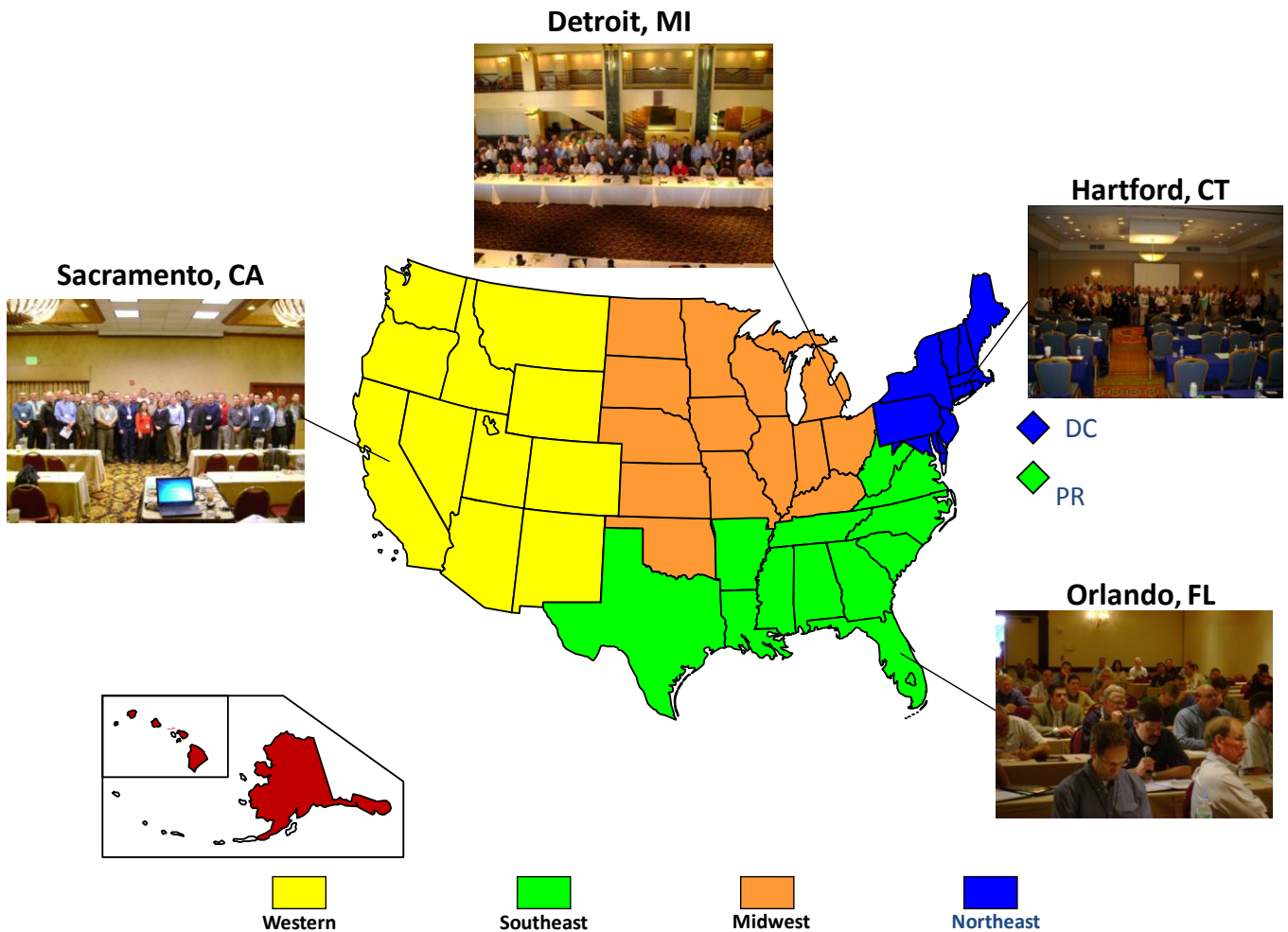


Bridge Preservation Partnership Roundtable Question Responses for 2010 Report



**AASHTO Transportation System Preservation
Technology Services Program
January 2011**

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Background

The AASHTO Transportation System Preservation Technology Services Program (TSP2) has sponsored a series of Bridge Preservation Partnership (BPP) meetings held in four regions of the country in 2010. These were the first ever AASHTO TSP2 sanctioned bridge preservation partnership meetings that will be repeated annually.

The 2010 AASHTO TSP2 bridge preservation partnership meetings were supported through voluntary fund contributions from member states, funding from the FHWA Office of Asset Management and is supported by industry including the Bridge Preservation Association as well as academia. Future support for the voluntary fund is highly recommended.

Introduction

This report is a compilation of the responses to questions provided by participant states in preparation for roundtable discussions held for the Southeastern States in April 2010, Northeastern states in September 2010, Midwestern states in October 2010 and the Western states in December 2010. Thanks to those member states that provided responses to these questions in advance of these regional meetings. We appreciate the support for these meeting in general and the roundtable discussions in particular.

Agenda Development

Participant states developed and agreed in advance of each regional meeting to the questions being asked and topics discussed. Reader should note that questions may differ from one regional meeting to the next. Each regional steering committee had the benefit of information gleaned from earlier meetings and in some instances adopted and or changed questions for subsequent meetings. Issues may differ in each region of the country so the steering committees would customize their agendas and questions based on regional concerns and needs. Some were similar, some distinct.

Report Organization

In the tables that follow, compilation of questions asked and responses provided are documented within this report in sequential order. The following table is a question matrix for each of the four regional groups.

Questions used for each Bridge Preservation Partnership meetings

Southeast (SE)	Northeast (NE)	Midwest (MW)	West (W)
1. Has your State adopted a particular definition for bridge preservation? If so, please provide the definition.	1. Has your State adopted a particular definition for bridge preservation?	1. Has your State adopted a particular definition for bridge preservation? If so, please provide the definition.	
			1. What are your Bridge preservation activities? ¹
2. How does your State		2. How does your state	2. How does your state

¹ See appendix D for Western region State responses to this question.

Southeast (SE)	Northeast (NE)	Midwest (MW)	West (W)
identify bridge preservation needs? Please explain the process.		identify bridge preservation needs? Please explain the process.	identify bridge preservation needs? Please explain the process.
3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on an as needed basis?	2. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on an as needed basis?	3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on an as needed basis?	3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on an as needed basis?
4. Has your state established performance goals for your bridge program (goals and measures)? If so, a) What are your state goals and measures? b) How did you go about establishing these measures?		4. Has your state established performance goals for your bridge program (goals and measures)? If so, a) What are your state goals and measures? b) How did you go about establishing these measures?	4. Has your state established performance goals for your bridge program (goals and measures)? If so, a) What are your state goals and measures? b) How did you go about establishing these measures?
5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	3. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?
6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	4. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?
		7. Does your agency have an approved systematic process for bridge preservation? If no, why? ²	
		8. How do you determine the right fix for a bridge? Do you do a detailed scope? Including cost comparisons? Including	

² See appendix C for Midwest region State responses to this question.

