TO 0.967 MILES EAST OF THE PUMPERNICKEL VALLEY INTERCHANGE AND THE I-754 BRIDGE ON FRHU05 OVER I-80 (13.16 MILES CAT 1 RD);
FRHU13, SOUTH SIDE IRON POINT INTERCHANGE TO CATTLEGUARD (0.045 MILES CAT 5 RD);
FRHU24, NORTH SIDE IRON POINT INTERCHANGE TO FRHU23 (0.106 MILES CAT 5 RD);
FRHU25, SOUTH SIDE PUMPERNICKEL INTERCHANGE TO CATTLEGUARD (0.070 MILES CAT 5 RD);
FRHU26, NORTH SIDE PUMPERNICKEL INTERCHANGE TO CATTLEGUARD (0.067 MILES CAT 5RD);
FRHU05, SOUTH CATTLEGUARD TO SR789 (0.237 MILES CAT 4 RD).</td></tr>
<tr><td colspan="6">SCOPE: I 80: 2” MILL, 2” PLANTMIX BITUMINOUS SURFACE WITH 0.75” OPEN-GRADED COURSE AND I-754 BRIDGE REFURBISHMENT WORK; FRHU13, FRHU24, FRHU25, FRHU26: 2-1/2”MILL, 2-1/2” PLANTMIX BITUMINOUS SURFACE WITH 0.75" OPEN-GRADED COURSE; FRHU05: 3-3/4” MILL, 3” PLANTMIX BITUMINOUS SURFACE WITH 0.75” OPEN-GRADED COURSE.</td></tr>
<tr><td>3561</td><td>Carson City
Lyon</td><td>14.64 - 16.39
0.00 - 2.54</td><td>4.29</td><td>2</td><td>$7,018,885</td></tr>
<tr><td colspan="6">LOCATION: US50 FROM 0.343 MILES EAST OF DEER RUN RD TO THE CC/LY COUNTY LINE;
US50 FROM THE CC/LY COUNTY LINE TO 0.499 MILES EAST OF THE JUNCTION WITH SR341.</td></tr>
<tr><td colspan="6">SCOPE: 2-3/4" MILL, 2" PLANTMIX BITUMINOUS SURFACE WITH 0.75" OPEN-GRADED COURSE;
4" MILL, 4" PLANTMIX BITUMINOUS SURFACE IN LANE #2 EASTBOUND AND WESTBOUND.</td></tr>
<tr><td>3564</td><td>Douglas</td><td>0.00 - 3.86</td><td>3.86</td><td>3</td><td>$15,621,500</td></tr>
<tr><td colspan="6">LOCATION: SR207, KINGSBURY GRADE, FROM THE JUNCTION WITH US50 TO 3.866 MILES EAST OF US50.</td></tr>
<tr><td colspan="6">SCOPE: PULVERIZE 13" DEPTH, 8" ROADBED MODIFICATION, 5" PLANTMIX BITUMINOUS SURFACE; CONSTRUCT STORMWATER IMPROVEMENTS, SEDIMENT WORK, AND STABILIZE SLOPES.</td></tr>
<tr><td>3574</td><td>Washoe</td><td>22.58 - 25.34</td><td>2.76</td><td>1</td><td>$13,288,608</td></tr>
<tr><td colspan="6">LOCATION: I580 MOANA LANE TO THE TRUCKEE RIVER GRADE SEPARATION;
I580 AT AIRPORT RAMPS IN WASHOE COUNTY AT MILEPOSTS 23.36 AND 23.57.</td></tr>
<tr><td colspan="6">SCOPE: CRACK SEALING, SPALL REPAIR, AND DIAMOND GRINDING; RECONSTRUCT SOUTHBOUND FROM MOANA LANE TO THE TRUCKEE RIVER GRADE SEPARATION; SEISMIC RETROFIT AND REHABILITATION OF STRUCTURES I-1773 (MP 23.57) and I-1774 (MP 23.36).</td></tr>
</table>

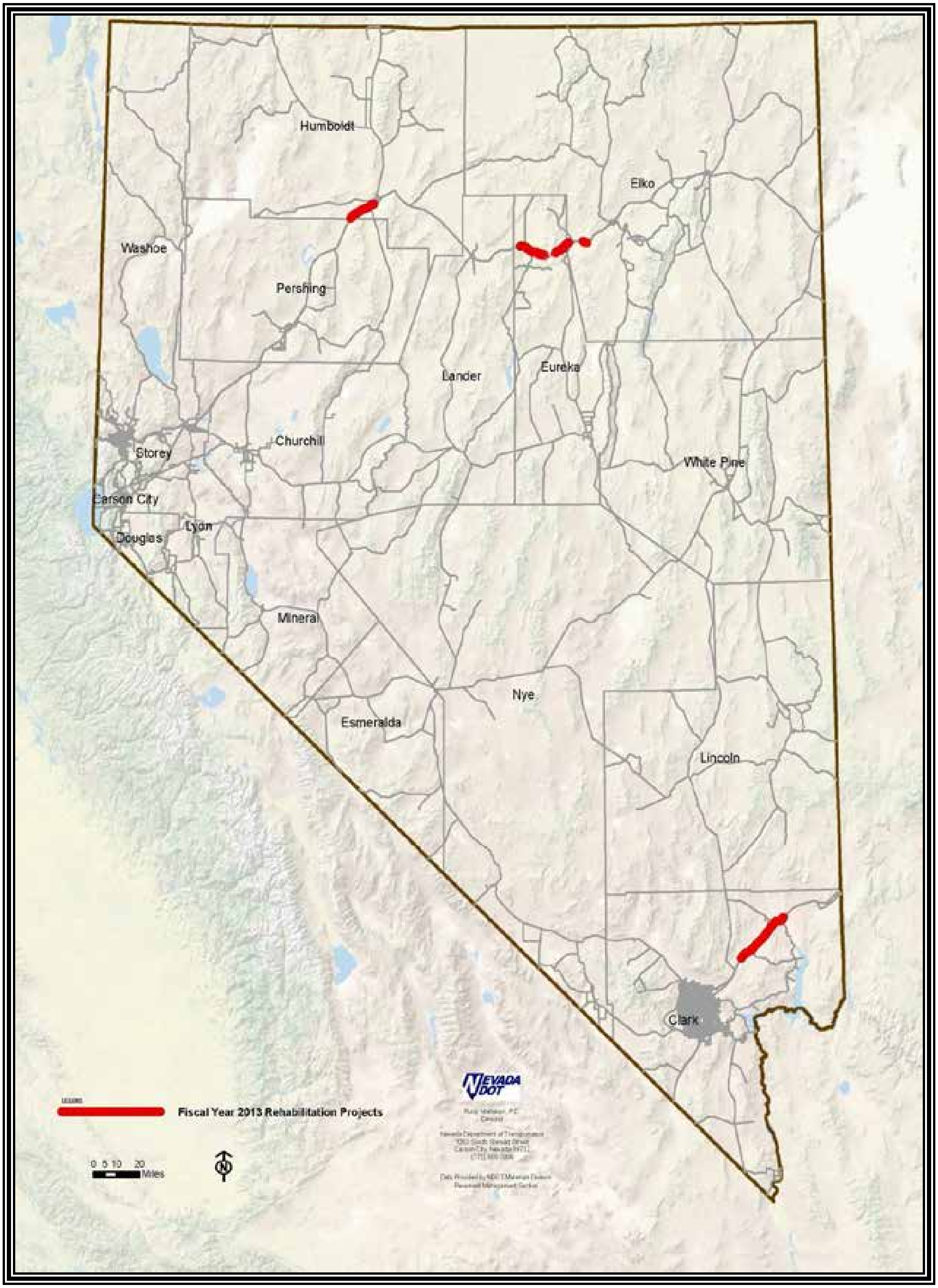


FIGURE 6. Fiscal Year 2013 Project Locations

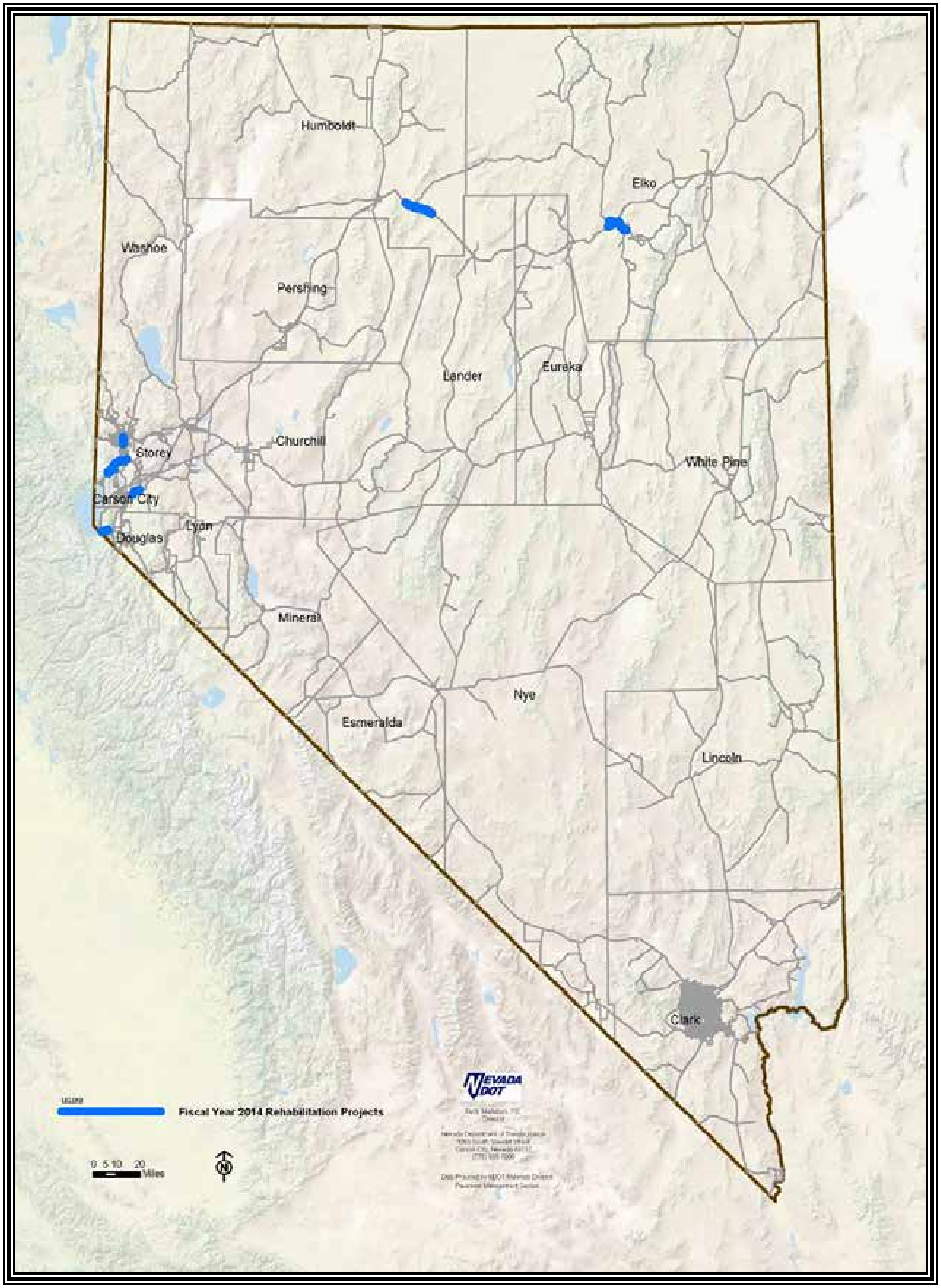


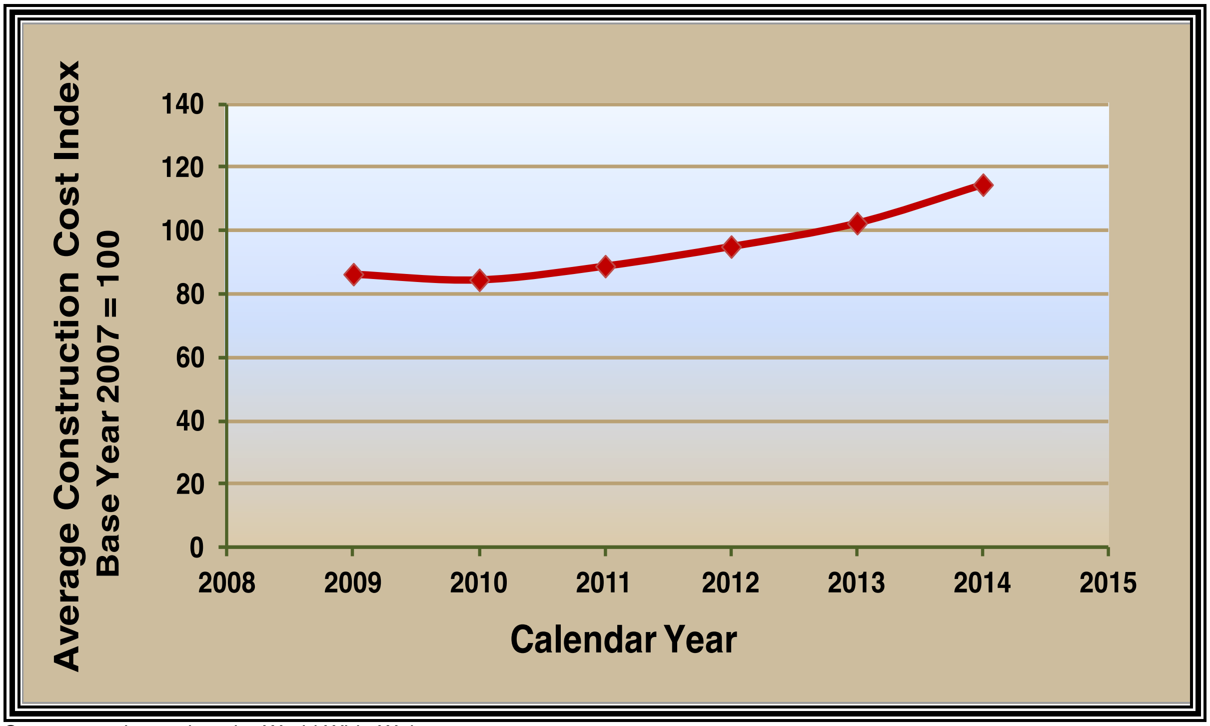
FIGURE 7. Fiscal Year 2014 Project Locations

COSTS OF CONSTRUCTION

The costs for maintenance and rehabilitation repair work on highways fluctuate from year to year. The periodic year to year fluctuations are typically due to price spikes in the costs of steel and energy. However, the costs for maintenance and rehabilitation repair work on highways always trend in the upward direction over the long-term.

NDOT recognizes that these periodic cost fluctuations complicate the project planning process and cause uncertainty in the highway construction industry. NDOT tries to mitigate this uncertainty by sharing the risk with contractors through fuel and asphalt escalation clauses in project contracts. However, sharing the risk of cost fluctuations does not eliminate the overall long-term increase in construction costs as reported by the Associated General Contractors of America (AGCA), the American Road and Transportation Builders Association, the Federal Highway Administration, and other data sources.

The Construction Cost Index (CCI) is defined as the measure of the price of labor, material, equipment, transport, and other costs associated with highway construction. Several western state construction cost indices were reviewed for years 2009 through early 2014. The data included an average of the California DOT (Caltrans), Colorado DOT (CDOT), and Utah DOT (UDOT) indices. The data shows a slight decline in the average CCI between 2009 and 2010, and this decline is indicative of a short-term price fluctuation. However, the data also exhibits a steady increase in the average CCI from 2010 through the first quarter of 2014. It is expected that this trend will continue into the future based on the current economic climate. FIGURE 8 indicates the average CCI data from Caltrans, CDOT, and UDOT for years 2009 through the first quarter of 2014.



Sources are located on the World Wide Web:
1) http://www.dot.ca.gov/hq/esc/oe/hist_price_index.html
2) http://www.udot.utah.gov/main/uconowner. gf?n=10172725194241610 and
3) http://www.coloradodot.info/business/eema/construction-cost-index

FIGURE 8. Average of Construction Cost Indices from Caltrans, CDOT, and UDOT

NDOT depends primarily on the revenue from fuel tax to fund road construction projects. Since much of this tax is not indexed to inflation, the purchasing power of the revenue for road construction is only about forty percent of what it was in 1992. The preservation of the state-maintained roadway network at acceptable condition levels becomes more challenging year after year. This challenge is due to the continuous increase in costs for road construction along with the consequences from neglecting the long-term effects of inflation.

PAVEMENT CONDITION

A safe, efficient, and reliable roadway network is a matter of regional importance and promotes the general welfare of all people that live, work, and play in the state. Nevada's pavement has ranked in the top one-half in the nation for the last several years as compared with the overall highway performance and efficiency of other states' roadway networks as reported in the *Annual Highway Report* by the *Reason Foundation*. NDOT uses the PSI pavement condition rating system to evaluate and report the condition of the roadway network. The PSI pavement condition rating system was previously discussed and graphically shown in FIGURE 2. TABLE 6 presents the PSI condition data for each road prioritization category on the state-maintained roadway network. FIGURE 9 is a map of the state's roadway network inventory identified by the PSI rating system. FIGURES 10 through 14 are maps of road prioritization categories 1 through 5 identified by the PSI rating system.

TABLE 6. *PSI Pavement Condition by Road Prioritization Category

Condition	PSI Rating Scale	PSI Condition by Road Prioritization Category Percentage (%) and Miles					
		Road Category 1	Road Category 2	Road Category 3	Road Category 4	Road Category 5	Roadway Network Totals
Very Good	5.00 to 4.00	43.5% 219	40.4% 374	22.8% 273	3.7% 32	0.4% 7	**17.7%** **905**
Good	3.99 to 3.50	50.8% 256	39.4% 365	54.8% 657	28.0% 240	7.1% 117	**31.9%** **1,635**
Fair	3.49 to 3.00	5.0% 25	15.9% 147	18.0% 216	37.7% 323	22.6% 371	**21.1%** **1,082**
Mediocre	2.99 to 2.50	0.6% 3	3.0% 28	3.2% 38	21.2% 182	32.7% 535	**15.3%** **786**
Poor	2.49 to 2.00	0.1% 0.55	0.9% 8	0.8% 10	7.2% 62	24.8% 406	**9.5%** **487**
Very Poor	< 2.00	0.0% 0	0.4% 4	0.3% 4	2.1% 18	12.3% 202	**4.5%** **228**
	Total Miles	**504**	**926**	**1,198**	**857**	**1,638**	**5,123**

* 1) Data as reported in the 2012 PMS Data Warehouse.
2) The reported total of 5,123 miles includes hotmix asphalt pavement and excludes Portland Cement Concrete Pavement (PCCP). PCCP is not included because of its unique service life requirements and distress characteristics that vary significantly from hotmix asphalt pavement. Each PCCP pavement segment is reviewed separately. The total state-maintained roadway network mileage of 5,393 miles mentioned in the *Roadway Network Inventory* section of the report is the official mileage count that includes PCCP roads.