Southeast (SE)	Northeast (NE)	Midwest (MW)	West (W)
		life cycle cost comparison? ³	
7. How does your state prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	5. How does your state prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?		7. How does your state prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?
8. How do you capture/assess work accomplishment?	6. How do you capture/assess work accomplishment?	9. How do you capture/assess work accomplishment?	8. How do you capture/assess work accomplishment?
9. What research needs do you believe is needed in the area of bridge preservation?	7. What research needs do you believe is needed in the area of bridge preservation?	10. What research needs do you believe is needed in the area of bridge preservation?	9. What research needs do you believe is needed in the area of bridge preservation?
			10. Is the majority of your bridge maintenance work accomplished by contract or state forces? ⁴
			11. Approximately what percent of your maintenance expenditures are for reactive or corrective maintenance versus cyclic or preventive maintenance activities? ⁵
			12. What barriers does your state have regarding the use of new bridge preservation products? ⁶

The question and responses that follow have been compiled following a convention which shows all of the State responses nationally to a particular question. Where blanks appear a different question was used for that particular State. Appendices A through D provide the question and response by region of the country. For instance appendix A covers the Southeast Region, appendix B covers the Northeast Region and so on.

Meeting(s) Documentation

Each roundtable discussion and meeting presentations that occurred prior to them was video recorded during each regional meeting and can be viewed at the TSP2 website which can be found at: www.tsp2.org.

³ See appendix C for Midwest region State responses to this question.

⁴ See appendix D for Western region State responses to this question.

⁵ See appendix D for Western region State responses to this question.

⁶ See appendix D for Western region State responses to this question.

This question was asked at the SE, NE, and MW BPP meetings

1. Has your State adopted a particular definition for bridge preservation?	
AK	Please note that this question was not asked at their regional meeting.
AL	We do not have a particular definition, but preservation activities include: bridge painting, joint sealing, bearing replacement and deck sealing.
AR	No.
AZ	Please note that this question was not asked at their regional meeting.
CA	Please note that this question was not asked at their regional meeting.
CO	Please note that this question was not asked at their regional meeting.
CT	We haven't developed a bridge preservation definition. We have developed a Systematic Bridge Preventative Maintenance Program in coordination with our FHWA Division to use federal HBP funds as a means of extending the useful life of our bridges and we have developed eligible activities. The activities are element focused.
DC	<i>A program employing a network level, long term strategy that enhances bridge performance by using integrated, cost-effective set of practices that maintain, or restore the physical condition of bridge structure elements.</i>
DE	We have not adopted a formal definition for bridge preservation.
FL	Our non-official working definition is: Design, construction, maintenance and repair activities intended to extend the service life of our bridges and minimize life cycle costs.
GA	No. I am waiting to see what the AASHTO Bridge Committees propose and the results of this survey before I make a recommendation to GDOT Management.
HI	Please note that this question was not asked at their regional meeting.
IA	No.
ID	Please note that this question was not asked at their regional meeting.
IL	No, our state has not adopted a definition of bridge preservation.
IN	Yes, but not official yet, awaiting signature of INDOT and FHWA (Indiana Division Office) Executives. "Bridge and Culvert Preservation consists of activities performed on bridge or culvert elements or components that aim to prevent, delay, or mitigate deterioration". "Preservation actions may be scheduled or condition driven". "Preservation actions do not entail structural or operational improvements of an existing asset beyond its originally designed strength or capacity".
KS	Bridge preservation: activities performed on bridge elements or components that aim to prevent, delay, or reduce deterioration. Bridge preservation activities do not entail structural or operational improvements of an existing bridge asset beyond its originally designed capacity.

1. Has your State adopted a particular definition for bridge preservation?	
KY	No.
LA	No.
MA	We define preservation as work designed to address known deficiencies and to extend the useful service life of the bridge.
MD	We do not have a specific definition for bridge preservation.
ME	Not officially adopted.
MI	Michigan DOT defines “bridge preservation” rather broadly as follows: Preservation - Programmed work activities that restore or improve element integrity and ensure network safety and serviceability. A key assumption of the recommended strategies outlined below is that the identified maintenance activities are being performed. The following categories contain the core activities that impact the network condition, projects will be selected and prioritized with a Regional perspective. Capital Scheduled Maintenance (CSM) - Scheduled maintenance activities that maintain existing serviceability, and reduce deterioration rates on “good” structures. Work activities typically would include superstructure washing, flushing drainage systems, minor concrete patching and repairs, spot painting, concrete sealing, and joint repairs. Scheduled maintenance activities prevent “good” structures from becoming “fair” structures. Capital Preventive Maintenance (CPM) - Scheduled work activities that restore element integrity, and reduce deterioration rates on “fair” structures. Work activities typically would include joint replacement, pin and hanger replacement, zone and complete painting, scour protection, deck patching, thin overlays, and pedestrian fencing. These work activities have been modeled to equate to a “+1” condition rating improvement for the element(s) addressed. Preventive maintenance prevents “fair” structures from becoming “poor” structures. Any fix life realized is a function of the element being restored. Rehabilitation (R) - Programmed work activities that improve element integrity. Work activities typically would include deep overlays, superstructure repair (beam end repairs, bearing rehabilitation, diaphragm repair/replacement), extensive substructure repair, substructure replacement. Any fix life realized is a function of the element being improved. Rehabilitation work activities improve condition ratings to “fair” or “good”. Replacement (R) - Programmed deck replacement, superstructure replacement, or full structure replacement. Replacement work activities improve condition ratings from “poor” to “good”.
MN	Bridge Preservation is the repair or protection against future deterioration of a structure or an element. It extends the service life of a bridge without significantly increasing load carrying capacity or improving geometrics. Examples of bridge preservation projects