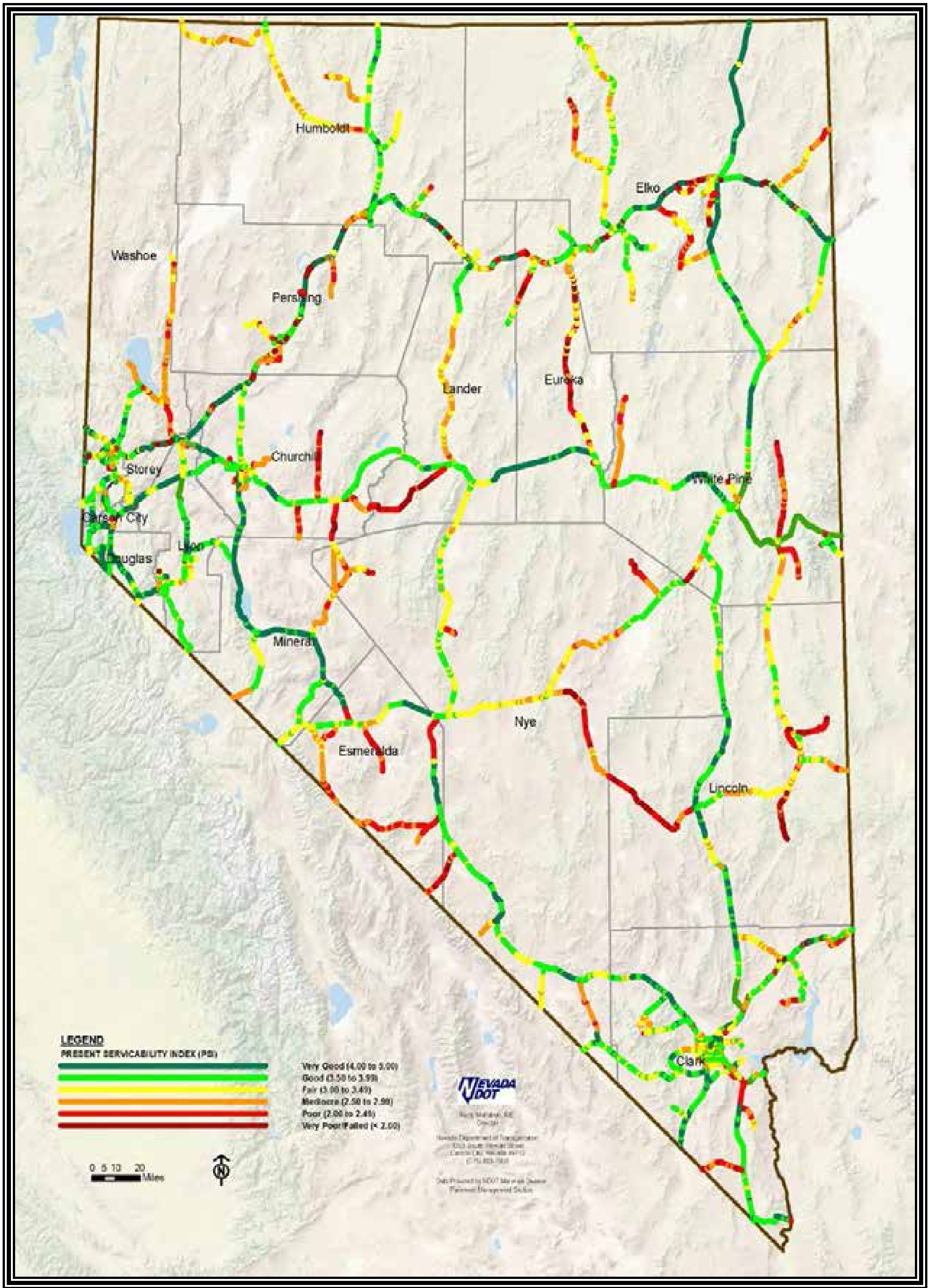


FIGURE 9. Roadway Network Inventory Identified by Present Serviceability Index (PSI)

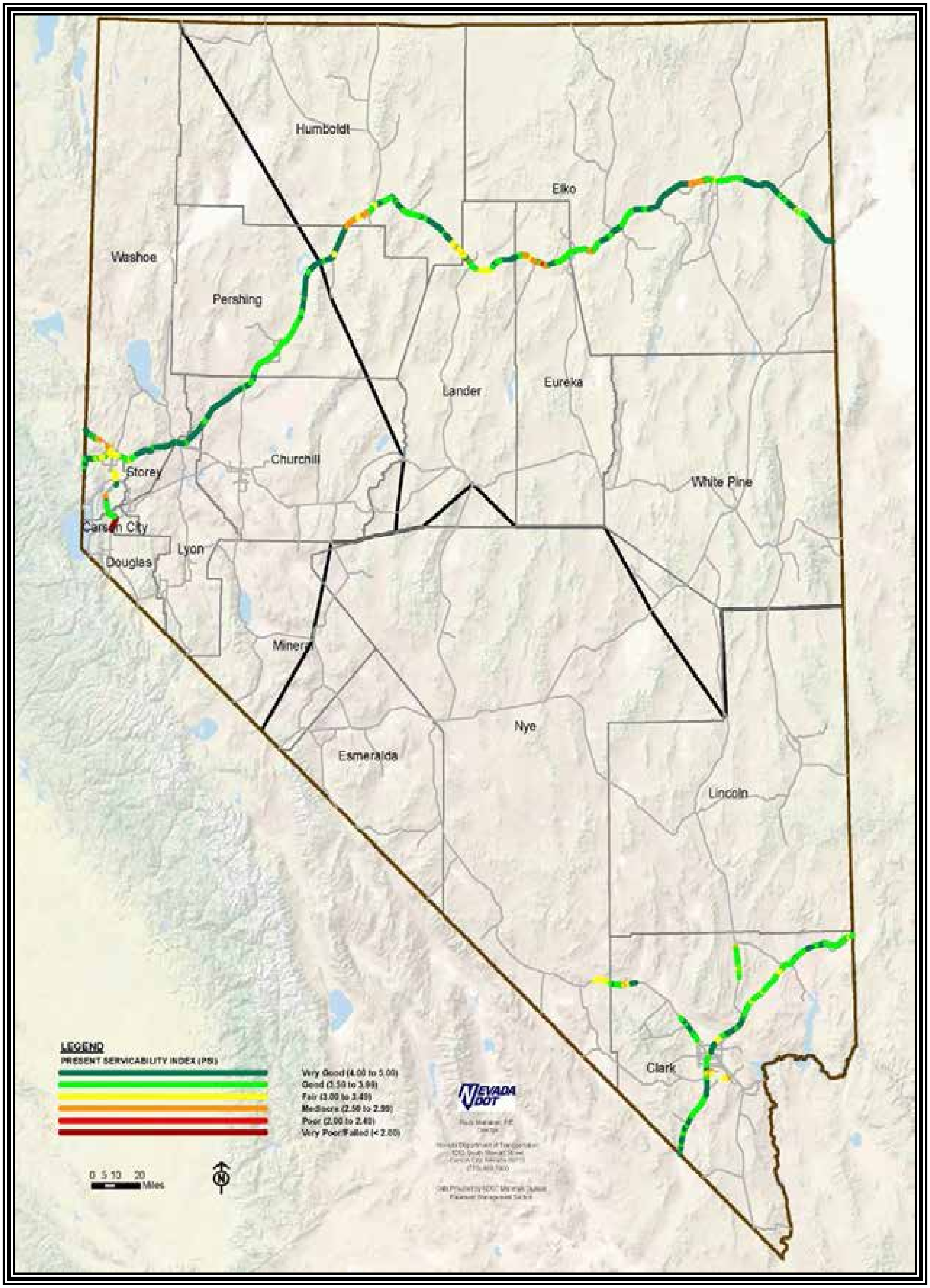


FIGURE 10. Road Prioritization Category 1 Identified by Present Serviceability Index (PSI)

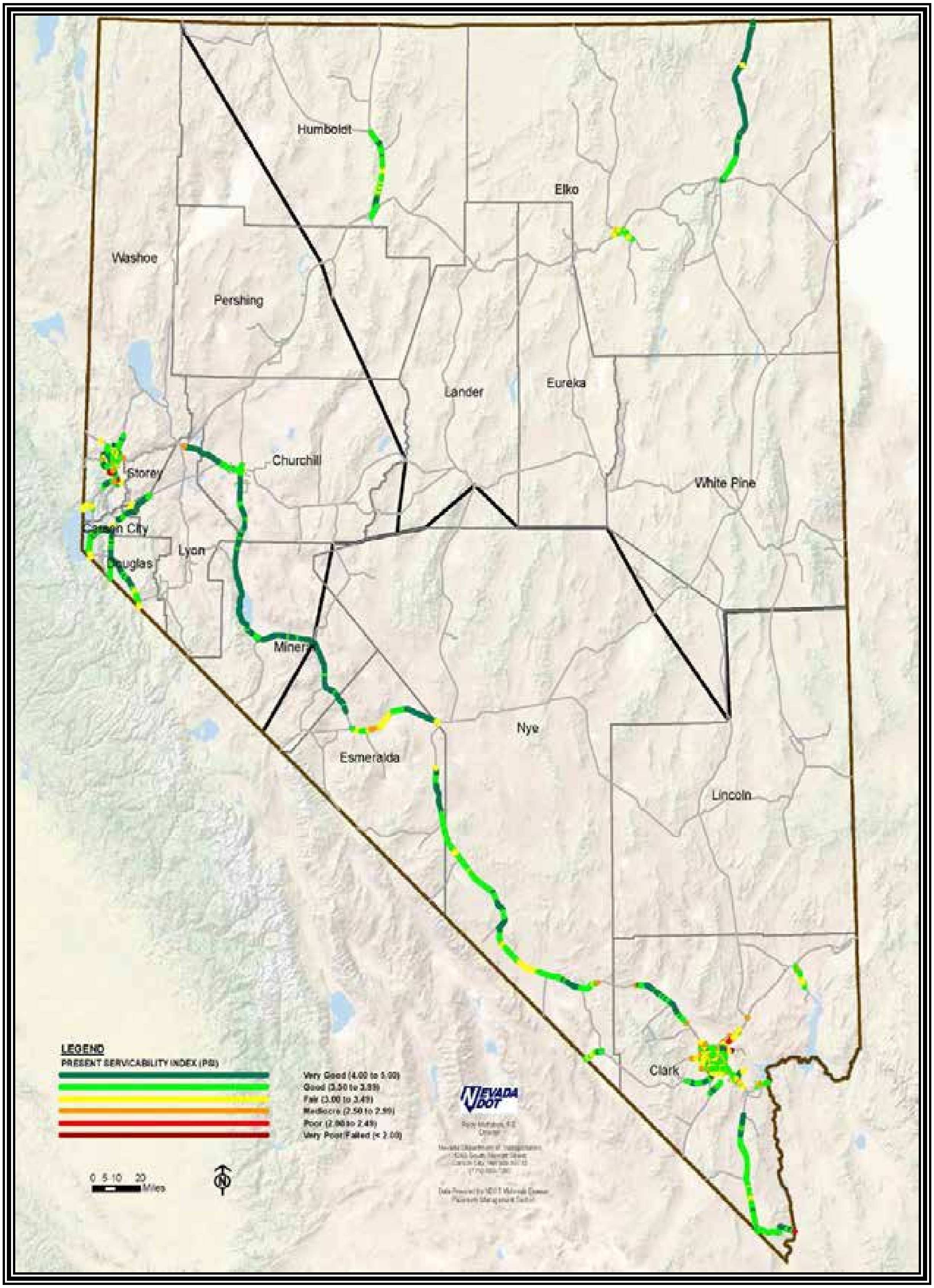


FIGURE 11. Road Prioritization Category 2 Identified by Present Serviceability Index (PSI)

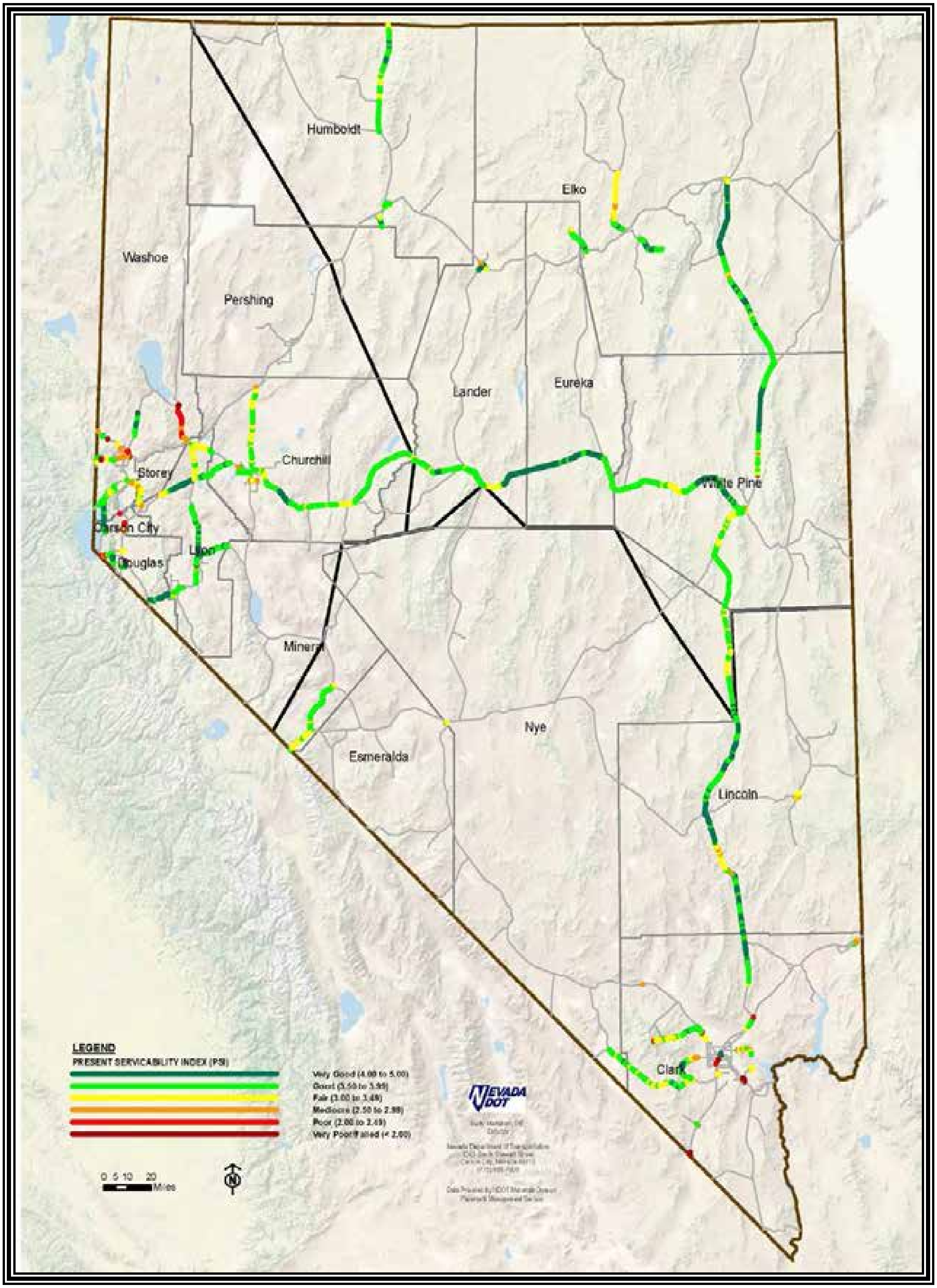


FIGURE 12. Road Prioritization Category 3 Identified by Present Serviceability Index (PSI)

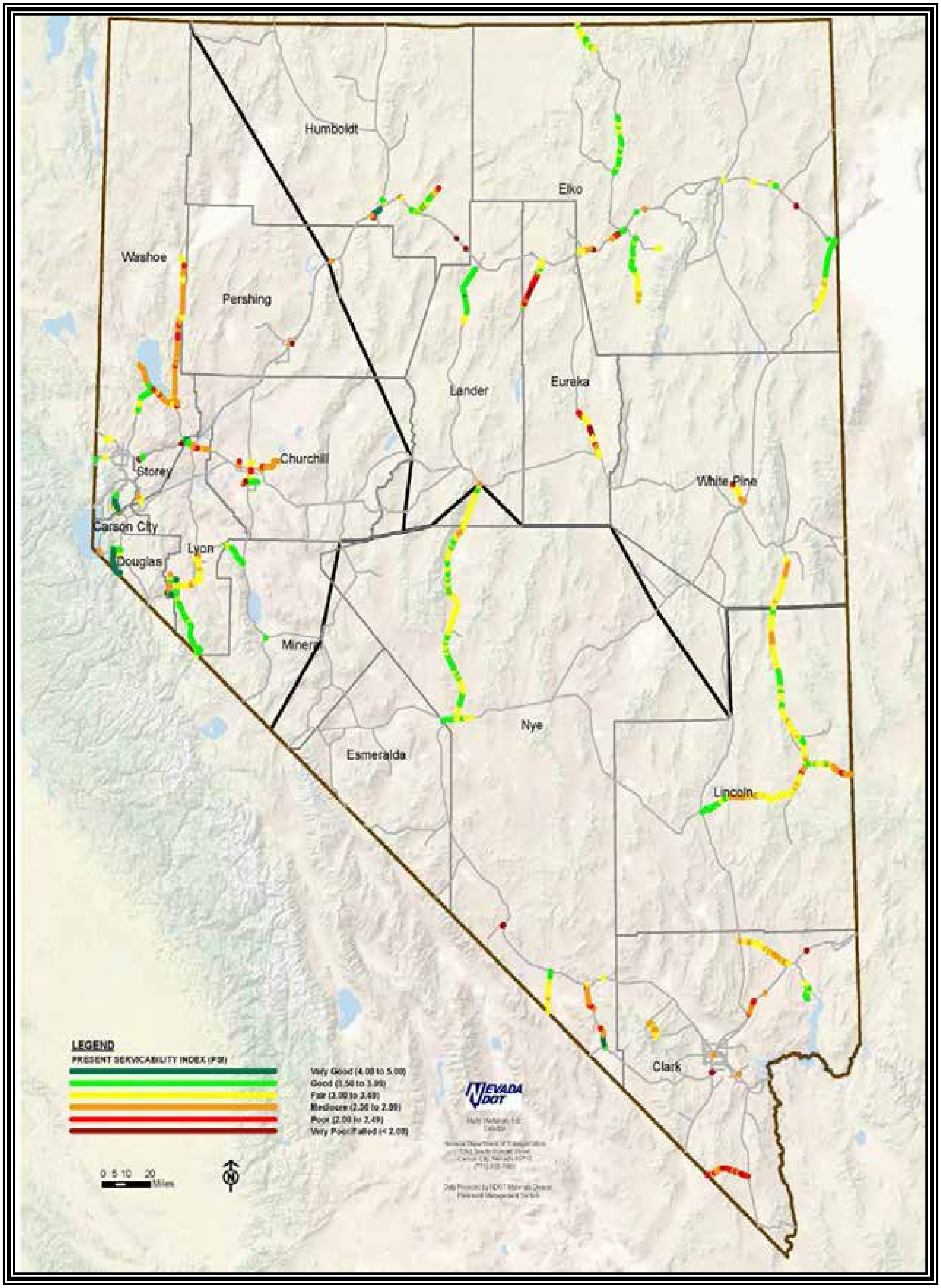


FIGURE 13. Road Prioritization Category 4 Identified by Present Serviceability Index (PSI)

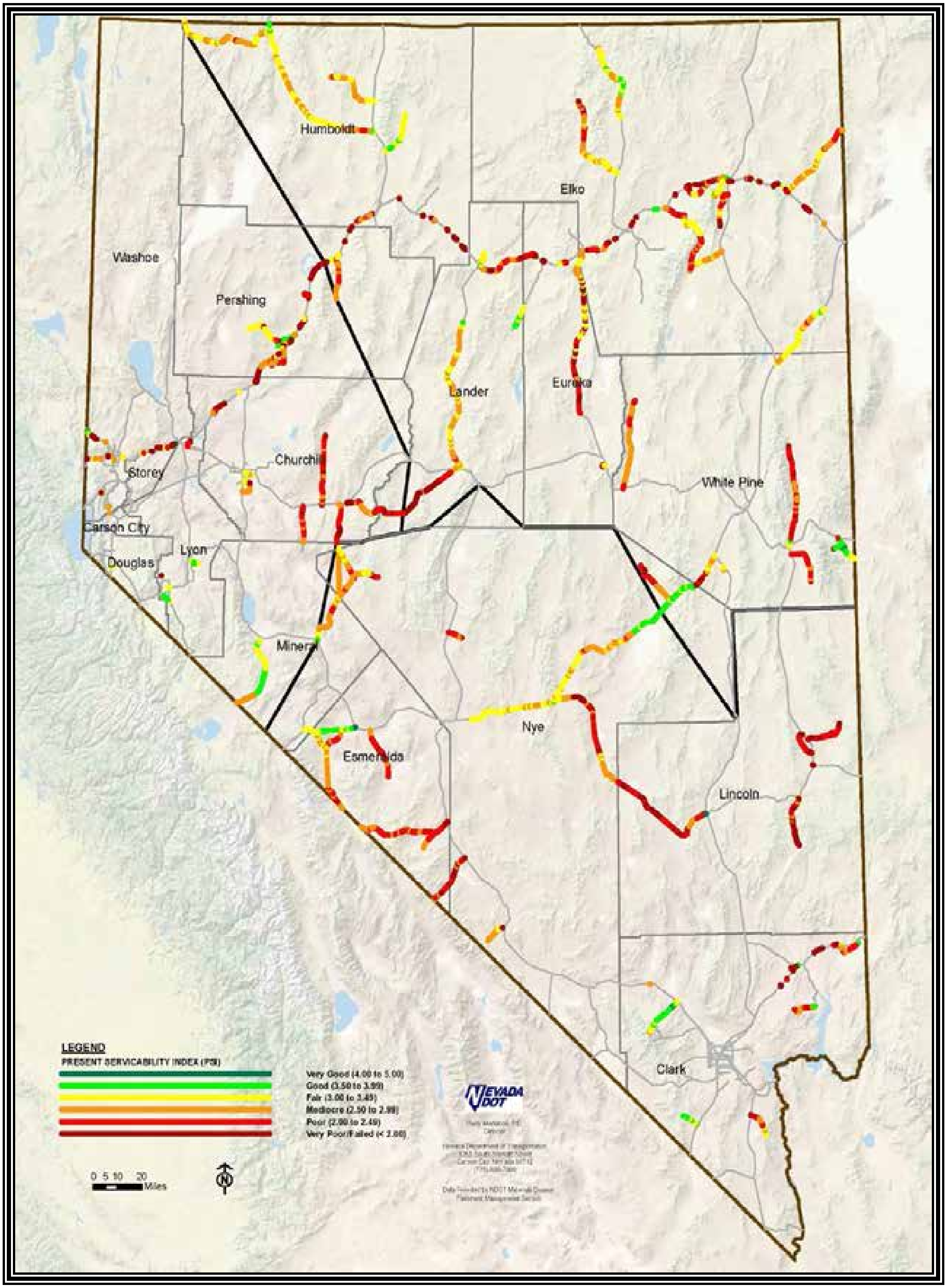


FIGURE 14. Road Prioritization Category 5 Identified by Present Serviceability Index (PSI)

NDOT partitions the state into three districts in order to effectively manage the state's pavement assets. District 1 includes the larger parts of Clark, Esmeralda, Lincoln, and Nye Counties. District 2 is comprised of most of Carson City, Churchill, Douglas, Lyon, Mineral, Pershing, Storey, and Washoe Counties. District 3 consists of the majority of Elko, Eureka, Humboldt, Lander, and White Pine Counties. TABLE 7 was developed to determine the pavement condition in each district identified by the PSI rating system. TABLE 8 was generated to evaluate the pavement condition in each county identified by the PSI rating system.