1. Has your State adopted a particular definition for bridge preservation?	
	include painting (spot, zone or complete), bridge joint repair/replacement, deck overlays, rail repair/replacement, scour countermeasures, minor superstructure or substructure repair. Bridge Preservation Activities should not exceed 30% of the cost of a new bridge.
MO	MoDOT has no formal bridge preservation definition. However, our Bridge Maintenance staff defines it as, “extending the life of a bridge or bridge component through appropriate maintenance or repair strategies”.
MS	No.
MT	Yes- preservation is defined as extending the life of the bridge without adding capacity.
NC	NCDOT and FHWA have a written agreement in the “Federal Highway Administration’s National Environmental Policy Act Requirements for North Carolina Department of Transportation’s Bridge Preservation,” regarding approved bridge preservation activities. This agreement was approved and signed by the Division Administrator, April 11, 2008. <i>“The Bridge Preservation Program (BPP) is a planned strategy of cost effective treatments to a bridge that prevent/retard future deterioration without increasing structural or traffic capacity. The BPP is to be used in conjunction with an effective bridge maintenance program to extend the useful life of a bridge. When implemented, the BPP will provide a preservation schedule for each type of bridge to be used as a guide to ensure preservation activities are completed in a timely manner to keep the bridge from having a reduction in the bridge’s level of service.</i>
ND	No.
NE	No, Nebraska does not have a formal definition for bridge preservation.
NH	We have not adopted a specific definition. Our definition would be similar to the following: Bridge Preservation includes those activities that maintain and extend the useful life of a structure. These activities include periodic maintenance, repairs to maintain or restore capacity and function, and rehabilitation that does not increase capacity, but extends the life of the structure.
NJ	The New Jersey Department of Transportation’s Bridge Preventive Maintenance Program is intended to extend the life of bridges in good-standing condition by applying cost-effective preventive maintenance treatments.
NM	Please note that this question was not asked at their regional meeting.
NV	Please note that this question was not asked at their regional meeting.
NY	No. Generally is considered synonymous with bridge maintenance – which ends with deck replacement.
OH	A term used in Bridge Preservation Funding - The goal of the preservation funding process is to achieve and maintain “steady-state” conditions – relatively low and stable level of deficiencies small enough that a predictable rate of preventive maintenance and regular repairs can sustain the desired conditions. While in the maintenance section of the Ohio DOT does not use a Preservation term but uses a preventive maintenance definition. Preventive maintenance can be defined as the act of keeping a structure in its as-built condition and/or protecting it from inevitable deterioration due to environment, traffic vibration and deicing chemicals. In some cases, structures are built with flaws such as cracks in concrete which require action to prevent moisture and chlorides from infiltrating the micro-structure and causing early

1. Has your State adopted a particular definition for bridge preservation?	
	deterioration.
OK	No
OR	Please note that this question was not asked at their regional meeting.
PA	Actions to extend the life of a bridge without improving bridge functionality or performance (keeping good bridges good). The following bridge preservation items below are eligible for Federal Funding based on our programmatic agreement: a) Scour countermeasures; b) Expansion dams; c) Beam end repairs and restoration; d) Fatigue and fracture retrofits; e) Bridge bearings and supports; f) Spot/zone painting; g) Deck restoration and overlays; h) Painting; i) Approach slabs
PR	The PRHTA has not adopted a particular definition for bridge preservation because our agency does not and is not in charge of the preservation and maintenance program. The DTPW (Department of Transportation and Public Works) is the agency in charge of the preservation and maintenance program. There program is based as on three criteria's: Routine/scheduled, maintenance, condition-based emergency (an inspection driven action, actions are specific to the situation after inspection and evaluation of condition, for safety and/or to keep bridge open.), maintenance & rehabilitation (could involve any or all three major structures components after inspection and evaluation condition is performed). The information for there preservation and maintenance program of is based and submitted by the PRHTA Bridge Inspection Office.
RI	No.
SC	No formal definition but we have adopted an informal "Fix-it-First" philosophy. Basically we want to lengthen the service life while extending the use of our funding levels.
SD	We do not have a formal definition. We view it as any type of periodic work needed to reach and extend beyond expected structure life.
TN	TNDOT doesn't have a particular definition, but our Office believes that <i>repairing</i> bridges is "preserving" the bridge for the future.
TX	The Maintenance Operation Manual states that " <i>the structural and operational characteristics of all highway bridge structures should be preserved as near as practical to the originally constructed or subsequently modified conditions</i> ".
UT	Please note that this question was not asked at their regional meeting.
VA	VDOT: VDOT considers preservation and maintenance as a single program. VDOT has a definition for maintenance and for specific maintenance categories. The following are the maintenance categories and their respective definitions: Ordinary Maintenance And Condition Based Preventive Maintenance: Day-to-day maintenance activities to preserve and correct minor defects of transportation assets during their expected service life and which contribute to the safety and comfort

1. Has your State adopted a particular definition for bridge preservation?	
	of the traveling public. Ordinary maintenance is performed to care for and maintain the highway and associated assets so that it retains its original intended use. This includes maintenance work on assets exhibiting wear from weather, or work designed to prevent further deterioration and damage. Ordinary maintenance includes, but is not limited to, tractor mowing, litter pick-up, premix patching, and all maintenance inspections. Planned Preventive Maintenance (PM): Any planned activity⁷ performed in advance of a need for repair or in advance of accumulated deterioration so as to avoid such occurrences and reduce or arrest the rate of future deterioration. The activities may correct minor defects as a secondary benefit. PM is 1) planned, 2) cyclical, AND 3) not condition based. PM generally is designed to extend the useful life of the asset. * Note: PM does not add structural capacity for pavements. Repair/Corrective Maintenance: Any work that is required to return a damaged or deteriorated asset to design functionality and capability. Restorative / Replacement Maintenance: The replacement or complete restoration of assets that cannot be repaired. If the asset no longer functions, is obsolete, or does not conform to current Federal or State mandates for design performance, then it must be replaced or overhauled. Examples include work performed on pavements, bridge decks, or other major assets to restore the asset to its original or reconstructed design condition, as practicable, or replaced to its originally functioning service level. Major Rehabilitation: This maintenance work applies to bridges and pavements only. Work in this category includes full depth reconstruction where the entire pavement asset is removed and replaced. The work may also include restoring structural integrity or correcting major safety defects for bridges and pavement. Examples include restoring and/or strengthening the load carrying capacity of a bridge, recycling or reworking existing materials to maintain their structural integrity, and reworking or strengthening the base or sub-base of a pavement section.
VT	Vermont does not have a specific definition for bridge preservation however we are moving towards doing preventive maintenance projects (membrane and pave, cleaning and applying protective coatings to steel, etc) aimed at extending a bridges useful life as well as targeted repair projects to reduce the number of deficiencies.
WA	Please note that this question was not asked at their regional meeting.
WI	WISDOT established the long term goal to maintain structures in State as follows: Provide bridges which are cost effective, maximize service life with minimal maintenance and meet the overall expectations of the traveling public with respect to comfort, convenience and safety. To meet the goal, WISDOT is having a strategic investment plan to maintain 90 percent of our bridges in “fair or good” condition by 2015. NBI rating of 5

⁷ Applies to pavement, bridge and drainage assets only.

1. Has your State adopted a particular definition for bridge preservation?	
	or more is considered as fair or good condition in Wisconsin. This statement of goals can be found in the 2003 Draft agreement for the use of Federal funds for preventive maintenance of structures. WisDOT's vision for preservation and maintenance is a Wisconsin where transportation system investment benefits are maximized through cost effective strategies that foster:: Ongoing routine maintenance Long-term preservation Continued availability of transportation services statewide
WV	As per the "Agreement For The Use Of Federal Funds For Preventive Maintenance Of Highway Structures in West Virginia" signed on June 16, 2009 between FHWA and WVDOH - Preventive maintenance for structures is the <i>planned strategy of systematic and cost-effective application of treatments to existing bridge elements that preserves or improves the current condition of such elements, retards future deterioration, and maintains or improves the functional condition of the system without increasing structural capacity</i>. The treatments require timely placement to ensure the maximum benefit to the element. The goal is to obtain the greatest benefit with the smallest level of investment. The planned result is an increase of the life expectancy of the particular bridge element. Preventive maintenance has the <u>goal</u> to restore the deteriorated element to its as-built condition.
WY	Please note that this question was not asked at their regional meeting.

This question was asked at the SE, MW, and WBPP meetings

2. How does your State identify bridge preservation needs?	
AK	Bridge maintenance needs are identified during bridge inspections and by Region Maintenance personnel. Bridge preventive maintenance activities are identified by the Regions and submitted to Bridge Section for concurrence. Addressing bridge needs which are included within the limits of a roadway project (3R type projects).
AL	Bridge Painting is prioritized using the painting module in our bridge management system, ABIMS (Alabama Bridge Information Management System). Other bridge needs are identified by bridge inspectors and stored in ABIMS.
AR	Bridge needs are identified by bridge inspections. Districts then may use their maintenance funds or make a recommendation for a contract job.

2. How does your State identify bridge preservation needs?	
AZ	ADOT prioritizes bridge repair projects based on the inspection recommendations. Bridge deck rehabilitation candidates are generated from: a. Routine Bridge Inspection; b. Bridge deck in-depth inspection; c. District input; d. Field Review.
CA	Bridge preservation needs, and other bridge needs, are primarily identified by routine bridge inspections. Work recommendations are made by engineers performing bridge inspections. These work recommendations are reviewed by Structure Maintenance staff that assembles them into fairly large projects that normally involve multiple bridges in a geographic area. The projects are designed by in-house staff and let out for construction. Bridge painting is managed separately from this process and some routine preservation activities are carried out by bridge crews.
CO	Region discretionary bridge maintenance is based on Pontis information for the above activities. For each activity a letter grade is assigned based on the quantity of the associated bridge components that are not in condition state 1. The planned preventive maintenance program is also based on Pontis information to identify bridge preservation needs. Reseal or Replace Bridge Deck Joints: <u>PPM10 – Clean and Paint Steel Bridge Elements (EA):</u> Applies to all of the element in Condition State 2, 3 and 4 for the following elements: - 147 - Steel - Cable not embedded in concrete (Coated) - 161 - Steel - Pin and Hanger Assembly - Painted - 202 - Steel - Column or Pile Extension - Painted The Pontis Bridge Inspection Coding Guide can be found at the following web site: http://www.coloradodot.info/library/bridge/inspection-code-guide.
CT	Please note that this question was not asked at their regional meeting.
DC	Please note that this question was not asked at their regional meeting.
DE	Please note that this question was not asked at their regional meeting.
FL	Through the bridge inspection process and analyzing results for lessons learned to apply to similar structures.
GA	Since I don't have a definition of preservation, I have no preservation needs. However, my preservation needs would be my top reoccurring maintenance needs: • Replace edge beams • Replace expansion joints • Paint structural steel • Rehab decks • Bridges with an asphalt roadway – remove asphalt and rehab deck • Concrete encasement with reinforcing steel of all steel piles from 2 feet below ground line to the bottom of cap. • Scour repairs Maintenance needs are indentified by creating and running queries of the BIMS (Bridge Information Management System) database. BIMS contains the data from the Bridge Inspection Program.
HI	HDOT Bridge Design request candidate projects from Districts based on preliminary

2. How does your State identify bridge preservation needs?	
	Pontis printout of recommended bridge MR&R work.
IA	Bridge preservation needs are identified as part of our inspection review process. Recommendations are made to correct deficiencies or do preventive maintenance that will prolong the life of the bridge or element.
ID	<i>Bridge preservation needs are identified as work candidates in our Pontis Bridge Management System.</i>
IL	Bridge preservation needs are identified within each of our nine district offices by the district's Bridge Maintenance Engineer.
IN	Preservation actions and/or treatments are identified in the Preservation Policy documents. Using the National Bridge Inspections (NBI) condition rating/system and assigned trigger values to select and prioritize activities/treatments.
KS	a) Begins with actual bridge inspection and maintenance recommendations conducted on site. b) Office Review-All field inspections are in reviewed in the office. Lists are created for needed actions for each bridge inspection. Action Lists: “307 Form”: Provides a list of all required repairs to be completed by the Area or Sub-Area Forces (Light Equipment Required). A-list: Provides a list of all bridges that need or have contract repairs. B-List: Provides a list of all bridges needing a paint project. C-List: Provides a list of all signing repairs. D-List: Provides a list of all repairs to be conducted by District Forces (Heavy Equipment Required). c) An Area Review Meeting is held after the completion of the Office Review. All Lists are discussed at that time and it is then determining who, when and what actions will be taken. District and Area Staff attend the meeting to go over the lists with Bridge Management Staff. d) The annual Set-Aside Project selection are completed and let for the next fiscal year. These projects including bridge repairs, bridge painting, culvert replacements (≤ 20 feet structures), and all re-deck candidates. The following steps describe the actual selection process.

2. How does your State identify bridge preservation needs?	
	i) Area selects their priority projects using mainly the Area A & B Lists. ii) District prioritizes all of the Area Requests for the District and submits their list to Bridge Management. iii) Bridge Management reviews all of the District Lists and conducts a Field Check with the Districts. Bridge Management prioritizes the results to meet the overall States needs and budget restraints.
KY	The Districts send us (Central Office) their requests for bridges that need work done by a contract. The Districts will use their bridge crews for small nontechnical repairs. We will also query Pontis for bridges in need of work to include as a group project.
LA	Bridge candidates are selected based on a <i>systematic process</i> . Each of our 9 Districts receive a list of candidate bridges and then prioritize projects or activities based on local conditions and needs, with the first priority as preservation of bridges on Interstate or Urban NHS routes, followed by Rural NHS routes and then SHS routes. Districts may combine several element-specific projects into one construction project to facilitate competitive bidding. The Bridge Preventive Maintenance Selection Committee (BPMSC) reviews the district's priority list and then makes final selections. The BPMSC consists of the: Chief of Systems Engineering, Bridge Program Manager, Bridge Maintenance Manager, Bridge Preventive Maintenance Engineer, Bridge Management Systems Engineer, and Highway Program Engineer. The approved project is sent to the districts to initiate plan development.
MA	Please note that this question was not asked at their regional meeting.
MD	Please note that this question was not asked at their regional meeting.
ME	Please note that this question was not asked at their regional meeting.
MI	Michigan has a state long range plan and strategic goals for pavement, bridges, and other major infrastructure. Bridge preservation needs are identified to meet our strategic plan and bridge performance goals through our Annual Call for projects and development of a rolling five year plan. Bridge forecasting and strategy is done using our BMS and included in our long range plan, and funding is allocated to each of our seven regions and our big bridge program for the work categories; capital preventive maintenance, capital scheduled maintenance, rehabilitation, and replacement, and projects are picked that meet the guidelines provided in the Call for projects letter. Projects are reviewed and approved by MDOT's Bridge System Manager and MDOT's Project Steering committee.
MN	The District performs Routine Maintenance and Pontis element level inspections for their bridges. Routine and preservation activity needs are reported to the District Bridge Engineer through inspections. Projects are then identified through these activities in coordination with the Bridge Office.
MO	We identify preservation needs during our routine safety inspections, enter this information into our BMS, and share it with district staff. On major bridges ($\geq 1000'$ in length), our inspectors write a report documenting the condition of the structure and their