TABLE 7.
District Pavement Condition Identified by Present Serviceability Index (PSI)

District	Average PSI Condition by Road Prioritization Category and Miles per District				
	Road Category 1	Road Category 2	Road Category 3	Road Category 4	Road Category 5
District 1	3.82 135 mi	3.62 517 mi	3.59 278 mi	3.16 370 mi	2.59 541 mi
District 2	3.98 152 mi	3.79 291 mi	3.53 350 mi	3.17 253 mi	2.37 268 mi
District 3	3.96 217 mi	3.87 118 mi	3.76 570 mi	3.12 234 mi	2.69 829 mi
Total All Districts	3.93 504 mi	3.71 926 mi	3.65 1198 mi	3.15 857 mi	2.59 1638 mi

TABLE 8.
County Pavement Condition Identified by Present Serviceability Index (PSI)

County	Average PSI Condition by Road Prioritization Category and Miles per County				
	Road Category 1	Road Category 2	Road Category 3	Road Category 4	Road Category 5
Carson City	3.78 4 mi	3.95 14 mi	2.86 7 mi	Not Applicable	Not Applicable
Churchill	4.06 28 mi	3.95 48 mi	3.61 140 mi	2.88 25 mi	2.23 97 mi
Clark	3.84 128 mi	3.49 284 mi	3.53 135 mi	2.82 69 mi	2.57 72 mi
Douglas	Not Applicable	3.82 56 mi	3.59 26 mi	3.58 19 mi	1.04 2 mi
Elko	3.99 122 mi	3.95 80 mi	3.82 117 mi	3.26 112 mi	2.66 258 mi
Esmeralda	Not Applicable	3.89 97 mi	Not Applicable	Not Applicable	2.63 141 mi
Eureka	3.75 13 mi	Not Applicable	3.91 54 mi	2.59 41 mi	2.44 71 mi
Humboldt	3.92 44 mi	3.70 38 mi	3.68 50 mi	2.93 23 mi	2.82 166 mi
Lander	3.81 19 mi	Not Applicable	3.74 63 mi	3.51 41 mi	2.56 147 mi
Lincoln	Not Applicable	Not Applicable	3.86 103 mi	3.22 145 mi	2.09 91 mi
Lyon	4.11 16 mi	3.91 30 mi	3.75 103 mi	3.30 77 mi	2.44 15 mi
Mineral	Not Applicable	4.12 93 mi	3.55 35 mi	3.73 11 mi	3.03 63 mi
Nye	3.29 7 mi	3.71 111 mi	3.61 49 mi	3.26 138 mi	2.81 252 mi
Pershing	3.97 75 mi	Not Applicable	Not Applicable	2.61 2 mi	2.45 112 mi
Storey	Not Applicable	Not Applicable	3.15 11 mi	3.20 3 mi	Not Applicable
Washoe	3.98 48 mi	3.46 75 mi	3.20 64 mi	3.03 116	2.36 17 mi
White Pine	Not Applicable	Not Applicable	3.73 241 mi	3.10 35 mi	2.67 134 mi
Total All Counties	3.93 504 mi	3.71 926 mi	3.65 1198 mi	3.15 857 mi	2.59 1638 mi

Past condition data were reviewed using the PSI pavement condition rating system to determine if the funds spent to perform maintenance and rehabilitation repair work were adequate enough to maintain or improve the average condition of the roadway network. FIGURES 15 through 20 are the results of this review. FIGURE 15 demonstrates the overall average PSI for the entire roadway network was in good condition from 2001 through 2005, transitioned from good condition to fair condition in 2006, and steadily declined from 2007 through 2014. The overall average PSI did not improve in 2012 despite the fact that $298.6M of rehabilitation and maintenance funds were spent in 2011 to improve the roadway network. It is anticipated that the overall average condition of the roadway network will transition from fair condition to mediocre condition within the next few years.

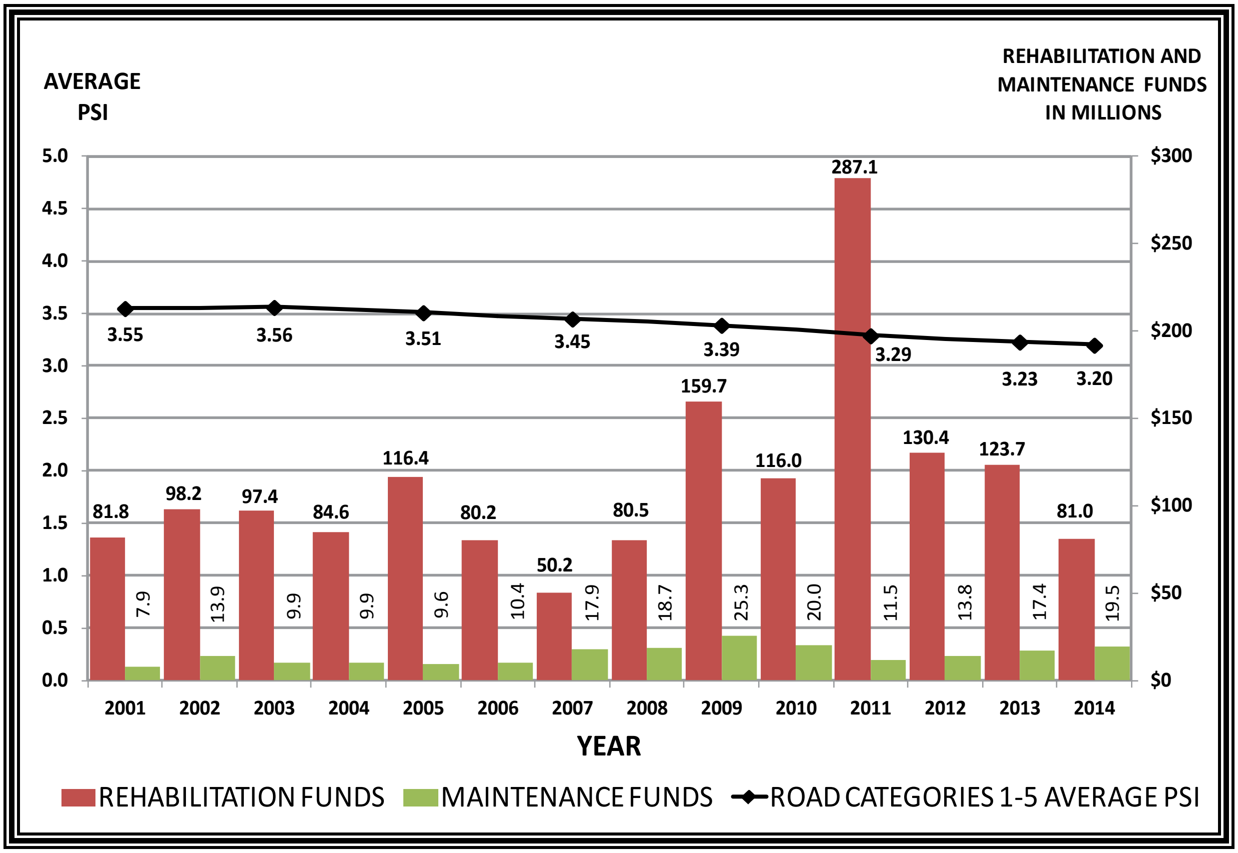


FIGURE 15. Average PSI and Expenditures for Roadway Network

FIGURE 16 illustrates the long-term average PSI for road category 1 and the rehabilitation expenditure for each year from 2001 through 2014. Category 1 roads include the controlled access highways such as I-15, I-580, and I-80. These roads are highest in priority due to interstate economic importance. NDOT spends a substantial amount of funds to maintain these roads in very good condition each year. Regardless that an average $60M per year has been spent to rehabilitate this road category, the roads are very near transitioning from very good condition into good condition. It is expected that this transition will occur within a decade.

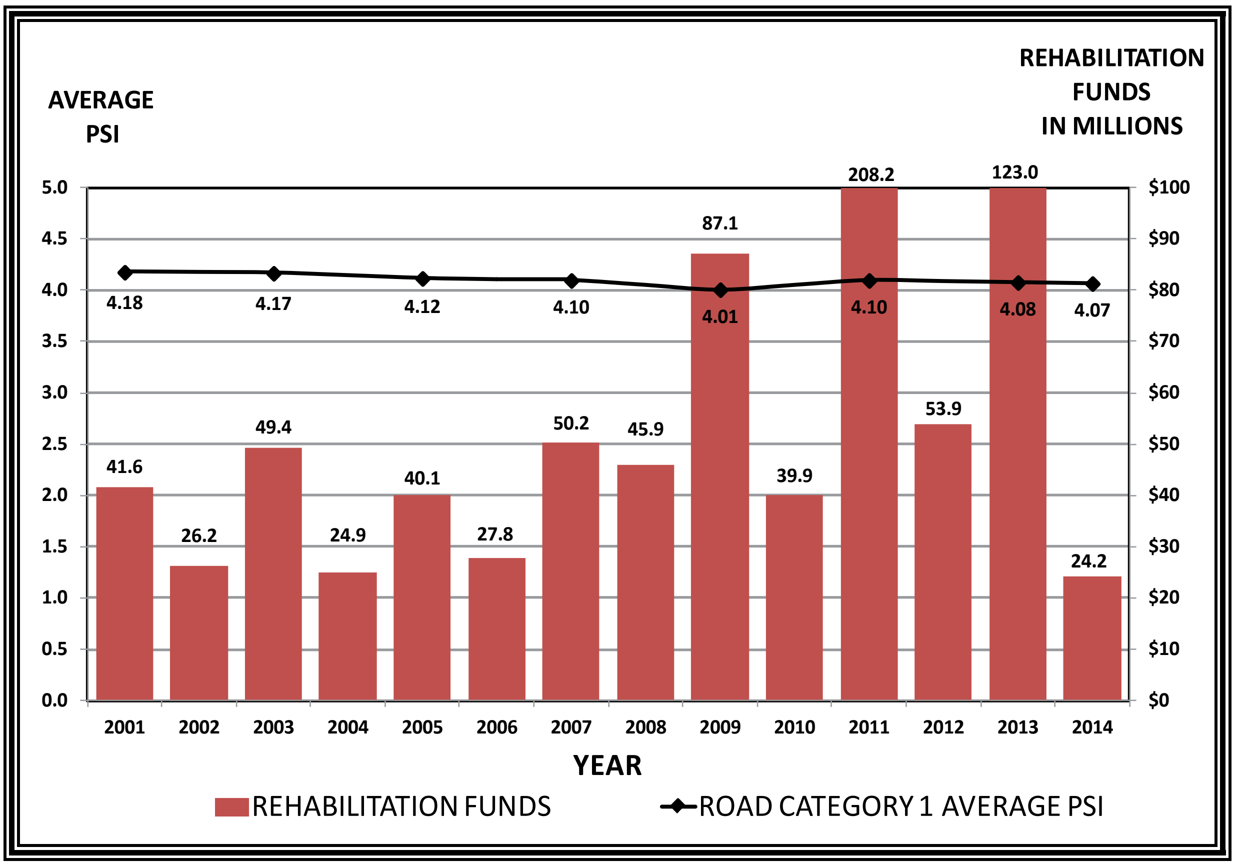


FIGURE 16. Average PSI and Expenditures for Road Category 1

FIGURE 17 shows the long-term average PSI for road category 2 and the rehabilitation expenditure for each year from 2001 through 2014. Category 2 roads include routes such as St. Rose Parkway/Lake Mead Drive, US-50 Lincoln Highway, and Fifth Street in Elko. The average PSI remained solidly in good condition for most of the reporting years. Recently, the average PSI has deteriorated to a point near the threshold of changing from good condition to fair condition. The average PSI for category 2 roads is expected to deteriorate into fair condition within several years.

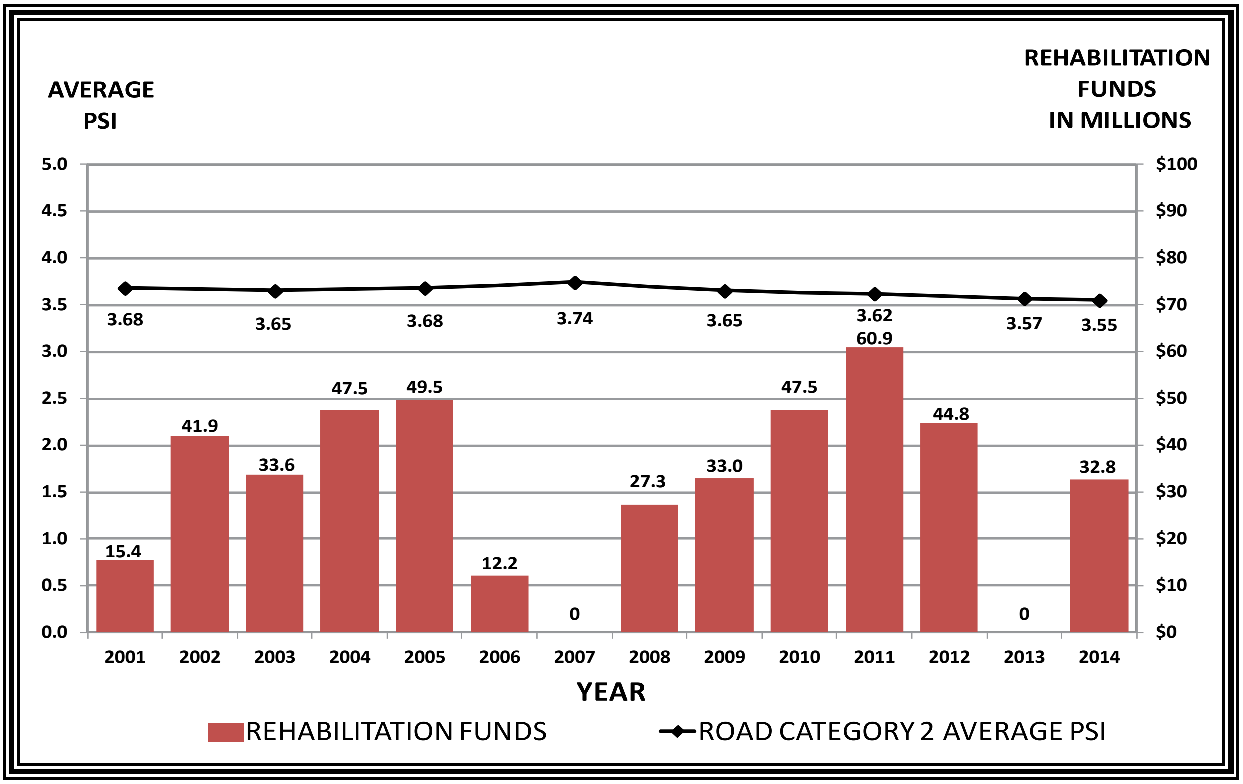


FIGURE 17. Average PSI and Expenditures for Road Category 2

FIGURE 18 displays the long-term average PSI for road category 3 and the rehabilitation expenditure for each year from 2001 through 2014. Category 3 roads include routes such as Kyle Canyon Road, SR-28 near Lake Tahoe, and SR-225 at the Elko west urban limits. The average PSI was at the high end of good condition for many years and has recently declined into the lower end of good condition. This category of roads is expected to deteriorate into fair condition within the next couple of years.

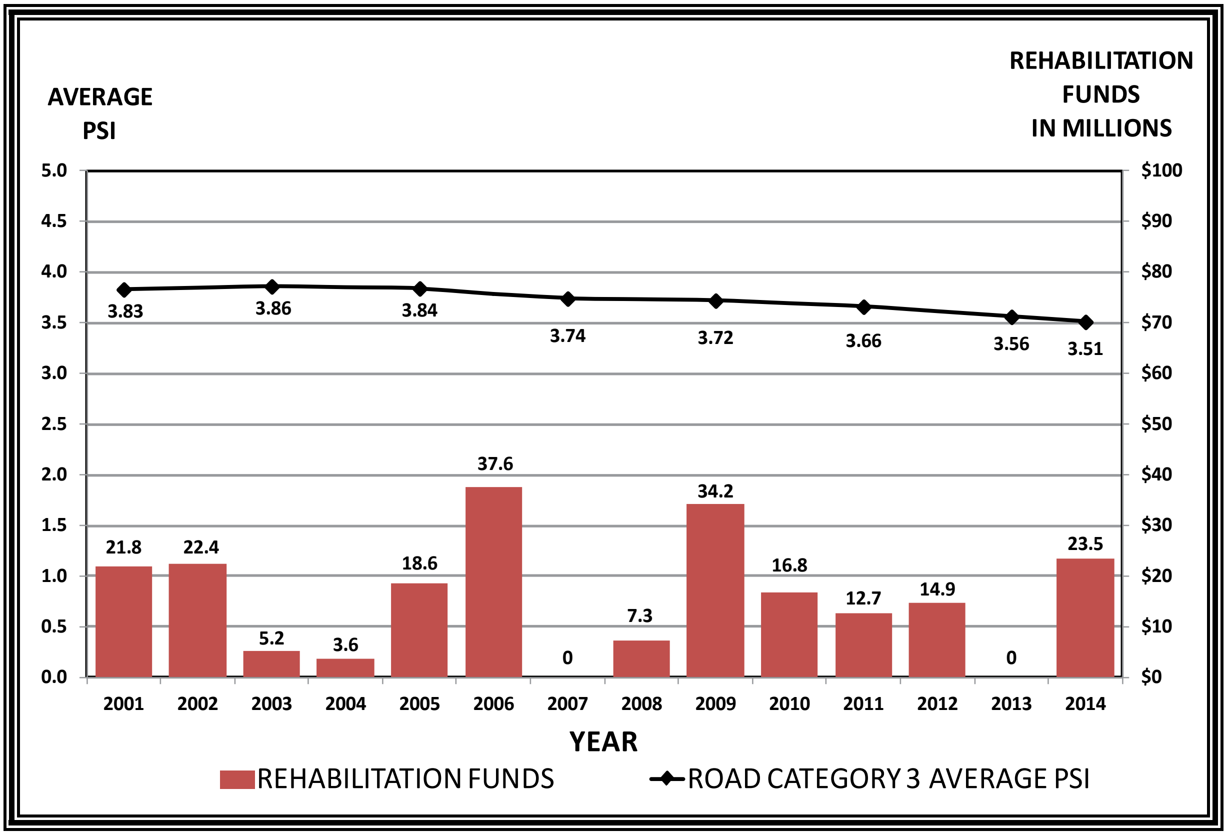


FIGURE 18. Average PSI and Expenditures for Road Category 3

FIGURE 19 demonstrates the long-term average PSI for road category 4 and the rehabilitation expenditure for each year from 2001 through 2014. Category 4 roads include routes such as Deer Creek Road, Foothill Road/Genoa Lane, and Jiggs Road. These roads were in good condition from 2001 through 2003, and thereafter transitioned into fair condition in 2004. The average PSI continued to deteriorate through the entire fair condition rating from 2005 through 2013, and transitioned into mediocre condition in 2014. The decline into mediocre condition occurred despite spending almost $17M in 2012.