2. How does your State identify bridge preservation needs?	
	recommendations for preserving it. In addition, we review construction projects to ensure preservation needs are included in the scope of work.
MS	No funds are dedicated for bridge preservation. Each District office identifies the Maintenance needs for the District.
MT	Bridge preservation needs are identified by using the Pontis BMS. The needs are restricted to deck, joint, bearings and rail work. (keeping the roof in good shape).
NC	NCDOT field personnel select candidates for preservation treatments. The field forces may utilize their State funds for completing preservation activities or they may submit candidates to the State Bridge Management Unit to utilize Federal funds. Most preservation activities are let to contract. NCDOT is in the transition process of implementing a new Bridge Management System and it is the Department's vision this tool will further aid in candidate selection.
ND	Bridge Division uses PONTIS reports to identify bridges that will have maintenance done by contract. We will run these through our project development process and put them out in our regular bid opening schedule. The District Maintenance forces will schedule certain work items that have been identified by our Bridge Inspectors.
NE	Needs are determined through routine bridge inspections. A maintenance report or bridge repair report is submitted by the inspection team, and reviewed by our inspections quality control personnel.
NH	Please note that this question was not asked at their regional meeting.
NJ	Please note that this question was not asked at their regional meeting.
NM	Priority lists are generated from PONTIS. Each district (6) gets 6 lists; Interstates, US highways, NM Routes, local routes, culverts and scour projects. Lists are generated by state office from PONTIS based on NBI ratings and sufficiency ratings. State office personnel, district personnel and FHWA then meet and further prioritize lists based on engineering input. Lists are then used to update STIP. NMDOT targets bridges with condition rating "Fair" for minor rehabilitation and preservation projects. Bridges with condition rating "Good" are targeted for preservation projects, specifically deck overlay or deck sealing.
NV	Preservation needs are initially identified during ongoing bridge inspections, as well as by identification and reporting by bridge owners and NDOT District maintenance personnel. Contracting needs are further identified, refined, and prioritized during the project scoping and preliminary design.
NY	Please note that this question was not asked at their regional meeting.
OH	Typically - Routine cyclic preventive maintenance such as bridge deck sweeping and cleaning is performed each spring and early summer by contract or in-house crews. Other needs such as wearing surface pothole repair, scour control/correction, and concrete repairs or resetting bearings is identified and prioritized during the annual bridge inspection cycle by the bridge and inspectors. Additional methods are: -County Supervisors review their respective State and Federal Routes every two weeks. -Either the respective County or District Bridge Crew clean the bridge every two years. -ODOT District One has a Web Site and utilizes a Customer Inquiry Management System

2. How does your State identify bridge preservation needs?	
	(CIMS) to track call in concerns
OK	Through bridge inspections and bridge management. Please explain the process. Using PONTIS, we identify locations for overlay, paint, and joint projects.
OR	Oregon's State Bridge Program identifies rehabilitation and replacement projects based on twelve need categories. Oregon also has a Major Bridge Maintenance Program and a Local Bridge Program. The Major Bridge Maintenance (MBM) Program is funded separately from routine Bridge Maintenance. Currently the MBM program projects are selected based on Inspector critical and urgent recommendations and District recommendations. The Local Bridge Program priorities (generally replacements) are selected based on a Technical Ranking System adopted for use of the local program only.
PA	Please note that this question was not asked at their regional meeting.
PR	The PRHTA identifies bridge preservation needs <i>by inspection and evaluation</i> of bridges according to NBIS. This involves any of the <i>three major components of a bridge; deck, substructure and superstructure</i> . This information is then <i>submitted to the DTPW</i> by e-mail and/or memo including recommendation for decision-making.
RI	Please note that this question was not asked at their regional meeting.
SC	Through the bridge inspection process, Highway Maintenance Management System (HMMS) and Central Office oversight, the needs are identified and prioritized as A, B, C or D with A and B being the highest priority. We then identify those needs that can be adequately addressed by maintenance forces. We also hope to begin identifying basic needs by bridge type that can be accomplished by maintenance forces on a regular cycle. Other preservation needs which are beyond the capabilities of maintenance forces are contracted out. Needs such as bridge painting and deck preservation are identified and prioritized by condition and road system by the Central Office.
SD	Bridge Division uses PONTIS reports to identify bridges that will have maintenance done by contract. We will run these through our project development process and put them out in our regular bid opening schedule. The District Maintenance forces will schedule certain work items that have been identified by our Bridge Inspectors.
TN	Bridges are chosen from a repair list created by our Inspection Office. The project manager also checks if the bridge is on the replacement list, as this could change the scope of repairs in the project. If there is any "preservation" work that needs to be done, it would be done at the same time as the repairs.
TX	For the most part, TxDOT districts are responsible for identifying and prioritizing maintenance actions that are needed. They use inspector maintenance recommendations that come from the routine safety inspections or District conducted bridge maintenance inspections. These maintenance actions utilize general maintenance funds that all districts have available to them to address all manner of maintenance needs (bridge, pavement, facilities, etc.) The one exception to this is prioritization of the dedicated bridge preventative maintenance funds. Initial prioritization of these funds and projects is done by the districts with the final selection carried out by the Maintenance and Bridge Divisions of TxDOT. In the final prioritization special attention is paid to how the project

2. How does your State identify bridge preservation needs?	
	will address predefined statewide areas of concern (ie scour, substructure, joints, etc). This effort uses the NBI and Elemental condition states from safety inspections to allocate the limited funding that is dedicated for this effort.
UT	Utah uses bridge inspection data to determine which bridges require which treatments at what time. Benefit-cost ratios assist in deciding the most efficient use of funds. We also work to integrate preservation work with roadway projects to ensure maximum efficiency of use of funds.
VA	VDOT uses the AASHTOWare Pontis as a bridge management tool. VDOT has customized Pontis to meet VDOT's business needs. Customization of the software included updating the deterioration and cost models for major elements. Bridge maintenance needs are identified and categorized. The Central Office Bridge Management Engineer identifies the statewide needs through Pontis. This information is used for performance measures and for apportioning bridge maintenance funds to the districts. The District Structure and Bridge engineer and his staff use Pontis, inventory data and the NBI inspection reports to develop their annual maintenance plans and in the overall management of their respective districts' program. Virginia utilizes the Structure Inventory and Bridge Management System (Pontis) to determine the total maintenance and improvement needs for bridges and culverts. The needs assessment process is conducted on an annual basis and serves as the foundation for the statewide Bridge Program Management Plan. The assessment process includes but is not limited to the following items: • Determine the estimated maintenance and improvement costs • Develop and generate standard simulation scenarios to assist in the determination of the statewide needs by District and system. ○ Determine the estimated needs to maintain current condition for various performance measures ○ Determine the estimated needs to improve the performance measure by one percent (1%) increments. • Generate a prioritized list of work candidates for three (3) funding sources (Preventive Maintenance, Maintenance and Rehabilitation, and Replacement and Improvement
VT	Please note that this question was not asked at their regional meeting.
WA	a. Bridge Maintenance identifies bridge maintenance needs based on customer complaint, internal notice, or bridge structural repair list provided by Bridge Inspections. One region does annual bridge maintenance inspections of all their bridges. The other five regions are not funded to do this preservation work. b. Bridge Preservation funded contracts based on Bridge Management System needs. i. BMS data identifies and prioritizes need. ii. Preservation action defined and cost estimate assigned for budget.
WI	Regional bridge management engineers provide identified needs during the inspection. We also provide cyclic preservation measure like deck sealing.