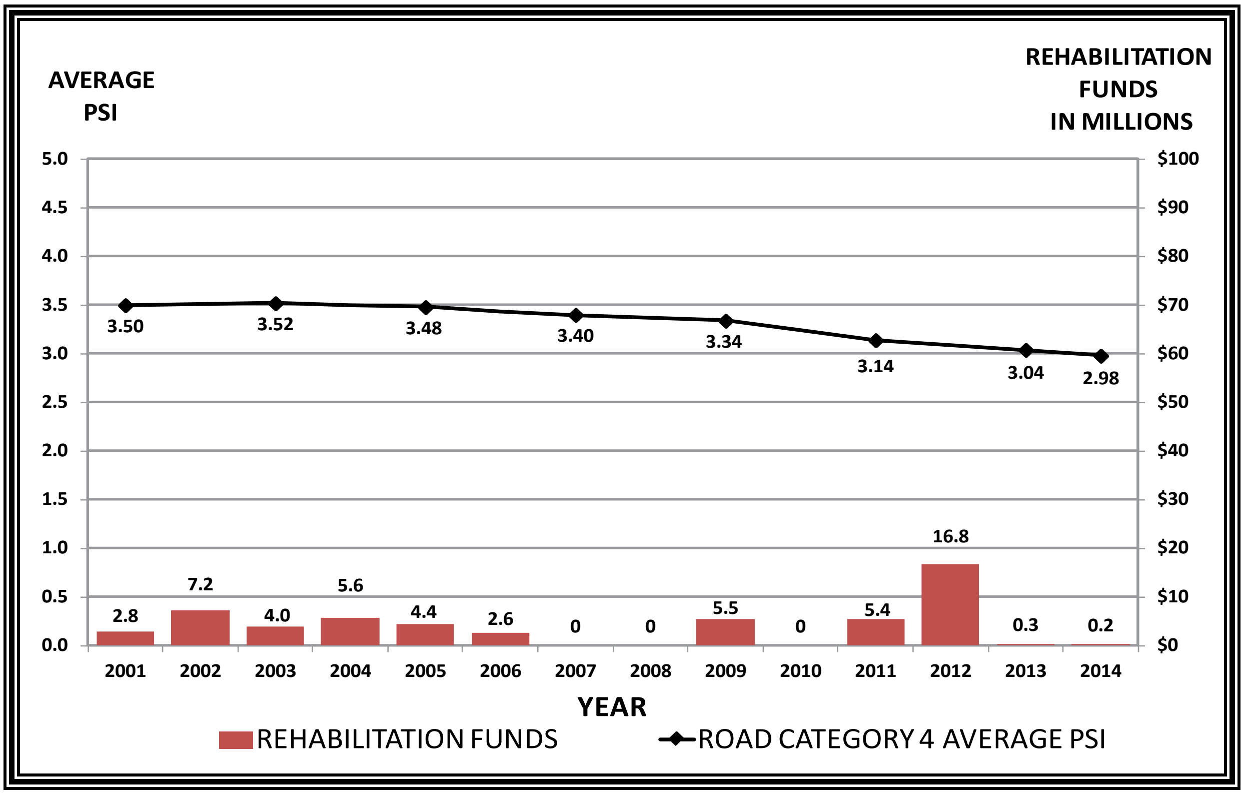


FIGURE 19. Average PSI and Expenditures for Road Category 4

FIGURE 20 presents the long-term average PSI for road category 5 and the rehabilitation expenditure for each year from 2001 through 2014. Category 5 roads include routes such as Lee Canyon Road, Dixie Valley Road, and Secret Pass Road. These roads have remained in a mediocre condition over the duration of the reporting period, with exception of year 2003. This stability in mediocre condition is due to the fact that the majority of the maintenance funds spent each year, as shown in green in FIGURE 15, are used for maintenance repair work on these low-volume roads.

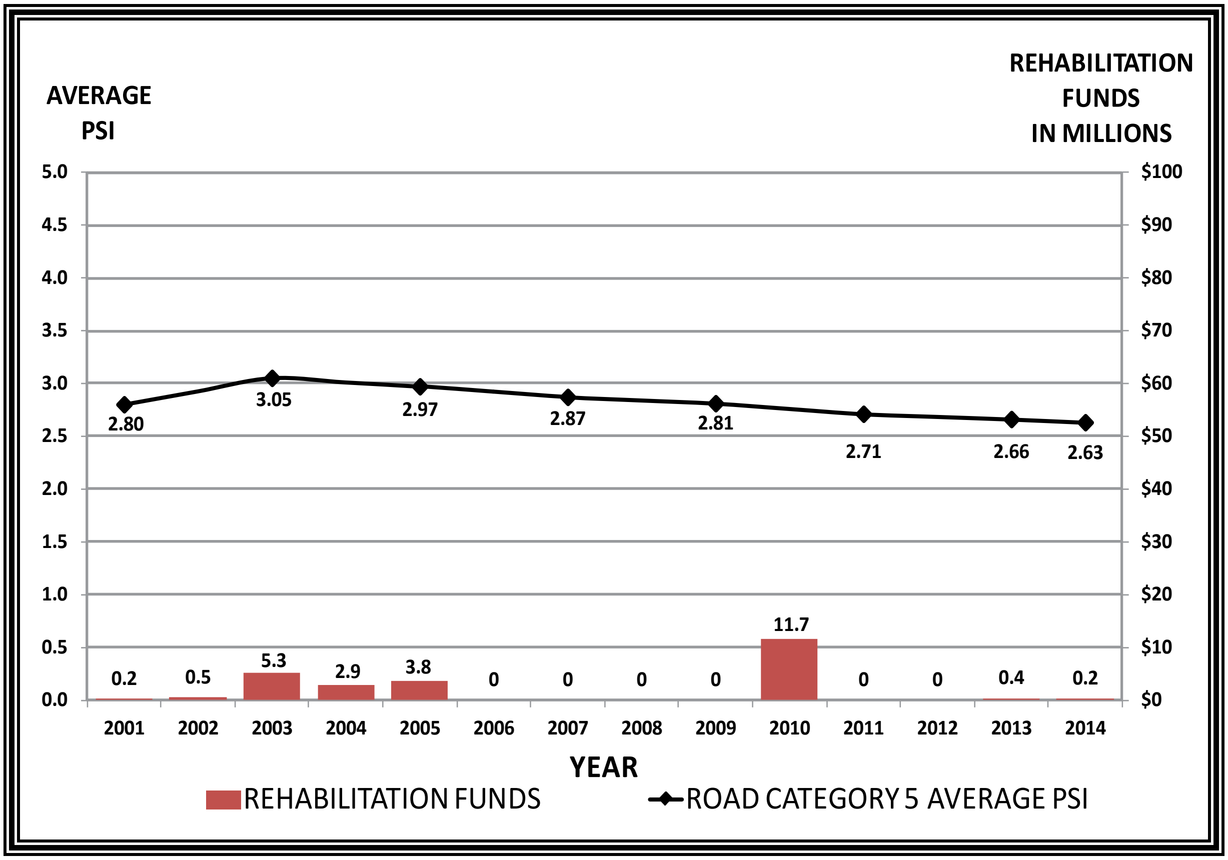


FIGURE 20. Average PSI and Expenditures for Road Category 5

In previous State Highway Preservation Reports, the roadway network was divided into four types of repair strategies that were based on the age of the pavement. These four repair strategies described the work that was needed on the roadway network. FIGURE 21 is included in the current State Highway Preservation Report for continuity purposes. FIGURE 21 presents the change in roadway network condition based on the need for preventive and corrective maintenance repair work as well as the need for overlay and major rehabilitation repair work. A significant rehabilitation program from 1999 through 2002, along with the proactive plan of repairing pavement in fair condition before allowing pavement to deteriorate into conditions where repairs are six times more costly, helped to keep most pavement in the preventive and corrective maintenance repair categories for a few years. However, the roadway network is aging and allocated funding does not have the purchasing power of the past due to rising material costs and inflation. The amount of pavement that requires overlay or major rehabilitation repair work is now similar to the amount of work needed in 1987, when repair needs were amongst the highest ever recorded.

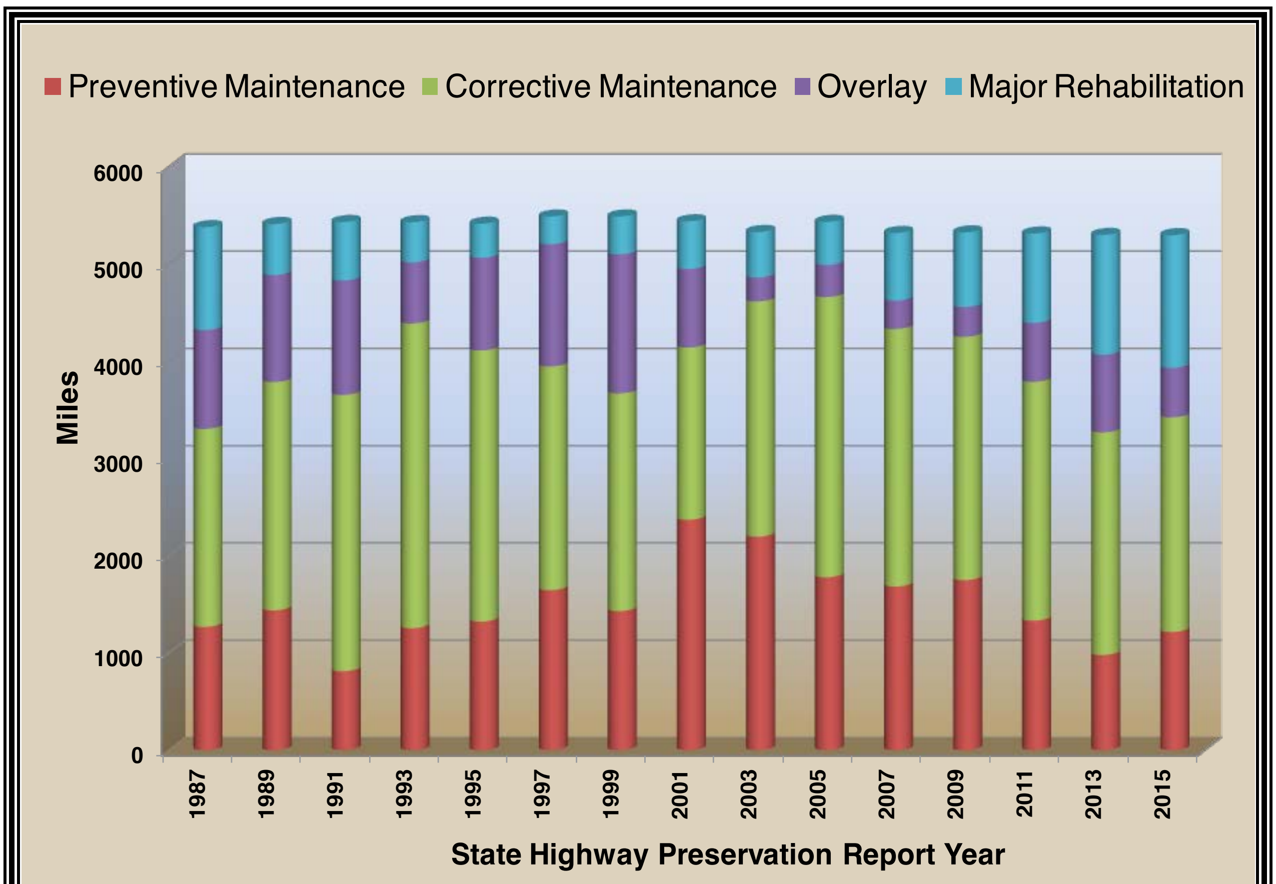


FIGURE 21. Change in Pavement Condition Over Time Based on Repair Strategies

Currently, and in all future State Highway Preservation Reports, the work needed to repair the roadway network is divided into two types of repair categories rather than four types of repair strategies. These two types of repair categories include “maintenance” and “rehabilitation” repair work. Maintenance repair work consists of both preventive and corrective maintenance treatments. Treatments include repair work such as crack filling, chip seals, and patching. Rehabilitation repair work consists of both overlay and major rehabilitation construction work. Recommended repair work is contingent on the condition of the pavement. TABLE 9 summarizes the roadway network condition based on the road prioritization categories and the type of maintenance or rehabilitation repair work needed for each category of road. Of the 5,296 miles of pavement inspected, there were 3,423 miles of pavement in a condition that may require maintenance repair work and 1,873 miles of pavement in need of rehabilitation repair work. All newly rehabilitated roads are included in the maintenance repair category even though very little maintenance effort is required in the first few years of pavement service life. Newly rehabilitated roads are still monitored and any isolated areas in need of minor maintenance repair work are improved.

TABLE 9. *Pavement Condition Based on Road Categories and Type of Repair Work

Road Prioritization Category	Maintenance Repair Work		Rehabilitation Repair Work		Total Miles
	Miles	Percentage of Roadway Network	Miles	Percentage of Roadway Network	
1	513.85	9.70%	130.56	2.47%	**644.41**
2	658.02	12.43%	274.36	5.18%	**932.39**
3	557.78	10.53%	643.39	12.15%	**1,201.17**
4	529.49	10.00%	329.76	6.23%	**859.25**
5	1,163.70	21.97%	494.69	9.34%	**1,658.39**
Total for Road Categories 1 - 5	**3,422.84**	**64.64%**	**1,872.77**	**35.36%**	**5,295.61**

*The total 5,295.61 miles represents the total network miles based on age, including PCCP pavement. The age of a small portion of the roadway network is unknown and therefore not included in the total miles for TABLE 9.

PAVEMENT CONDITION GOAL

A pavement condition goal has been established to provide a measure of the effectiveness of the maintenance and rehabilitation repair work that is performed on state roads. The goal can also indicate the adequacy of funding appropriated for pavement repair work. A process was used to develop the pavement condition goal and several criteria were examined. Careful consideration was used to balance the cost of rehabilitation at varying pavement condition levels with the availability of funds. Other criteria used in the process included pavement deterioration rates, the effectiveness of maintenance repair work, traffic volume, the number of heavy trucks, and the cost to repair or replace roads in each particular road prioritization category. The pavement condition goal to maintain a minimum of 95% of roads in fair or better condition was approved for each road category. TABLE 10 lists the current status of each road category with respect to the established pavement condition goal. Although categories 1, 2, and 3 roads exceed the established pavement condition goal, a substantial amount of categories 4 and 5 roads do not meet the goal.

TABLE 10. Pavement Condition Versus Established Goal by Road Category

Condition	PSI Rating Scale	PSI Condition by Road Prioritization Category Percentage (%) and Number of Miles					
		Road Category 1	Road Category 2	Road Category 3	Road Category 4	Road Category 5	Roadway Network Totals
Very Good	5.00 to 4.00	43.5% 219	40.4% 374	22.8% 273	3.7% 32	0.4% 7	**17.7%** **905**
Good	3.99 to 3.50	50.8% 256	39.4% 365	54.8% 657	28.0% 240	7.1% 117	**31.9%** **1,635**
Fair	3.49 to 3.00	5.0% 25	15.9% 147	18.0% 216	37.7% 323	22.6% 371	**21.1%** **1,082**
Mediocre	2.99 to 2.50	0.6% 3	3.0% 28	3.2% 38	21.2% 182	32.7% 535	**15.3%** **786**
Poor	2.49 to 2.00	0.1% 0.55	0.9% 8	0.8% 10	7.2% 62	24.8% 406	**9.5%** **487**
Very Poor	< 2.00	0.0% 0	0.4% 4	0.3% 4	2.1% 18	12.3% 202	**4.5%** **228**
Total Miles:		**504**	**926**	**1,198**	**857**	**1,638**	**5,123**
Condition Goal: Min. Percentage of Roads in Fair or Better Condition		**95%**	**95%**	**95%**	**95%**	**95%**	**----**
Current Condition: Percentage of Roads in Fair or Better Condition		**99.3%**	**95.7%**	**95.6%**	**69.5%**	**30.2%**	**----**
Does the current condition meet the condition goal?		**YES**	**YES**	**YES**	**NO**	**NO**	**----**

FIGURE 22 displays the percentage of miles per road category as identified by the PSI pavement condition rating system. The majority of pavement in road category 1 is in fair or better condition. Road categories 2 and 3 pavement is in better average condition than the road category 4 pavement. The majority of pavement in road category 5 is in mediocre or worse condition.

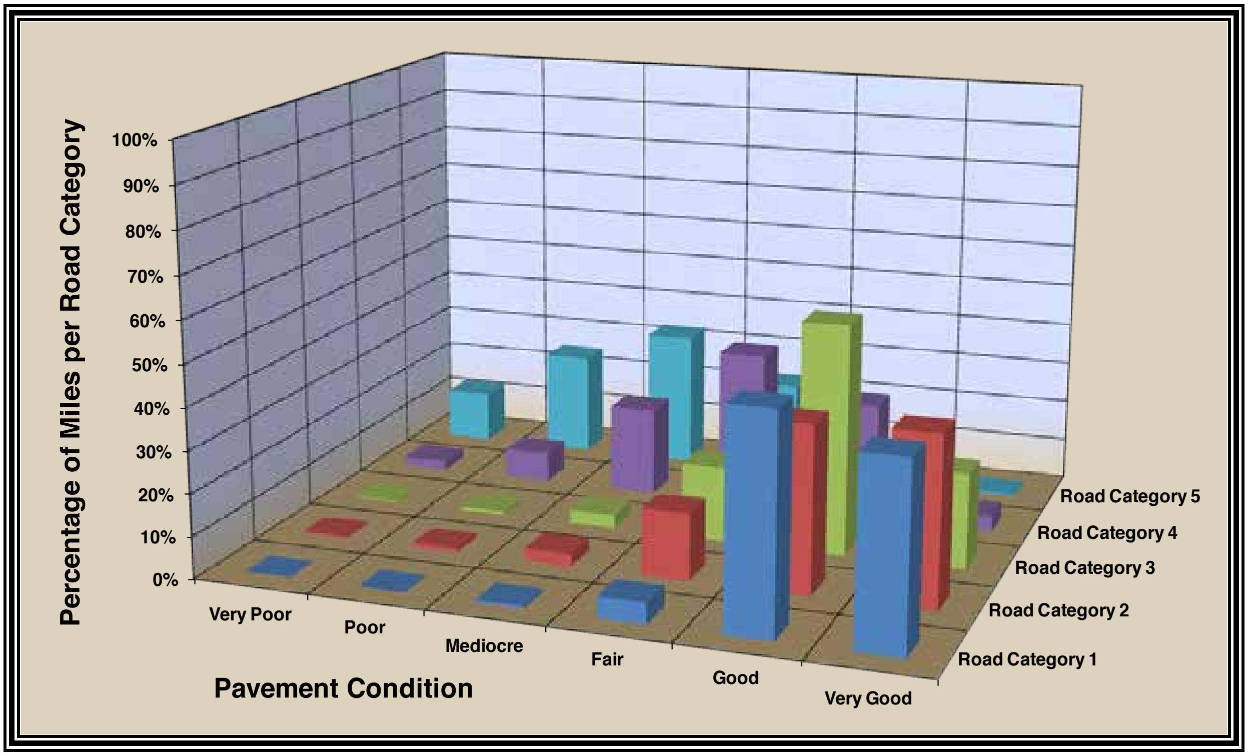


FIGURE 22. Percentage of Miles per Road Category and Pavement Condition

BACKLOG OF PAVEMENT REHABILITATION WORK

The backlog of pavement rehabilitation work has been defined as the funds necessary to rehabilitate roads to acceptable condition levels. The backlog of pavement rehabilitation work increases when funds are not spent at the optimal time in order to maintain roads at acceptable condition levels. Previously, NDOT calculated the backlog of pavement rehabilitation work based on the goal of keeping every mile of the state-maintained roadway network in very good condition. However, the goal of maintaining every mile in the constant status of very good condition was not realistic or achievable.

Currently, the contemporary practice of evaluating the condition of the roadway network based on the PSI pavement condition rating system, and the established pavement condition goal, is used to calculate a more realistic estimation of the backlog. The cost of rehabilitation work varies for each road category. Category 1 roads are more expensive to rehabilitate because of the required pavement widths and thicknesses that need to be repaired. Category 5 roads are the least expensive to rehabilitate because of narrow widths and thin pavement sections. TABLE 11 summarizes the backlog of pavement rehabilitation work for the state-maintained roadway network. The information includes the number of miles in each road category that are in less than fair condition as well as the cost of rehabilitation per mile. Only road categories 4 and 5 have deficient pavement that does not meet the established pavement condition goal to maintain a minimum of 95% of roads in fair or better condition. Furthermore, the percentage of deficient miles in road categories 4 and 5 is substantial. There are 1,280 miles of deficient pavement that would cost $661.9M to repair.

FIGURE 23 illustrates the $661.9M backlog of pavement rehabilitation work in percentage of miles per road category. There is 25.5% of road category 4 pavement in less than fair condition and 64.8% of road category 5 pavement in less than fair condition as observed by the total of the very poor, poor, and mediocre condition percentages. The $661.9M backlog of pavement rehabilitation work is expected to rise as pavement in mediocre condition deteriorates into more costly to repair conditions.

TABLE 11. Backlog of Pavement Rehabilitation Work

Road Prioritization Category	1	2	3	4	5
Deficient Pavement In Miles	0	0	0	219	1061
Estimated Cost to Rehabilitate Pavement Per Mile	$2.1M	$1.3M	$0.7M	$0.6M	$0.5M
Total Cost to Rehabilitate Pavement Per Road Category	$0M	$0M	$0M	$131.4M	$530.5M
Total Backlog of Pavement Rehabilitation Work	**$661.9M**				

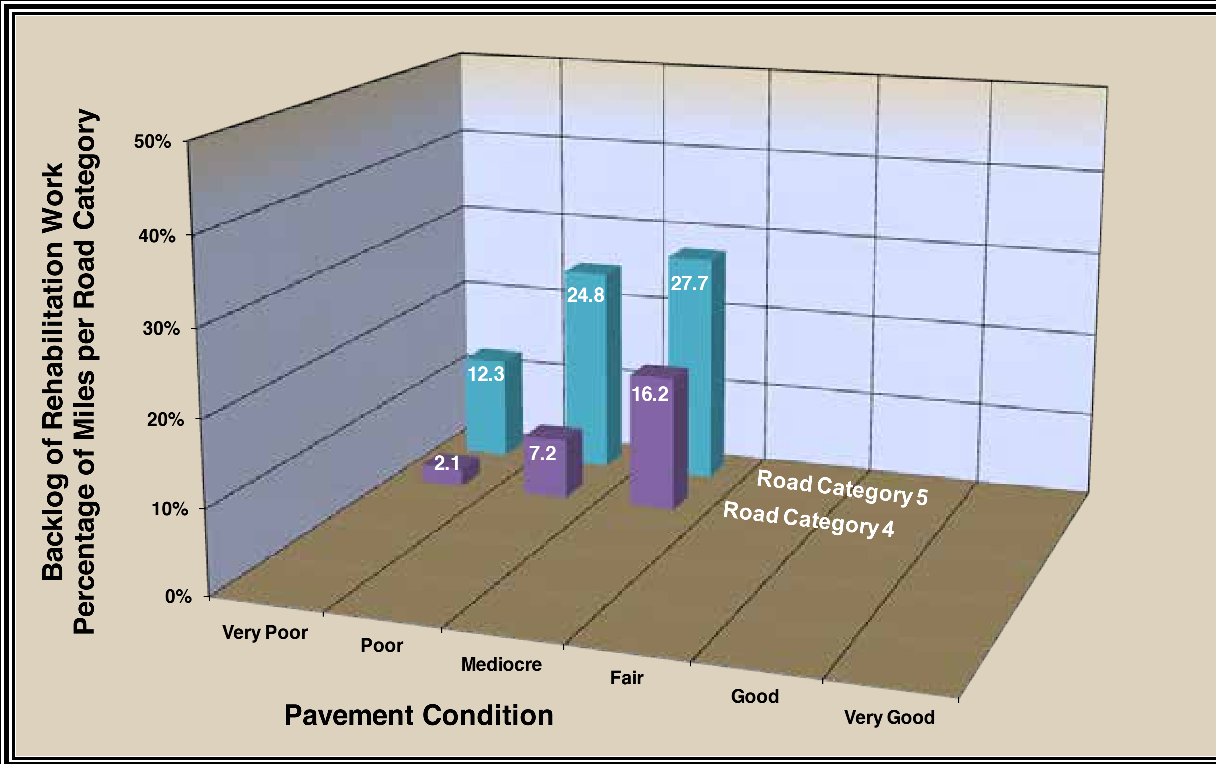


FIGURE 23. Backlog in Percentage of Miles per Road Category

ADEQUACY OF PAVEMENT PRESERVATION FUNDS

The adequacy of pavement preservation funds can be determined by comparing the current and projected funding levels for repair work to the current and projected PSI pavement condition levels. The established pavement condition goal to maintain a minimum of 95% of roads in fair or better condition is also used to determine adequacy. Adequate funding would allow for pavement to be maintained in conformance to the established pavement condition goal.

Analysis was performed on each road category to determine if there were enough funds available to maintain the pavement within conformance to the established pavement condition goal. FIGURES 16 through 20 demonstrate that funding and pavement condition levels for each road category vary from year to year. However, FIGURE 15 shows that regardless the amount of funds spent, the average PSI pavement condition for the entire roadway network has continued to trend downwards. Only road categories 1, 2, and 3 pavement meet the established pavement condition goal to maintain a minimum of 95% of roads in fair or better condition. Road categories 4 and 5 pavement does not meet the established goal. Funds for pavement preservation repair work must be increased if the established goal is to be met.

TABLE 12 is a summary of the average number of miles rehabilitated and scheduled for rehabilitation for years 2009 through 2019, in addition to the average funds spent and scheduled to be spent for pavement repair work each year. These averages include the actual amount of miles rehabilitated and funds spent for years 2009 through 2014, plus the projected amount of miles to be rehabilitated and corresponding funds for years 2015 through 2019. TABLE 12 also contains the estimated additional miles that need to be rehabilitated and additional funds required to maintain each road category at 2014 PSI pavement condition levels. The current average funding of $132M per year would need to be increased by $191M per year, for a total of $323M per year, in order to maintain each road category at 2014 PSI pavement condition levels. Additional funds are also needed to improve the condition of road categories 4 and 5 pavement to satisfy the established pavement condition goal.

TABLE 12. Adequacy of Pavement Preservation Funds

Road Prioritization Category	1	2	3	4	5
Current Average Number of Miles Rehabilitated per Year	42	33	30	8	2
*Current Average Funds per Year	$71M	$30M	$25M	$5M	$1M
*Total Current Average Funds per Year	$132M				
Additional Average Number of Miles Requiring Rehabilitation per Year	8	44	70	49	80
Additional Average Funds Required per Year	$16M	$57M	$49M	$29M	$40M
Total Additional Average Funds Required per Year	$191M				

*Estimated average rehabilitation funds per year for years 2009 through 2019, excluding maintenance funds.

PROGRESS IN THE 12-YEAR PLAN FOR RESURFACING OF STATE HIGHWAYS

The amount of pavement preservation repair work has been restricted for many years due to long-term financial constraints. The funds allocated for the pavement preservation budget are limited because many funds are needed for other purposes such as capacity improvement projects and other program budget obligations. There are simply not enough funds available to preserve the state-maintained roadway network in a condition that satisfies the established pavement condition goal to maintain a minimum of 95% of roads in fair or better condition.

FIGURE 24 illustrates what will happen to the condition of the state-maintained roadway network over the next twelve years using three different budget scenarios. An average of $132M will be used as the yearly pavement preservation budget for scenario one since this is the actual average expenditure for pavement rehabilitation work from 2009 through 2014. Budget scenario one is represented by the red line and consists of spending an average of $132M per year on pavement rehabilitation work for the next twelve years. There are presently 75% of all state-maintained roads in fair or better condition. Spending an average of $132M per year will result in the average condition of the roads to deteriorate to less than 50% of roads in fair or better condition by the year 2027. Furthermore, the $661.9M backlog of pavement rehabilitation work would substantially increase over time.

FIGURE 24 demonstrates budget scenario two with the yellow line. There is an increased expenditure of $191M per year, in addition to the $132M per year base investment, for a total of $323M per year. Spending $323M per year on pavement rehabilitation work will result in a stagnant pavement condition level. The average condition of 75% of all roads in fair or better condition would remain the same from 2014 through 2027. Although the roadway network would not deteriorate below 2014 PSI pavement condition levels, the backlog of pavement rehabilitation work would not be reduced. Road categories 4 and 5 would never meet the established pavement condition goal to maintain a minimum of 95% of roads in fair or better condition.

FIGURE 24 depicts budget scenario three with the green line. This budget scenario is the preferred PMS plan in a business environment where funding gaps are nonexistent. Increasing the $323M per year budget with an additional $55M per year through 2026, for a total of $378M per year, would gradually improve the pavement condition of the state-maintained roadway network. This budget would also eliminate the backlog of pavement rehabilitation work. This ideal budget scenario would accommodate the preservation needs of the entire roadway network and provide the funds necessary for all road categories to exceed the pavement condition goal established in TABLE 10. The blue line shows the condition of the pavement wherein 95% of roads are in fair or better condition. A budget of $378M per year would incrementally raise the percentage of roads in fair or better condition from now until 2027. Thereafter, the network pavement condition would level off and the budget could actually be reduced to $323M per year since the backlog of pavement rehabilitation work would be eliminated.

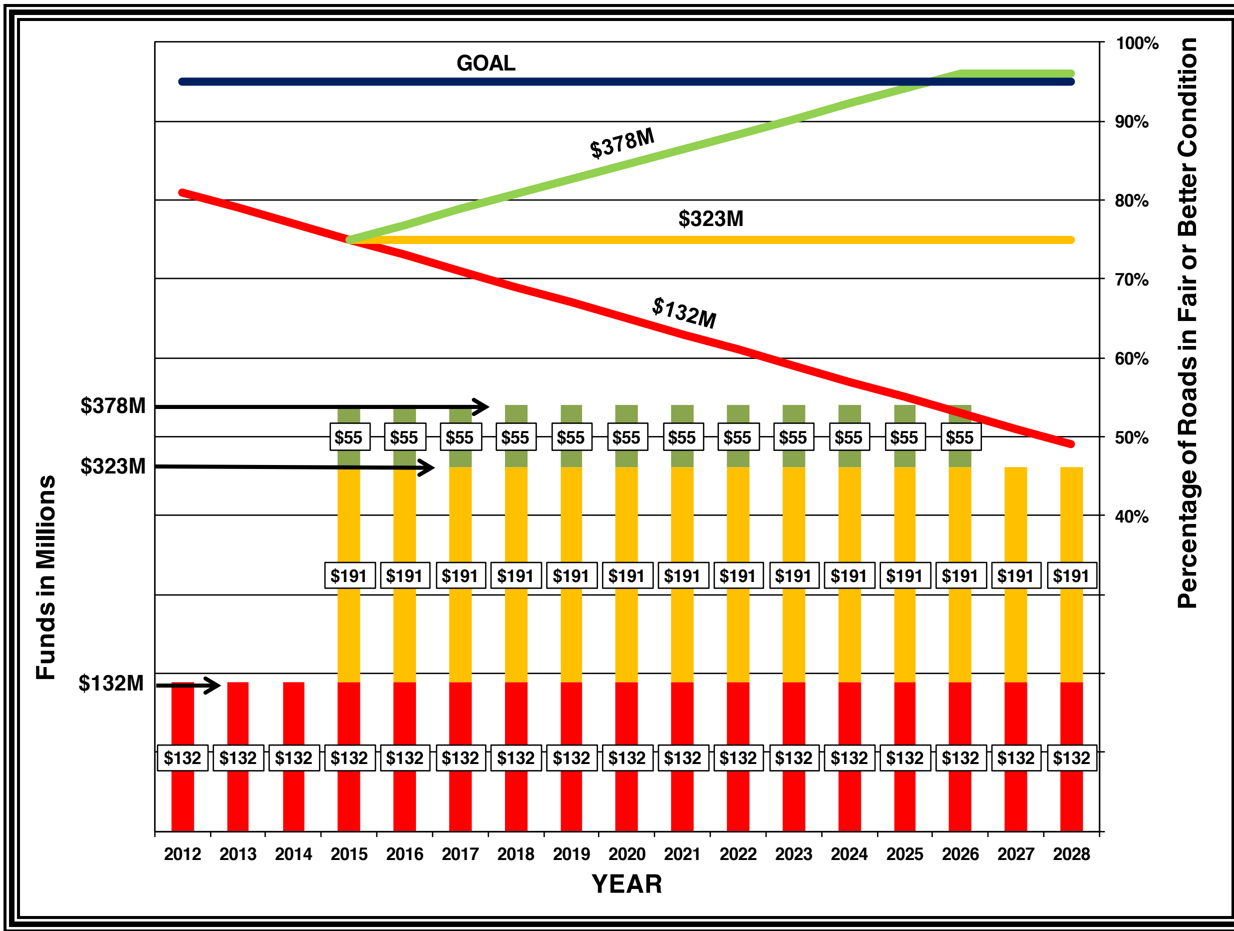


FIGURE 24. Future State-maintained Roadway Network Funding Options

PAVEMENT PRESERVATION SUMMARY

The State Highway Preservation Report is presented to Nevada Legislature with the intent to fulfill the requirements as outlined in Nevada Revised Statute 408.203(3). NDOT is accountable to report the progress made on the resurfacing plan for state highways. The following aspects of the resurfacing plan have been addressed:

- The pavement preservation revenues and expenditures for fiscal years 2013 and 2014 were presented. The revenue for the maintenance and rehabilitation repair work constructed on state highways is primarily funded by the federal government and the State of Nevada. This revenue generally consists of vehicle fuel tax and registration fees. Approximately $270,187,268 were invested for road maintenance and rehabilitation repair work during the last biennium. FIGURE 5 illustrates the funding sources and construction expenditures for the road repair work.

- TABLES 3, 4, and 5 summarized the rehabilitation and maintenance repair work that was advertised in fiscal years 2013 and 2014. The information includes lists of projects along with the associated mileage and cost for each project. The project locations and scopes of work were also reported.

- The pavement condition of the state-maintained roadway network was provided. The pavement condition was objectively measured with the Present Serviceability Index (PSI) rating system. This rating system quantifies pavement condition into one of six sections that correspond to pavement in very good, good, fair, mediocre, poor, and very poor or failed condition. The data were described using several methods including tabular format, maps, analysis by district and county distribution, and a long-term investigation displayed on column charts.

- A pavement condition goal was established for the roadway network. The goal to maintain a minimum of 95% of roads in fair or better condition was approved for each road category. The goal was determined through a process that considers numerous criteria including the balance of rehabilitation cost at varying pavement condition levels with available funds, pavement deterioration rates, effectiveness of maintenance repair work, traffic volume, number of heavy trucks, and cost of repair or replacement.

- The backlog of pavement rehabilitation work was calculated based on the established goal to maintain a minimum of 95% of roads in fair or better condition. TABLE 11 lists the estimated backlog for the entire state-maintained roadway network. A total of $661.9M is required to repair 1,280 miles of deficient pavement.

- TABLE 12 was developed to document the adequacy of pavement preservation funds. The condition of the roadway network was predicted through 2019 based on deterioration rates and scheduled rehabilitation work. Predicted conditions forecast that the current average funding level of $132M per year is inadequate to maintain each category of road in conformance to the established goal to maintain a minimum of 95% of roads in fair or better condition. TABLE 12 also documents the additional amount of work and cost required to maintain each road category at 2014 PSI pavement condition levels. The $132M average funding per year must be increased by an additional $191M per year, for a total of $323M per year, to simply maintain the roadway network at 2014 PSI pavement condition levels. The proposed $323M per year allocation does not include the funds necessary to reduce the backlog of pavement rehabilitation work.

- The progress in the 12-year plan for resurfacing of state highways was examined and three different budget scenarios were investigated. The first budget scenario included an average of $132M per year expenditure for rehabilitation repair work. The first budget scenario would result in the roadway network pavement condition level deteriorating from 75% to less than 50% of roads in fair or better condition by the year 2027. The second budget scenario included an average of $323M per year expenditure for rehabilitation repair work. The second budget scenario would result in a stagnant pavement condition level of 75% of roads in fair or better condition, and the backlog of rehabilitation work would not be reduced or eliminated. The third budget scenario included an average of $378M per year expenditure on rehabilitation repair work through the year 2026. This budget scenario would improve the roadway network pavement condition level to 95% of roads in fair or better condition, and completely eliminate the backlog of pavement rehabilitation work.

- Supplementary information contained in the report includes:
  - An explanation of the state-maintained roadway network inventory including PMS inventory management through designated road prioritization categories 1 through 5.
  - A description of the PSI pavement condition rating system that is used to objectively rank pavement conditions for many PMS purposes.
  - Definitions for maintenance and rehabilitation repair strategies as well as the optimal construction timing based on the PSI pavement condition rating system.
  - Commentary regarding the issues that besiege the costs for construction of state highway pavement rehabilitation projects.

BRIDGE PRESERVATION

INTRODUCTION

This report summarizes the Nevada Department of Transportation's (NDOT) efforts to preserve the state's bridge infrastructure which was constructed at an approximate cost of $2 billion. Preserving the bridge infrastructure is one of NDOT's highest priorities. Numerous resources are employed to maintain bridges in structurally sound, functional, and safe condition. Although the focus in the following discussion is on state-maintained bridges, information on bridges maintained by other agencies is also included because these bridges are eligible for federal funds that are administered by NDOT. Moreover, NDOT is responsible for inspecting and reporting the condition of all the bridges open to the public in Nevada, except bridges on federal lands. Bridges on federal lands are inspected and maintained by the federal government.

THE BRIDGE MANAGEMENT SYSTEM

Bridges are managed using the National Bridge Inventory (NBI) data which provides an inventory of bridge condition, location, needed repairs, load limits, susceptibility to flooding, and ownership information. A separate prioritization list enables NDOT to evaluate earthquake susceptibility and risks. This data, together with other factors, allows NDOT to identify preservation priorities and monitor the state's progress toward eliminating the backlog of bridge work.

BRIDGE INVENTORY

There are currently 1,952 public bridges in NDOT bridge inventory. A bridge is a structure spanning 20 feet or more that carries traffic over a depression or obstruction, and includes multiple box culverts and pipes. The maintenance of the bridge inventory is shared by many different organizations: NDOT maintains 1,154 bridges; county and city governments maintain 733 bridges; other local agencies maintain 49 bridges; private entities maintain 10 bridges; and other state agencies maintain 6 bridges.

BRIDGE CONDITION REPORTING

Bridge serviceability is characterized by the use of a numerical evaluation called the Sufficiency Rating. The Sufficiency Rating is used to assess the overall condition of a bridge and assists in the prioritization of bridge preservation efforts. Sufficiency Ratings vary from 0 to 100. A 100 Sufficiency Rating represents a bridge with no deficiencies.

The condition assessment is based upon a physical inspection of the structure. The deleterious effects of age, environment, fatigue, hydrologic scour, settling, and traffic collisions are assessed in the evaluation. Every bridge in Nevada is inspected at least once every two years. Bridges in poor condition are inspected more often. Inspection findings are factored into the determination of the bridge load, condition and Sufficiency Ratings.

The load rating denotes the strength of the bridge compared to design-truck loading. Structures with low condition or load rating may be classified as "Structurally Deficient." Structurally Deficient bridges are not necessarily unsafe or dangerous. Rather, these bridges become a priority for corrective measures, and may be posted to restrict the weight of vehicles using them. If a deficiency is determined to be severe, or the load carrying capacity is extremely low, the bridge would be closed to protect the travelling public.

NDOT adheres to policies and procedures in accordance with the FHWA's requirements. The FHWA included the verbiage discussing Structurally Deficient bridges in a report to Congress entitled "2008 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance." The verbiage was as follows:

"Structurally Deficient bridges are not inherently unsafe. Bridges are considered structurally deficient if significant load-carrying elements are found to be in poor or worse condition due to deterioration and/or damage, or the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point of causing intolerable traffic interruptions. That a bridge is deficient does not imply that it is likely to collapse or that it is unsafe. By conducting properly scheduled inspections, unsafe conditions may be identified; if the bridge is determined to be unsafe, the structure must be closed. A deficient bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies. To remain in service, Structurally Deficient bridges often have weight limits that restrict the gross weight of vehicles using the bridges to less than the maximum weight typically allowed by statute.”