2. How does your State identify bridge preservation needs?	
WV	Mostly at the District level with their local knowledge of the bridges along with management at the Central Office level. Please explain the process. For painting and deck overlay/replacement type work, our Central Office personnel ask our districts for candidate bridges and then prioritize the work after field and office reviews. For more minor work such as bridge washing or sealing of cracks, this type of work is usually handled at the District level with State forces as time or budgets allow.
WY	Bridge preservation/rehabilitation candidates are generated from a combination of routine bridge inspection, in-depth inspections, and district input.

This question was asked at the SE, NE(Q2), MW and WBPP meetings

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?	
AK	Annually use federal funds for eligible preventive maintenance activities. Bridge related activities must compete against roadway activities from a fixed amount of funding.
AL	We have a goal of 5% of HBP funds for Bridge Painting. Other preservation activities are State funded from maintenance budgets. There is not a dedicated fund.
AR	District maintenance funds for most activities. If a contract job is programmed then general construction funds - no dedicated funds.
AZ	HBP funds are split as shown below: Local - 30% State - 70% The current total allocation: \$23M (approx) Bridge Rehabilitation & Replacement - \$12M Inspection & Repair – \$4.5 M Deck Rehabilitation - \$4.5M Scour Retrofit – \$2M Only Bridge Replacement and major rehabilitation is funded from Highway Bridge Program. The Deck rehabilitation, scour retrofit, inspection and repair were funded by other federal funds.
CA	We have a dedicated fund for bridge preservation projects. Currently the fund is about 100 million per year. We also employ bridge crews and paint crews in our regional districts.
CO	10% of CDOT's bridge program funding is dedicated to planned preventive maintenance. A portion of the CDOT's maintenance budget is dedicated to Region discretionary bridge maintenance.
CT	In our Preventative Maintenance Program our strategy has been to let District-wide joint

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?	
	projects (Connecticut has 4 construction Districts—these projects are bid as conventional construction projects), followed by bearing replacement projects, followed by beam-end repair and painting projects. Going forward we intend to combine the bearing and beam-end projects to reduce mobilization costs. One thing not working well: are the NEPA and Public Involvement requirements for using federal dollars can be cumbersome (i.e.... SHPO effect determinations for a multitude of sights for a joint project).
DC	<i>Implementing pro active program such as: Routine scupper cleaning and washing; deck Joint replacement; bridge deck sealing; Bridge deck overlay, cleaning, painting girder ends and lubricating bearings</i> <i>b) All of the above are working well except replacing deck joint with Dow-corning silicon joint repair system. For the past year we have been using R.J. Watson silicoflex. Outcome to be determined.</i> <i>c) Research to find better materials, and repair methodology and establishing Database for information sharing.</i>
DE	Bridge painting b) What didn't work well? Joints are difficult to keep up with due to the quantity and variety of types c) What do you think should be the future direction of bridge preservation? Don't know.
FL	Bridge preservation activities are funded as part of the bridge repair and bridge maintenance budgets. These are distributed to the Districts based on inventory. FDOT is decentralized and the Districts have significant latitude as long as they follow department policies and procedures.
GA	Based on the recommendations of the Director of Engineering, State Bridge Engineer and State Bridge Maintenance Engineer; the Chief Engineer allocates maintenance funds from the Bridge Replacement and Rehabilitation Program (BRRP). For the last couple of years, maintenance funds have been \$10 million of Interstate Bridges and \$5 million for State Route Bridges.
HI	Use HBP funds. One line item in STIP for Interstate viaduct deck repair work is recommended.
IA	Preservation activities can be funded through our program as needed or with dedicated bridge maintenance funds.

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?	
ID	<i>Bridge Preservation is funded at \$10,000,000 in our STIP.</i>
IL	The districts receive contract maintenance and Day Labor funding each year. These programs are typically used for repairs, overlays, joint replacements etc. However, these funding sources are not sufficient for the needs that exist. They have not been used to a great extent for preventative maintenance in the past due to the significant needs for other maintenance and repairs. Some projects for overlays, expansion joints etc. are funded through the districts' other funding sources. Starting in FY11 a statewide funding line item was established for applying deck sealers to all concrete decks that have an NBIS condition rating of 6 or greater. One fourth of these bridges are to be treated each year such that all bridges will be on a four year cycle for application of a sealer. A statewide line item was also established for preventative maintenance on our "major bridges". Major bridges were selected as those over 1000 feet in length. The funding amount is not large, but is a step in the right direction. Specific types of work are currently being identified. A separate statewide funding line item for painting steel bridges has also been in place for many years. Although not sufficient to address all the painting needs, it does help greatly. Funding for maintenance and repair of border bridges that we share with adjacent states is discussed at annual border bridge meetings and our portion is funded by our Office of Planning and Programming.
IN	As needed basis for now.
KS	The majority of bridge preservation activities are funded through the Substantial Maintenance Program which includes 5 separate funds called the Bridge Set-Aside Program. The current funding level is set at \$21 M/year. Some additional repairs are picked up as part of Associated Bridge Work completed as part of some other major project.
KY	We can use HBP funds for major bridge rehabs and large bridge paint jobs. We can use Rural Secondary funds for bridges on rural secondary roads. We can Interstate Monies on bridges on an interstate. We have a bridge maintenance budget (\$24 million) that can be used for bridge work on any state maintained bridge.
LA	We have a dedicated annual budget of \$3 million.
MA	We do not have a dedicated funding. It is funded on an as needed basis.
MD	We find doing latex concrete overlays just prior to the deck reaching a point where this is not possible to very successful. We also find repairing substructures with cast in place concrete to be a much better long term repair then other methods. b) What didn't work well? Using pneumatically applied mortar (gunite) as a long term