Bridges are considered Structurally Deficient if:

- Significant load-carrying elements are found to be in poor condition.
- Has insufficient load carrying capacity & may have weight limits to remain in service. (See picture below.)
- More susceptible to flooding with significant traffic impacts.

Example of Structurally Deficient Bridge

Bridge assessments also include appraisal ratings, which measure how well the bridge serves the public, or its functionality. Included in the appraisal ratings are reviews of the deck geometry, under-bridge clearances, waterway adequacy, and approach geometry. Within this appraisal evaluation, a substandard structure is termed “Functionally Obsolete.” Like Structurally Deficient bridges, Functionally Obsolete bridges are able to serve the traveling public. However, Functionally Obsolete bridges may be more susceptible to congestion, collisions, or flooding because of the restrictive clearances and geometrics. The 2008 FHWA Report included the following verbiage regarding Functionally Obsolete bridges:

“Functional obsolescence is a function of the geometrics of the bridge in relation to the geometrics required by current design standards. While structural deficiencies are generally the result of deterioration of the conditions of the bridge components, functional obsolescence generally results from changing traffic demands on the structure. Facilities, including bridges, are designed to conform to the design standards in place at the time they are designed. Over time, improvements are made to the design requirements. As an example, a bridge designed in the 1930s would have shoulder widths in conformance with the design standards of the 1930s, but current design standards are based on different criteria and require wider bridge shoulders to meet current safety standards. The difference between the required, current-day shoulder width and the 1930s' designed shoulder width represents a deficiency. The magnitude of these types of deficiencies determines whether a bridge is classified as Functionally Obsolete."

Bridges are considered Functionally Obsolete if:

- Original design geometrics such as shoulder width, lane width, lateral clearance and vertical clearance do not meet current standards. (See pictures below.)
- They may be more susceptible to congestion, collisions, or flooding because of the restrictive clearances and geometrics.

Examples of Functionally Obsolete Bridges

Although Functionally Obsolete bridges are generally not as great a concern as Structurally Deficient bridges, these bridges can also become a priority for corrective measures and may be posted for vehicle size restrictions. Due to the fact that these terms cause undue concern, FHWA is considering changing the terminology. These terms do not imply that the bridge is unsafe. Safety and maintenance concerns are identified during regularly scheduled inspections.

There are 1,154 bridges on the state-maintained system that were reported in 2014. Based on the report, 189 or 16.4% of the bridges are Functionally Obsolete, and 15 or 1.3% of the bridges are Structurally Deficient.

There are 798 bridges that are maintained by Non-NDOT agencies that were reported in 2014. Based on the report, 36 or 4.5% of the bridges are Functionally Obsolete, and 19 or 2.4% of the bridges are Structurally Deficient. FIGURE 25 summarizes the substandard bridge conditions on the state and locally maintained bridge network.

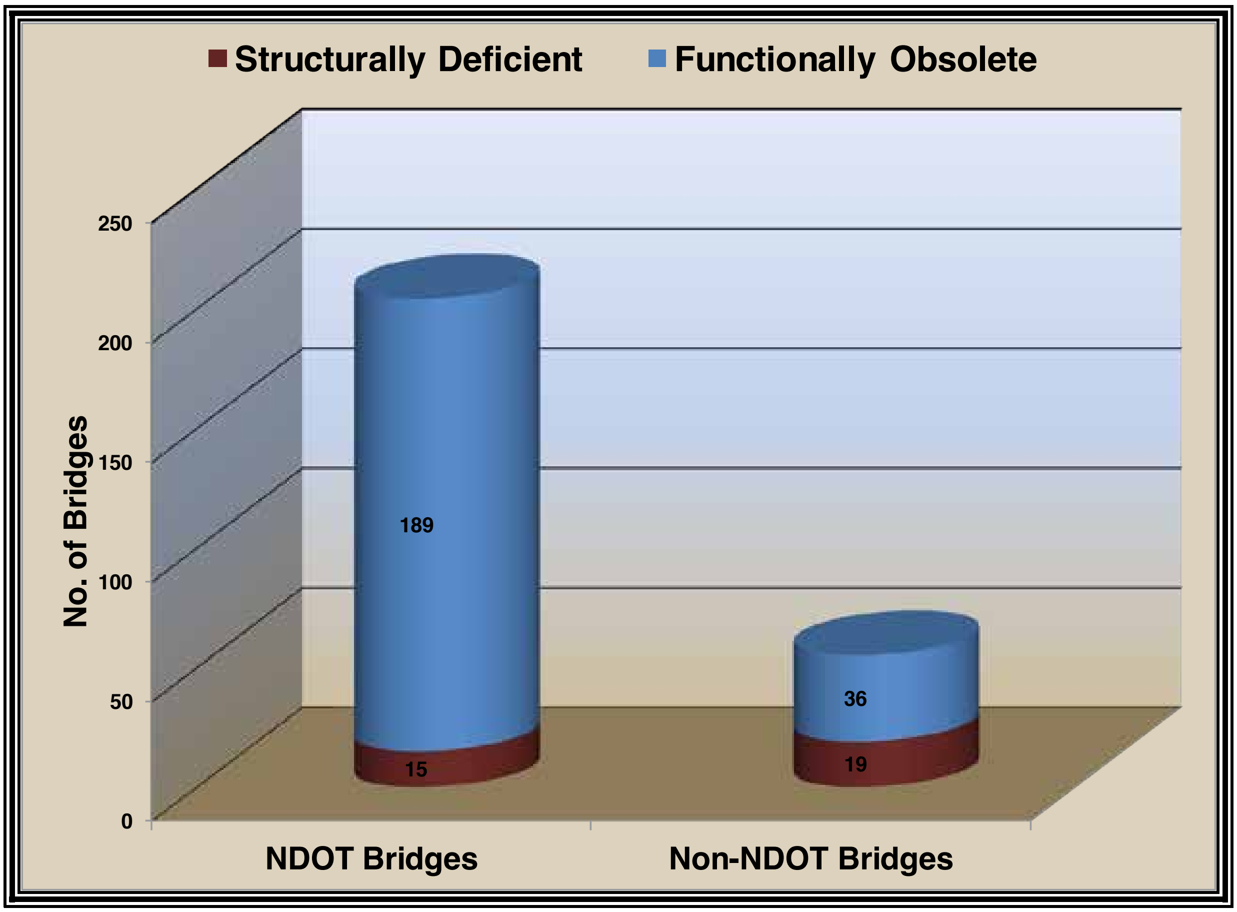


FIGURE 25. Substandard Bridges

FIGURES 26A, 26B, 26C, 26D, and 26E locate the Functionally Obsolete and Structurally Deficient bridges in the State's bridge inventory.

FIGURE 26A. Locations of Structurally Deficient and Functionally Obsolete Bridges

(Bridges categorized as Structurally Deficient or Functionally Obsolete may have less than desirable load carrying capacity or geometrics, but are not considered unsafe. Please refer to the discussion in the Bridge Condition Survey, P.56-58.)

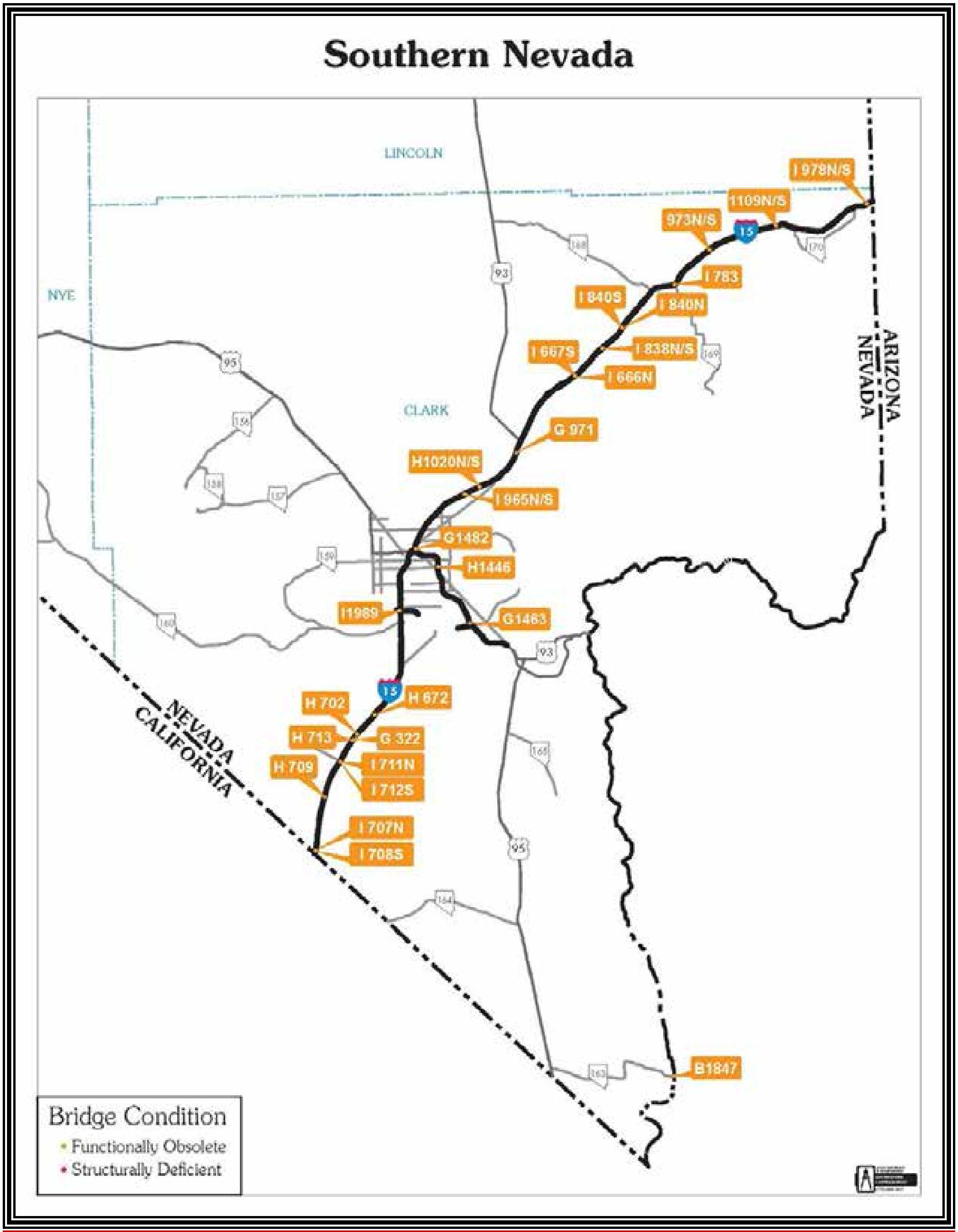


FIGURE 26B. Locations of Structurally Deficient and Functionally Obsolete Bridges

(Bridges categorized as Structurally Deficient or Functionally Obsolete may have less than desirable load carrying capacity or geometrics, but are not considered unsafe. Please refer to the discussion in the Bridge Condition Survey, P.56-58.)

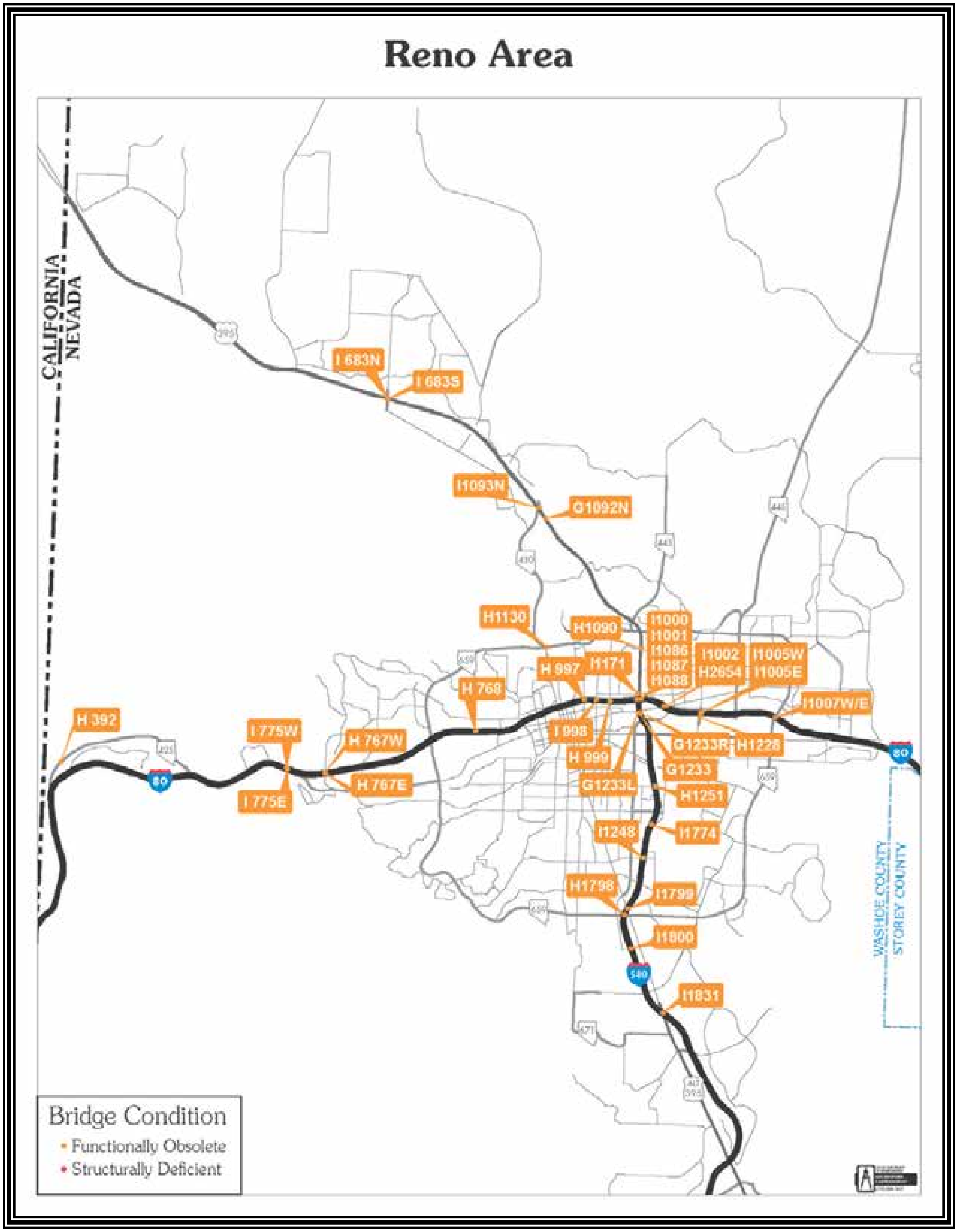


FIGURE 26C. Locations of Structurally Deficient and Functionally Obsolete Bridges

(Bridges categorized as Structurally Deficient or Functionally Obsolete may have less than desirable load carrying capacity or geometrics, but are not considered unsafe. Please refer to the discussion in the Bridge Condition Survey, P.56-58.)

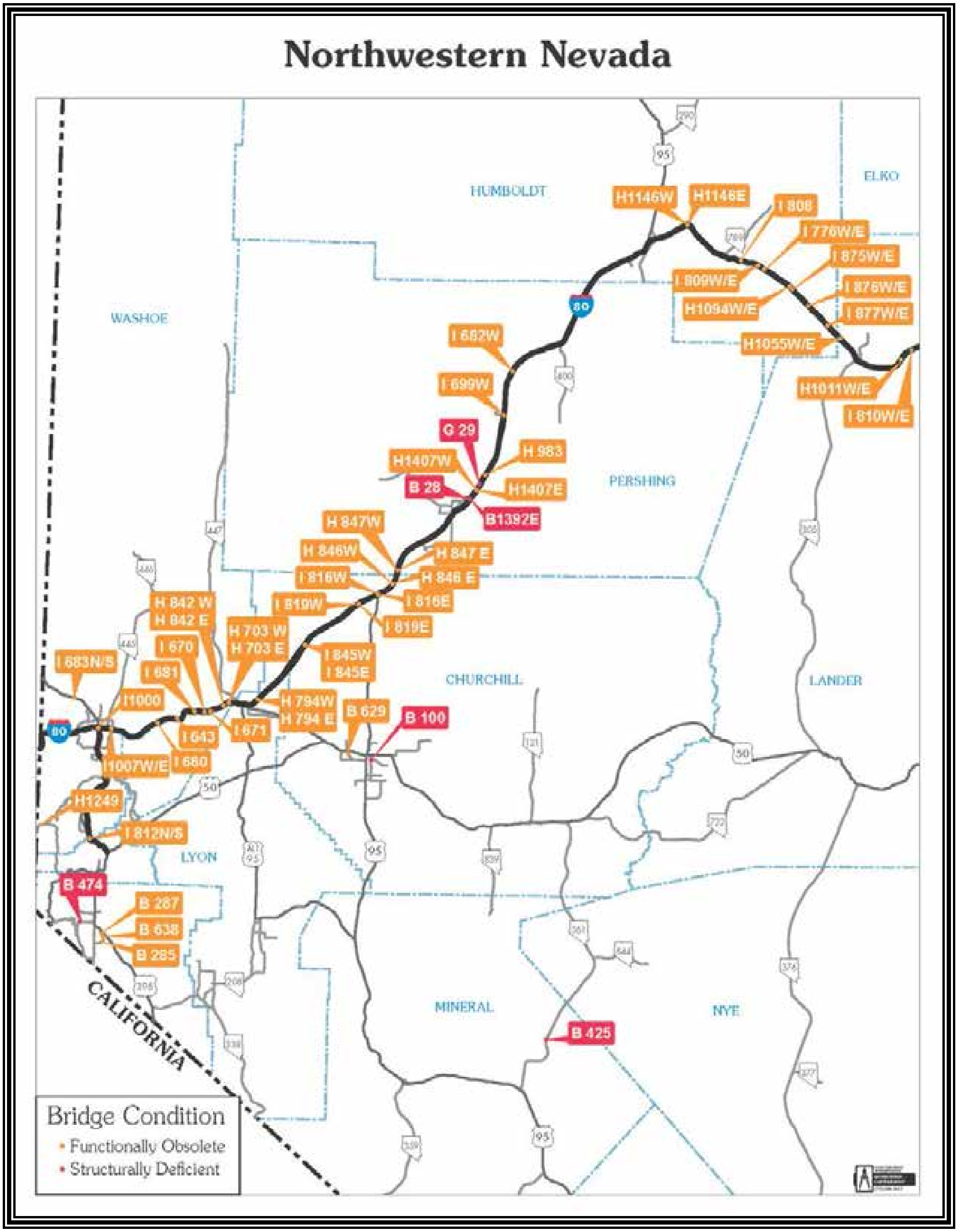


FIGURE 26D. Locations of Structurally Deficient and Functionally Obsolete Bridges

(Bridges categorized as Structurally Deficient or Functionally Obsolete may have less than desirable load carrying capacity or geometrics, but are not considered unsafe. Please refer to the discussion in the Bridge Condition Survey, P.56-58.)