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?	
	repair. c) What do you think should be the future direction of bridge preservation? Building less new systems and maintain the existing ones first. Do not privatize roadway/bridge maintenance.
ME	Washing, sealing concrete surfaces, sealing joints, partial paint, new wearing surfaces. Pour in place joints only have a limited life.
MI	Dedicated funding is provided to MDOT's bridge preservation program.
MN	Bridge preservation funding is a combination of program delivery (construction) budget and the operating budget sources. The Districts will program preservation contract projects on an as needed basis or within their allotted program delivery budget. District Bridge Maintenance/preservation performed by internal staff is funded by operating budget according to predetermined level based on overall infrastructure operational needs of the District.
MO	Depending on scope of work, bridge preservation is either funded through our construction or maintenance program. However, there is no dedicated funding in either program for such activities. As such, these needs must compete against others for funding. Unfortunately, bridge needs take a back seat to keeping our majors in good condition and improving the condition of our minors. Notes: 1) MoDOT does not have a preventive maintenance plan approved by FHWA; so, we are not using HBP funds for preventative maintenance activities. 2) Our highway & bridge construction budget is estimated to average \$500 million per year over the next 5 years. 3) We typically spend \$12-15M of MT funds annually on bridge maintenance functions.
MS	Mississippi DOT does not have a dedicated bridge preservation program.
MT	Funding is through our Federal Aid Bridge Program. The monies are set aside by developing a fund plan and projecting the needs over the STIP time frame (next 5 years).
NC	NCDOT utilizes two major sources of funding for preservation work. Preservation activities may be funded with State dollars as a part of planned maintenance work. Currently, NCDOT allocates \$53 M/yr for bridge maintenance and \$15 M/yr for bridge preservation activities. In addition to State funding, NCDOT utilizes dedicated Federal funds for preservation work. Currently, NCDOT's Interstate Bridge Preservation program receives \$5-10M/yr and an additional \$5M/yr is set aside for the Bridge Preservation Program (FHWA HBP Funds). NCDOT anticipates increasing these amounts by 2015.
ND	Bridge Division has a \$618,000 annual budget for bridge maintenance work. In recent years this money has, typically, gone towards painting steel bridges. Each District has their own budget line item for roads and bridges. Districts do not have a separate line item specifically for bridge maintenance. Larger scale projects such as deck overlays are programmed as construction projects and funded with federal aid.
NE	No dedicated funding for bridge preservation. State funds are used for bridge preservation, thru the construction program or district maintenance budgets, depending on the type and amount of work needed.
NH	Yearly washing and periodic oiling of bridges have been extremely successful in prolonging a bridge's useful life. Other activities that have been successful include

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?	
	deck membrane replacement combined with deck patching and deck patching combined with concrete overlays. Patching substructures has had spotty success because the underlying cause is not always fully addressed. Replacing deteriorated joints with asphaltic plug joints has worked in the short term, but these joints require a high degree of periodic maintenance. Bridge preservation activities and funding should be considered from the day a new structure is opened. Maintenance funding for <u>that new structure</u> should be included in the budget based on a periodic maintenance schedule which includes washing and sealing, repainting, replacing joints, deck membrane replacement, etc. Providing a limited pot of funding that allows us to perform required periodic maintenance on only a small percentage of the bridge inventory will continue to perpetuate the bridge conditions we see today.
NJ	Preventive Maintenance procedures used by the New Jersey DOT have been an evolving process developed throughout past years. As of right now, the following are included in the NJDOT Bridge Preventive Maintenance Program: Bridge Cleaning, Repair/Replace Joints, Repair Concrete Deck/Sidewalk, Seal Concrete Deck, Seal Cracks in Wearing Surface, Crack Sealing on Concrete Decks, Crack Sealing on Substructure, Inhibit Corrosion of Rebar, Lubricate Bearings, Substructure Concrete Repair, Sealing Concrete Substructure, Repair Approach Slabs, Repair Erosion/Scour, and Safety Improvements. b) What didn't work well? As of this writing, the New Jersey DOT has not had any issues with any item that caused it to be removed from the Bridge Preventive Maintenance Program. c) What do you think should be the future direction of bridge preservation? A cyclical, systematic approach to preserving and maintaining bridges has been established by the New Jersey DOT and the FHWA. A series of guidelines have been devised and should be followed.
NM	Funding is allocated to districts. New Mexico is not a centralized state. District allocates funding as needed. Bridge priority lists are used by districts. Our main preventative practices are deck overlays and deck sealing. All districts allocate funds for this. NMDOT uses BR Funding for bridge preservation projects.
NV	Bridge preservation activities are typically state/local agency funded, and no dedicated funding source exists for State preservation activities. Seismic retrofit work is primarily funded with Federal HBR funds, while recently identified scour mitigation needs are anticipated to be partially funded with HBR funds. NDOT Districts each maintain their own budgets for bridge maintenance activities.
NY	Use of polymer-based repair materials for expansion joint & deck waterproofing, FRPs for temporary repairs, bearing replacements (swapping steel sliders with elastomeric, use of GRP for rapid assessment – for bridge and network level info, identification of cyclical activities, skills training, Job Order Contracting, outreach to locals. b) Maintenance of steel coatings - we are not moving fast enough. c) More involvement with local owners. More stretching the limit resources. Consultants

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?	
	and designer moving into creative repairs and analysis to keep bridges open.
OH	The Funds Management Committee is an advisory body created to make fact-based recommendations on how the department should best allocate available funding based on the goals, conditions, and needs of Ohio's transportation network Committee utilizes broad-based representation from functional areas including: – Deputy Director of Planning – Chair – Rural and Urban District Senior Leadership – Finance, Highway Operations, Facilities, Local Programs, Safety, Traffic, Structures Committee Deliverables – Recommends funding mark for getting all programs up to the established goals – Clearly documented process for allocating pavement and bridge funds to the districts – Continually monitor capital programs due to: ○ Project costs modifications and inflation, funding levels, changing pavement and bridge conditions ○ Program and funding adjustments are then made to reach goals
OK	We have dedicated \$5 million of our BR funds for Preventive Maintenance
OR	Oregon's State Bridge Program identifies rehabilitation and replacement projects based on twelve need categories. Oregon also has a Major Bridge Maintenance Program and a Local Bridge Program. The Major Bridge Maintenance (MBM) Program is funded separately from routine Bridge Maintenance. Currently the MBM program projects are selected based on Inspector critical and urgent recommendations and District recommendations. The Local Bridge Program priorities (generally replacements) are selected based on a Technical Ranking System adopted for use of the local program only.
PA	Our bridge painting guidelines (for bridges greater than 100 feet long) has streamlined our painting efforts resulting in an economical method to provide corrosion protection to existing steel bridges. Concrete deck patching and waterproofing overlays (i.e. latex concrete, bituminous with membrane) has extended the deck life and improved rideability. b) What didn't work well? Repairing or replacing/installing expansion dams to ensure leak proof joints. We have had some issues keeping our joints intact after winters. The X.J.S. Expansion Joint System has been sparingly used due to bonding issues between the silicone and concrete. c) What do you think should be the future direction of bridge preservation? Taking into consideration Pennsylvania's age of the infrastructure (average age = 51 years), 3rd largest number of state-owned bridges (>25,000), and largest number of structurally deficient (SD) bridges (>5,590), bridge preservation is a strategic, economical, and critical activity needed to extend the life of a bridge. We must better strive to identify a bridge preservation life cycle that would determine the what's and when's of specific bridge preservation activities – in other words – try to get the biggest bang of the buck in performing the preservation activity at the optimum time to get the most life out of a bridge.