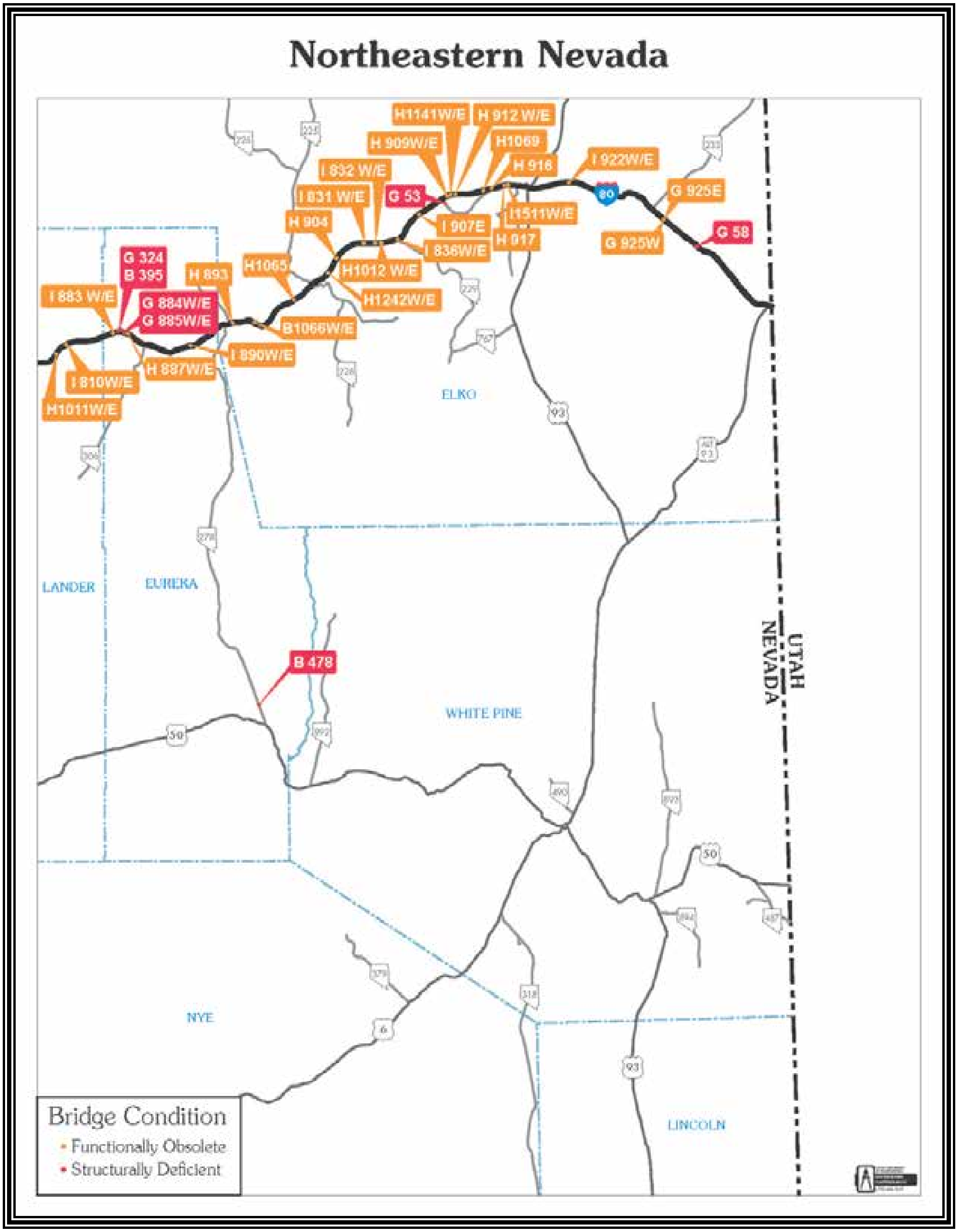


FIGURE 26E. Locations of Structurally Deficient and Functionally Obsolete Bridges

(Bridges categorized as Structurally Deficient or Functionally Obsolete may have less than desirable load carrying capacity or geometrics, but are not considered unsafe. Please refer to the discussion in the Bridge Condition Survey, P.56-58.)

In addition to the sufficiency rating, a bridge's susceptibility to seismic activity is considered when assessing its condition or "health." Nevada is the third most seismically active state in the US. Only California and Alaska are more seismically active. The central and western parts of Nevada are the most active, but southern Nevada does have the potential for damaging earthquakes. NDOT has replaced or retrofitted 135 bridge structures at a cost of over $45 million since it began including seismic activity as a component in the project prioritization process. Additionally, NDOT has placed a high priority on 97 more state-owned bridges in need of seismic retrofitting. The cost to upgrade bridges in need of seismic retrofitting is estimated at $40 million.

Generally, bridges with sufficiency ratings more than 80 are considered "good", ratings of between 50 and 80 can be considered "fair", and ratings less than 50 are considered "poor". FIGURE 27 illustrates the condition of bridges in Nevada. Less than 1 % of the bridges in Nevada are considered to be in poor condition. NDOT goes above and beyond the requirement in inspecting bridges. Railroad crossings and pedestrian structures are not required to be inspected by the Federal Highway Administration. For the sake of public safety, NDOT inspects these bridges when they span NDOT facilities, but does not report these ratings.

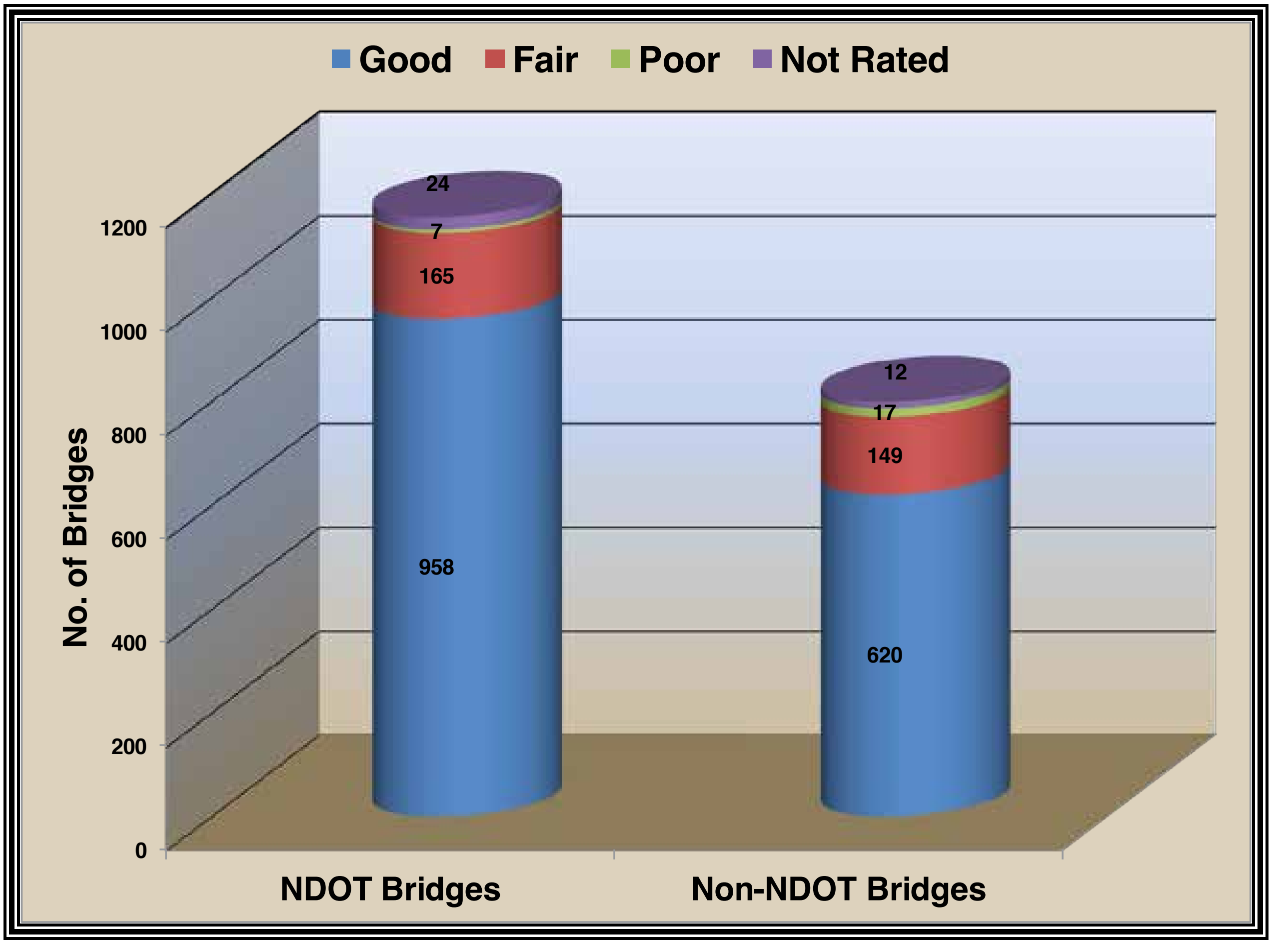


FIGURE 27. Nevada Bridge Conditions

Nevada bridge conditions compare very favorably to the bridge conditions in many other states, even though more than half of NDOT's bridges are over 40 years old. Older bridges generally have a service life of at least 50 years. Recently built bridges are expected to have a design life of 75 years. This prolonged design life was achieved by improvements in material, design, and construction methods. FIGURE 28 shows the age distribution of the State's bridges grouped by decade in which the bridge was originally constructed.

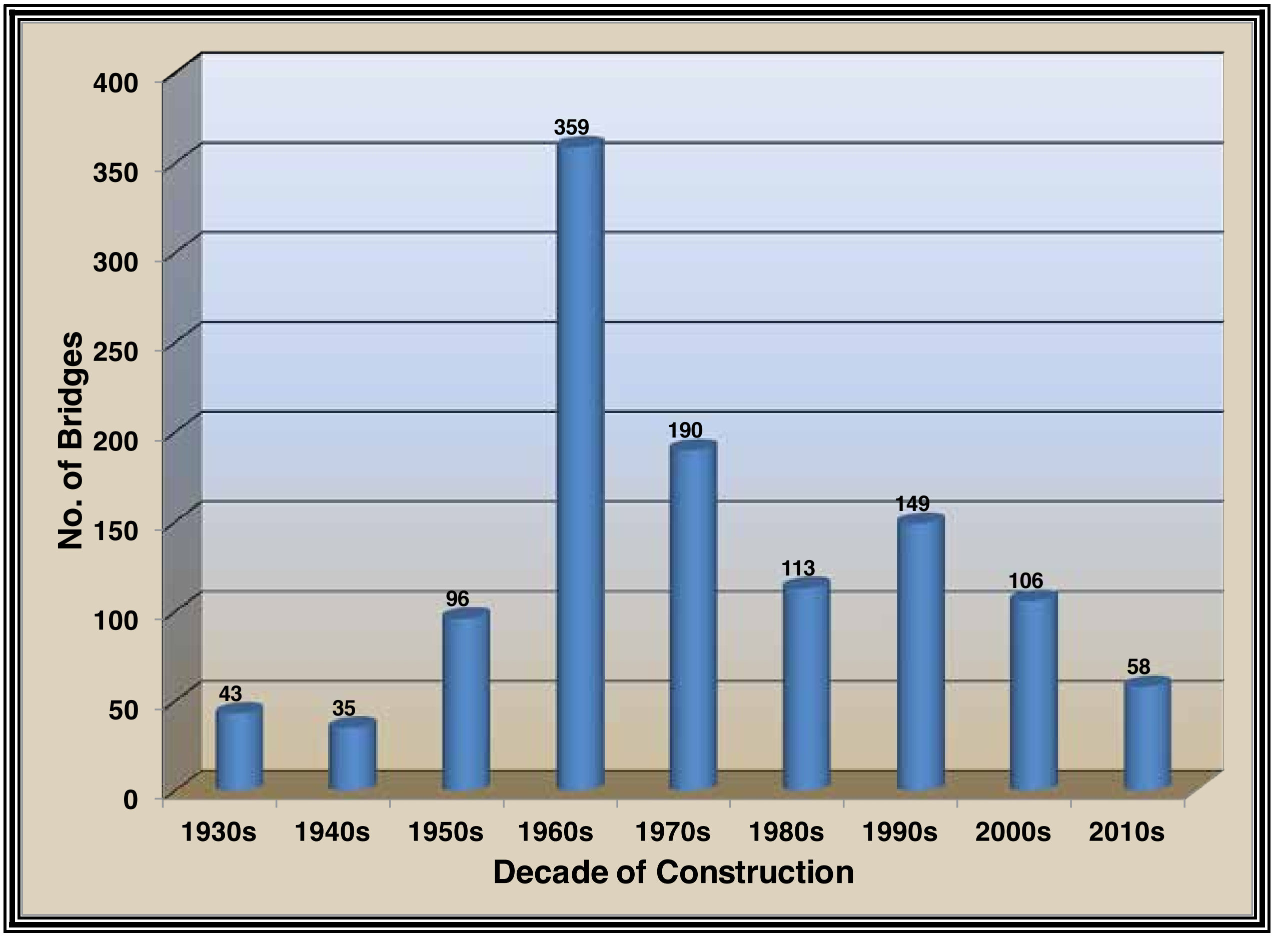


FIGURE 28. NDOT Bridges, Decade of Construction

BRIDGE CONDITION OVER TIME

FIGURE 29 illustrates NDOT maintained bridge conditions grouped by good, fair, and poor categories over time. The number of bridges in each category has remained fairly stable since 1996. FIGURE 30 shows that the number of Structurally Deficient bridges has decreased significantly from 1996 through 2014.

FIGURE 31 demonstrates that the condition of locally-maintained bridges has retained a similar proportion of good, fair, and poor bridge conditions in comparison to the total number of bridges surveyed from 1996 through 2014. These conditions slightly improved over the years despite the fact that there were over two and half times as many bridges surveyed in 2014 as compared to 1996. FIGURE 32 depicts the number of Structurally Deficient non-NDOT bridges over time.

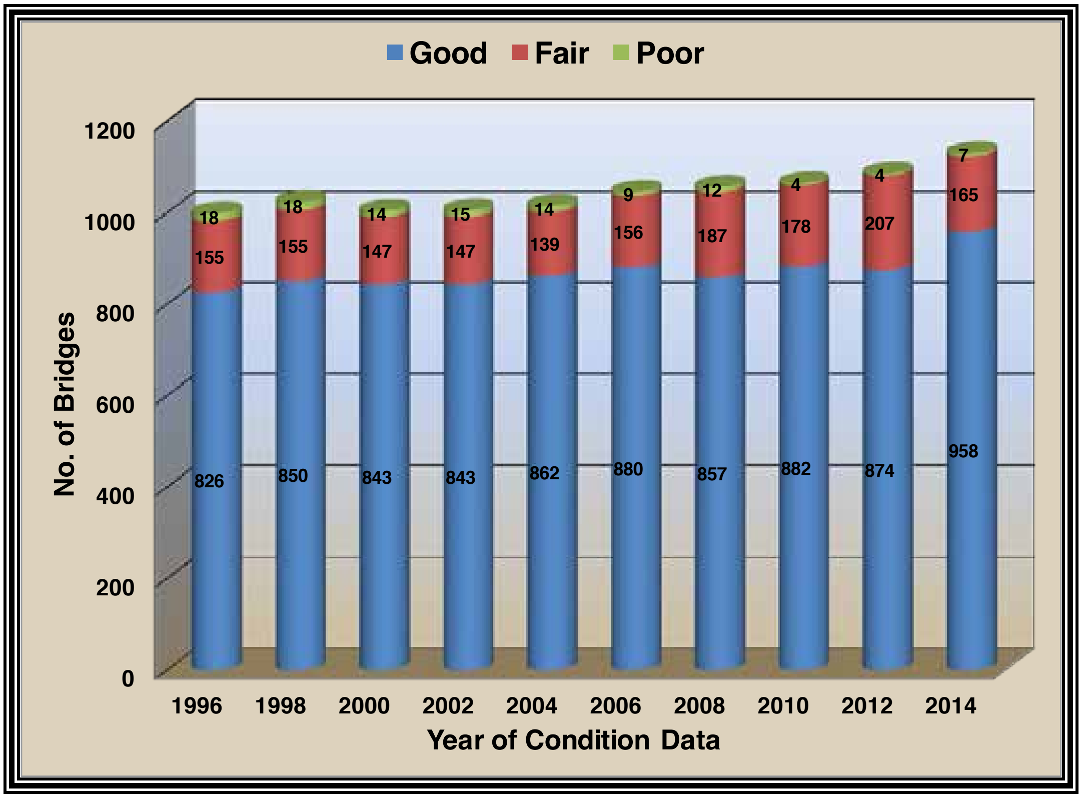


FIGURE 29. NDOT Bridge Conditions over Time

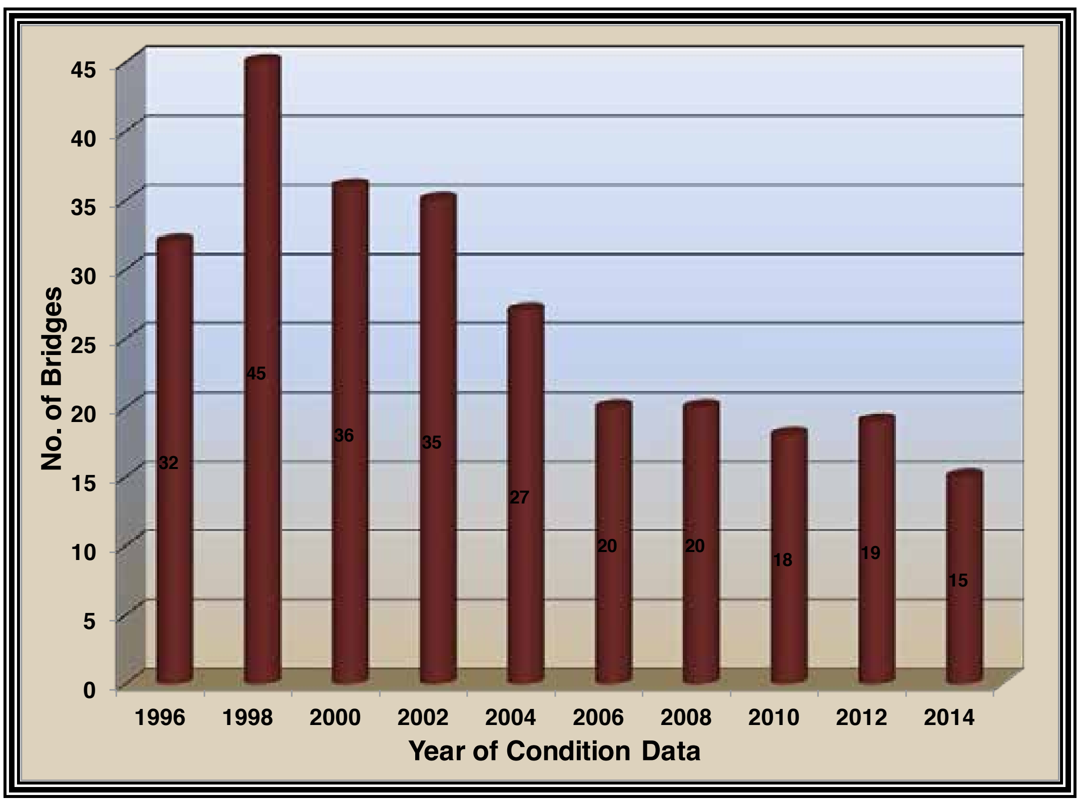


FIGURE 30. Structurally Deficient NDOT Bridges over Time

FIGURE 31. Non-NDOT Bridge Conditions over Time

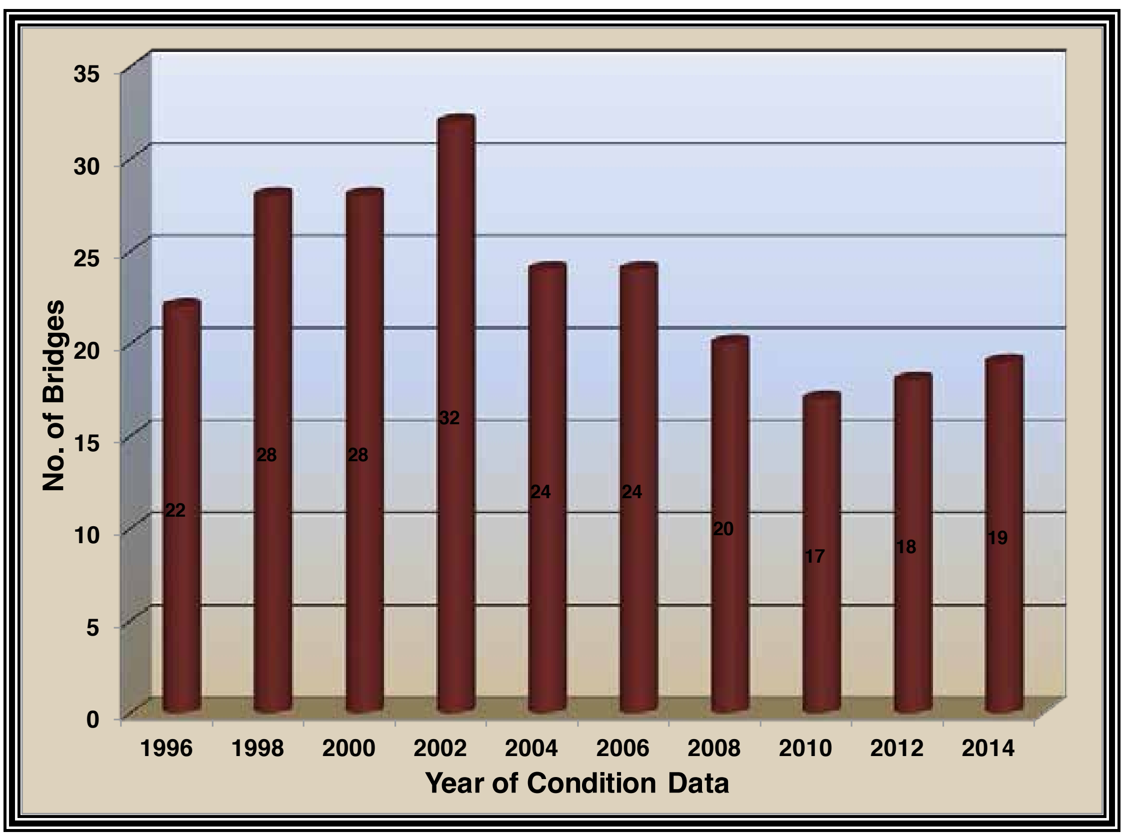


FIGURE 32. Structurally Deficient Non-NDOT Bridges over Time

THE COST OF BRIDGE CLOSURE FOR OWNERS

Structurally Deficient and Functionally Obsolete bridge locations are displayed in FIGURE 26A through FIGURE 26E. The deficient and obsolete bridges are primarily located on I-15 in Las Vegas and I-80 and US-395 in Reno. These routes connect Nevada with the rest of the country and carry hundreds of thousands of automobiles and trucks on a daily basis. Some Nevada Interstates bridges carry more than 100,000 vehicles daily in Northern Nevada urban area and approximately 250,000 vehicles daily in Southern Nevada urban area. If closure of a bridge in rural Nevada was required, the detour might add a few hundred additional miles to the travelers' journeys. A bridge closure and subsequent detours in urban areas will create extensive traffic jams and cause additional vehicle crashes. In both rural and urban bridge closures, the user costs due to travel delay or crashes will be quite significant until the bridge is reconstructed or repaired. Often, user costs due to delay or crashes can be in the hundreds of thousands of dollars per day. The importance of bridge maintenance and rehabilitation cannot be overemphasized.

The economic impacts of a bridge closure and subsequent activities are widespread. For example, the nationally reported bridge collapse in Minneapolis, Minnesota in 2007 had an economic impact on the state totaling $17 million in 2007 and $43 million in 2008 due to user costs. The user costs were estimated at $247,000 per day due to added travel time. The Minneapolis Bridge carried 140,000 vehicles daily before the collapse. This account does not include the compensations to the deceased and injured and the law suit expenses.

PROJECT PRIORITIZATION

The bridge preservation program competes for funding with capacity improvement, operations, pavement, hydraulic, and safety projects and programs. Since available funding is never unlimited, engineers prioritize projects in such a manner that will improve the condition of the entire bridge infrastructure network while maximizing bridge performance and keeping costs to a minimum.

Bridge projects are developed and prioritized based upon bridge condition (Sufficiency Ratings and Structurally Deficient status), essentiality for public needs (NHS status, ADT, and ADTT etc...), and association of other ongoing project work at the same location (pavement rehabilitation work etc…). Seismic retrofit work is prioritized based on a bridge's earthquake vulnerability and importance. The seismic vulnerability of older state-owned bridges has been investigated. Certain bridge types, such as large culverts, do not need seismic retrofit.

STATE BRIDGE PRESERVATION FUNDING

Similar to pavement rehabilitation, bridge work is paid for with fuel taxes and vehicle registration fees. Historically, available funding has only been sufficient to offset annual preventive/corrective maintenance costs.

Federal funds are available for bridge replacement, rehabilitation, or seismic retrofits. Typically, about 80% to 85% of federal funds are spent on bridge replacement and rehabilitation and about 15% to 20% of federal funds are spent on seismic retrofit work.

Under federal funding guidelines, off-system bridges must receive more than $2 million of the available federal funds. Bridges are described as off-system when the bridges are not located on the federal aid highway system. Off-system roads include Rural Minor Collector and Rural and Urban Local roads. Bridges are described as on-system when the bridges are located on the federal aid highway system. The Interstate, Urban Collector, and Rural Minor Arterial roads are included in the federal aid highway system. Of the 1,154 state-maintained bridges, 1,079 bridges are on-system and 75 bridges are off-system. Of the 798 county, city, other local agency, private, and other state agency bridges, 415 bridges are on-system and 383 bridges are off-system.

BIENNIAL EXPENDITURES FOR FISCAL YEARS 2013 TO 2014

TABLE 13 lists approximately $33 million worth of bridge preservation work that NDOT obligated in fiscal years 2013 and 2014.

TABLE 13. Bridge Expenditures in Fiscal Years 2013 and 2014

	Repair Strategy					
Fiscal Year	Preventive Maintenance	Corrective Maintenance	Rehabilitation	Replacement	Seismic Retrofit	Total
2013	$354,154	$7,568,596	$9,025,658	$384,384	$6,440,418	$23,773,210
2014	$439,263	$3,846,964	$0	$4,793,890	$0	$9,080,117
Biennium Total	$793,417	$11,415,560	$9,025,658	$5,178,274	$6,440,418	$32,853,327

TABLE 14 lists the numbers of bridges that NDOT rehabilitated, replaced, or seismically retrofitted in fiscal years 2013 and 2014.

TABLE 14. Numbers of Bridges Rehabilitated, Replaced, or Seismically Retrofitted in Fiscal Years 2013 and 2014

<table>
<tr><th rowspan="2">Fiscal Year</th><th rowspan="2">Entity</th><th rowspan="2">Federal-Aid System</th><th colspan="3">Repair Strategy</th><th rowspan="2">Total</th></tr>
<tr><th>Rehabilitation</th><th>Replacement</th><th>Seismic Retrofit</th></tr>
<tr><td rowspan="3">2013</td><td>State</td><td>On-System</td><td>12</td><td></td><td>11</td><td>23</td></tr>
<tr><td rowspan="2">Local/Other</td><td>On-System</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Off-System</td><td></td><td>1</td><td>2</td><td>3</td></tr>
<tr><td rowspan="2">2014</td><td>State</td><td>On-System</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Local/Other</td><td>Off-System</td><td></td><td>3</td><td></td><td>3</td></tr>
<tr><td colspan="3">Total</td><td>12</td><td>4</td><td>13</td><td>29</td></tr>
</table>

BACKLOG OF BRIDGE PRESERVATION WORK

Ideally, bridges maintained in fair or good condition for as long as possible will extend bridge service life and reduce the need for bridge replacement. Currently, a backlog of approximately $119 million exists for bridge preservation work. Bridge preservation includes repair strategies such as corrective maintenance, rehabilitation, and replacement work. TABLE 15 lists the backlog of currently needed bridge repair work. Preventive maintenance needs are not included in the bridge project backlog because this work is performed using routine-maintenance funds.

TABLE 15. Backlog of Bridge Work, State Bridges 2015
(Based on 2014 Condition Data)

System	Repair Strategy Required				Total
	Corrective Maintenance	Rehabilitation	Replacement	Seismic Retrofit	
Principal Arterial - Interstate	$19,800,000	$9,280,000	$3,600,000	--	$32,680,000
Principal Arterial - Non-Interstate	$8,360,000	$6,400,000	--	--	$14,760,000
Minor Arterial	$3,480,000	$3,840,000	$6,300,000	--	$13,620,000
Major Collector	$4,680,000	$3,520,000	--	--	$8,200,000
Minor Collector & Local	$2,000,000	$3,360,000	$4,500,000	--	$9,860,000
System Not Identified	--	--	--	$40,000,000	$40,000,000
Total	**$38,320,000**	**$26,400,000**	**$14,400,000**	**$40,000,000**	**$119,120,000**

PRESENT FUNDING VERSUS NEEDED FUNDING

The majority of NDOT maintained bridges were built prior to the 1980's. These older bridges typically have a useful service life of about 50 years, although bridges that were built more recently are expected to have a useful service life of 75 years. It is anticipated that most bridges approaching 50 years old will require major rehabilitation or replacement relatively soon. FIGURE 33 illustrates that many NDOT maintained bridges are approaching 50 years old and may be reaching the end of their useful service life. The estimated cost to replace all of the NDOT maintained bridges that are currently over 50 years old is $470 million. Because of the large number of bridges approaching 50 years old, the estimated cost to replace all of the NDOT maintained bridges that will be over 50 years old ten years from now is $1.5 billion.

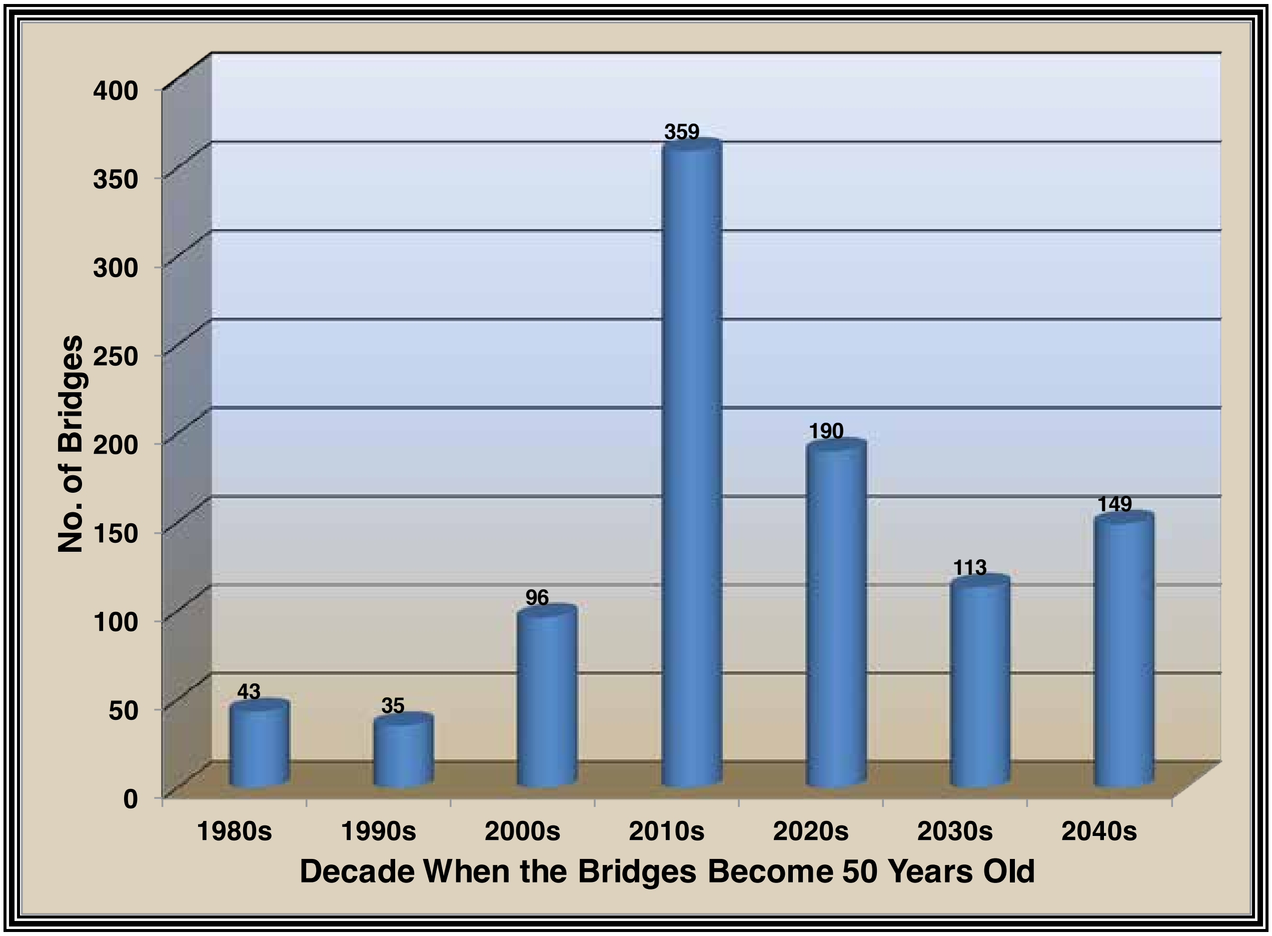


FIGURE 33. Number of 50 Year Old Bridges by Decade

Replacing all of NDOT's bridges over 50 years old is not practical to accomplish in five years or even ten years time. The strategy to forecast future bridge preservation costs is to replace the bridges gradually over the next fifty years, before the bridges reach 100 years old. Replacing 2% of the bridges over 50 years old each year will allow for a gradual replacement of all the old bridges, but does not replace the bridges quickly enough to decrease the number of bridges over 50 years old. Since NDOT already has 339 bridges over 50 years old, replacing 1 bridge a year is a replacement rate of less than 0.3% which is inadequate. Gradually increasing the replacement rate to 2% over the next ten years will ultimately require replacing 10 bridges a year because NDOT will have approximately 520 bridges over 50 years old at that time. If a 2% annual replacement rate is maintained for the subsequent ten years the trends will begin to stabilize; Twenty years from now NDOT would have approximately 580 bridges over 50 years old and would be replacing 12 bridges each year.

The current backlog of bridge preservation work is estimated to be approximately $119 million. The $11 million anticipated for bridge preservation work annually is not expected to be adequate to reduce or maintain the existing backlog. The current $15 million average annual need for bridge preservation work is expected to increase rapidly in the near future as the average age of NDOT maintained bridges increases. TABLE 16 lists the bridge costs, funds and backlog for 12 years starting FY 2015 assuming the bridge preservation funding remains at the anticipated level. FIGURE 34 illustrates the anticipated costs, funds and backlog growth of the bridge preservation based on TABLE 16 data. Under the present funding plan, the current $119 million bridge backlog is expected to gradually increase to $338 million in FY 2027.

TABLE 16. Anticipated Bridge Backlog, Costs, and Funds
State-Maintained System (in millions of dollars)

	Bridge Preservation Costs * (Normal Annual Deterioration Costs)			Bridge Preservation Funds ** (Funds Planned for Preservation Work)				
Fiscal Year	Corrective Maintenance, Rehabilitation, Replacement & Reconstruction	Preventive Maintenance	Total	Corrective Maintenance, Rehabilitation, Replacement & Reconstruction	Preventive Maintenance	Total	Extra Funds Needed ***	Backlog of Bridge Work
2015	14.7	0.4	15.1	11.0	0.4	11.4	3.7	**119.1**
2016	17.2	0.4	17.6	11.0	0.4	11.4	6.2	**122.8**
2017	17.9	0.4	18.3	11.0	0.4	11.4	6.9	**129.0**
2018	20.8	0.4	21.2	11.4	0.4	11.9	9.3	**135.9**
2019	26.0	0.4	26.5	11.9	0.4	12.3	14.1	**145.3**
2020	29.3	0.5	29.7	12.4	0.5	12.8	16.9	**159.4**
2021	32.7	0.5	33.2	12.9	0.5	13.3	19.8	**176.3**
2022	36.2	0.5	36.7	13.4	0.5	13.9	22.8	**196.1**
2023	39.8	0.5	40.3	13.9	0.5	14.4	25.9	**218.9**
2024	43.6	0.5	44.1	14.5	0.5	15.0	29.1	**244.9**
2025	47.5	0.5	48.0	15.1	0.5	15.6	32.4	**274.0**
2026	47.1	0.5	47.6	15.7	0.5	16.2	31.4	**306.4**
2027								**337.8**

* Inflation assumed at 3.00% per annum.
** Revenue growth rate assumed is 4.00% per annum.
*** Funds needed to maintain current backlog

Note: Backlog of Bridge work is as of beginning of fiscal year; preservation costs are those incurred during the fiscal year; and preservation funds are those that are available during the fiscal year.

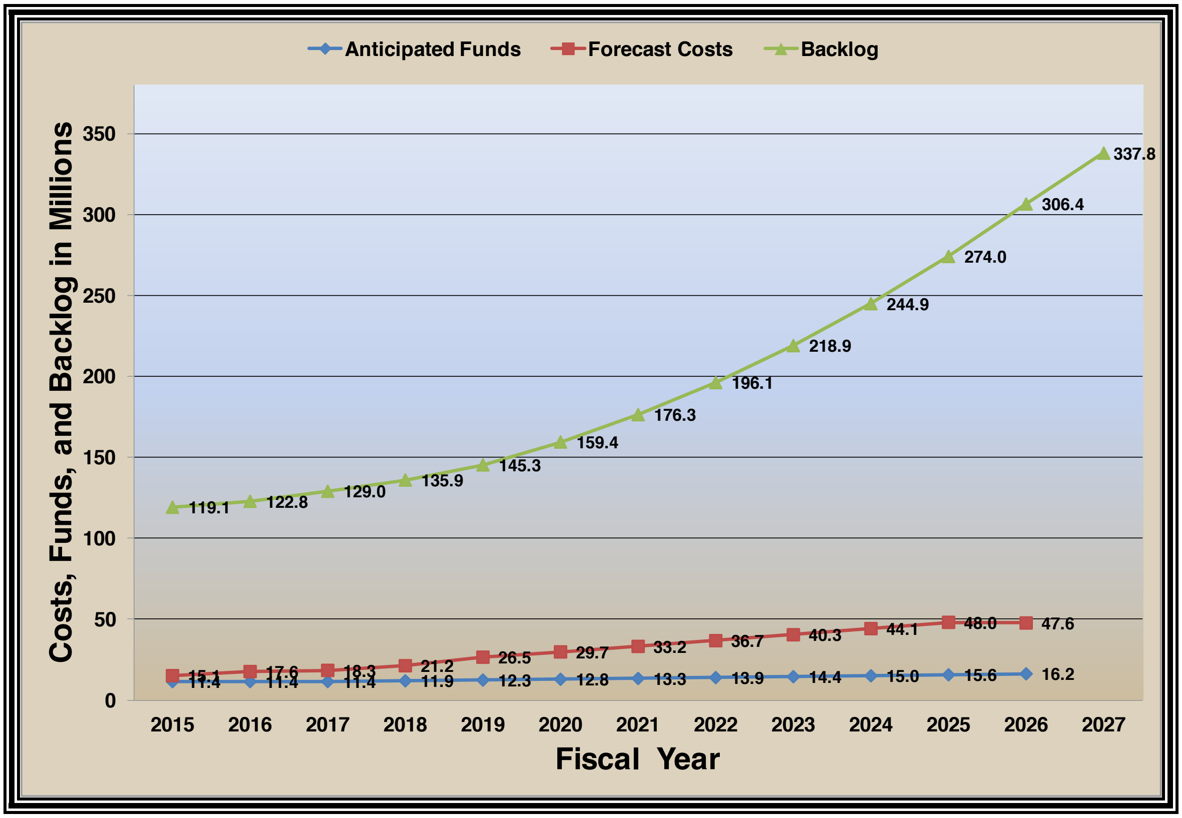


FIGURE 34. Anticipated Costs, Funds and Backlog of Bridge Preservation Work

BRIDGE PRESERVATION ACTION PLAN

NDOT's bridge preservation action plan is similar to plans detailed in previous State Highway Preservation Reports. The action plan is to preserve Nevada's public bridges in good condition by implementing the following bridge management practices:

- Replace or rehabilitate Structurally Deficient bridges before the bridges become hazardous or overly burdensome to users.
- Seismically retrofit bridges that do not meet current seismic standards.
- Apply timely corrective measures to existing structures.
- Apply effective preventive maintenance strategies to existing structures.

BRIDGE PRESERVATION SUMMARY

Nevada has enjoyed the benefit of good bridge conditions as compared to the bridge conditions in many other states for quite a while. Nevada's preservation program and favorable environment has contributed to the good results. However, NDOT's bridge assets are aging. After a useful life of 50 years, many of NDOT's older bridges will require replacement. NDOT's current bridge replacement rate of 1 to 2 bridges a year will not keep up with the large number of bridges reaching the end of their useful life. Increased spending in bridge corrective maintenance, rehabilitation, and replacement is necessary to preserve NDOT's bridge assets and to avoid costly bridge closures and emergency bridge replacements. If bridge preservation spending is increased to match the forecast costs shown in FIGURE 34, the current backlog of bridge work can be maintained. If the funding is gradually increased as shown over the next ten years, the forecast bridge preservation cost is expected to level off at approximately $48 million per year.

STATE HIGHWAY PRESERVATION REPORT

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