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?	
PR	PRHTA doesn't have a major budget for preservation. DTPW has a small budget for minor repairs and rehabilitations. This is one of the major issues that PR is addressing at the moment.
RI	Federally funded.
SC	We use both State and Federal funds. Some Federal funds are dedicated while most State funds are still as needed although we are trying to change that somewhat.
SD	We have a dedicated bridge fund which includes funding for preservation work. Bridge preservation work is sometimes paid by other funds when included with mainline work.
TN	HBP (Federal) and 451 Funds (State). TN uses mostly State funding; we have an agreement with TN FHWA to use 5% of the allotted HBP funds for preservation.
TX	Districts have the flexibility to use allocated maintenance funding to address bridge issues, but bridge issues must compete with pavement needs and the bridge issues almost always lose out. TxDOT does have a small dedicated bridge preventative maintenance funds that is available every year that is used to help address bridge needs. TxDOT has also made limited use of HBP funding to address bridge maintenance needs.
UT	Utah uses bridge inspection data to determine which bridges require which treatments at what time. Benefit-cost ratios assist in deciding the most efficient use of funds. We also work to integrate preservation work with roadway projects to ensure maximum efficiency of use of funds.
VA	See response to answer 2 above. Additionally, bridge preservation is funded through the maintenance budget. VDOT funds the bridge program based on needs. Virginia's code requires funding maintenance first.
VT	Recently Vermont has focused on two types of preventive programs. The 1 st being membrane and pave. The 2 nd cleaning and painting structural steel. With the exception of a deck needing a bit more repair than expected, we are hopeful that these projects prove beneficial. As for the future direction, getting a handle and establish the 'right' cycle for preventive measures is key.
WA	a. Six Region Administrators allocate a portion of the Region maintenance budget to address Bridge Maintenance needs. This is based on history, increase in inventory, and how the crews are doing to meet their performance goals. b. Bridge Preservation contract funding is submitted to and approved by State Legislature.
WI	Try to include actual bridge preservation whenever possible in projects that serve multiple purposes. Finding what should be spent depends combining risk and what the policies may be.
WV	IM (Interstate Maintenance), NHS and STP funds are used as the main source of funding for bridge preventive maintenance type work. Recently the agreement between FHWA

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?	
	and the WVDOT opened up the use of HBP (Highway Bridge Program) funding for preventive maintenance on bridges.
WY	No response.

This question was asked at the SE, MW, and WBPP meetings

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?	
AK	Decrease the deck area of bridges classified by the FHWA as structurally deficient or functionally obsolete using a five year average. b) How did you go about establishing these measures? State metric established to match FHWA's metric used to monitor the State's performance.
AL	Goal to remove all posted bridges from the State network.
AR	No official goals.
AZ	a) The purpose of Bridge Inspection and Repair Program is to maintain state highway bridges so that the condition rating index exceeds 92.5%. b) How did you go about establishing these measures? Condition Rating Index is based on Deck (N58) , Superstructure (N59), Substructure (N60) condition ratings higher than 4. The bridge joints condition rating is an Arizona specific rating item not included in the FHWA condition rating guidelines.
CA	Caltrans uses four performance measures for bridges. For bridge maintenance and preservation work, we use a "backlog" measure that tracks the time period a maintenance or preservation action has been unaddressed. Typically, our expectation is that any maintenance or preservation action is addressed within two years of being identified. For risk mitigation projects (scour, seismic) and rehabilitation projects, we track the number of bridges that have these needs. Bridges with risk mitigation needs or rehabilitation needs are considered "distressed" and the total number of distressed bridges is reported regularly. At a network level, Caltrans uses the Bridge Health Index to capture the network picture of how we are doing. Caltrans also tracks and reports the number of structurally deficient bridges mainly because nationwide reports often use this measure. Caltrans does not make project related decisions based on the structurally deficient status of a bridge. b) How did you go about establishing these measures? The bridge health index was developed in Caltrans to utilize the detailed element inspection information that was being collected and to develop a direct link between condition and asset value. The "backlog bridge" time frame was established based on reasonable project project delivery time

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?	
	frames. The “distressed bridge” measure is really just a count of the number of bridges with major needs, but is very effective at showing the overall performance of our rehabilitation programs.
CO	The goal of the Region discretionary bridge maintenance program is to reach a letter grade of at least B, where an A represents bridge components in a Pontis condition state 1. The goal of the planned preventive maintenance is to reduce the number of leaking bridge expansion devices and unsealed bridge decks. We are in the process of determining goals for the other planned preventive maintenance activities. In regards to the CDOT bridge program, CDOTs goal is to eliminate all poor bridges based on the sufficiency ratings and select list status.
CT	Please note that this question was not asked at their regional meeting.
DC	Please note that this question was not asked at their regional meeting.
DE	Please note that this question was not asked at their regional meeting.
FL	90% of State bridges in good or better condition. Structurally Deficient Bridges programmed for repair or replacement within 6 years of identification. These performance measures were established by the Department’s Executive Board based on input of the Maintenance Office.
GA	a) Current conditions codes are determined by the Bridge Inspection Program. • Maintain interstate bridges such that they can carry all legal loads • Maintain interstate bridges such that they, at a minimum, have decks that are in good condition • Maintain U.S. Route bridges such that they can carry all legal loads • Maintain U.S. Route bridges such that they, at a minimum, have decks that are in satisfactory condition • Maintain State Route bridges such that they can carry all legal loads • Maintain State Route bridges such that they, at a minimum, have decks that are in fair condition • Maintain Off-System State-Owned bridges such that they can carry all legal loads • Maintain Off-System State-Owned bridges such that they, at a minimum, have decks that are in fair condition b) Director of Engineering, State Bridge Engineer, and State Bridge Maintenance Engineer established these measures.
HI	Not aware of HDOT goals specifically established for bridge preservation.
IA	As a result of a funding needs study we established a goal to reduce the number of structurally deficient bridges by half (120 bridges) in ten years. We have a performance measure to assure that no less than 95% of the State maintained bridges do not have a lower Sufficiency Rating with respect to the previous year based on the following criteria: 1. Sufficiency Rating must drop more than 3 points (to be

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?	
	statistically significant). 2. Border Bridges are not included. 3. New bridges and recently reconstructed bridges without initial inspections for comparison to previous data will not be included. How did you go about establishing these measures? We need to replace or repair 12 more bridges than the number of bridges that become structurally deficient in a year.
ID	<i>ITD has established the goal of having 80% of our bridges on the state highway system as being in “good condition”. For the purposes of this performance measure we have defined “good” as an NBI rating of Deck, Super, Sub of 6 or better. Currently we are at 71% in good condition as measure by square foot area.</i> b) How did you go about establishing these measures? <i>Benchmarked surrounding states. Fiscally realistic.</i>
IL	No.
IN	Practically yes, officially no! Goals are to improve and maintain the bridge elements conditions which are identified in the bridge Performance Measure Goals at or above the thresholds. How did you go about establishing these measures?: Bridge elements were selected based on their Maintenance Cycles (Paint, Wearing Surface, and Deck) and bridge Structural Integrity (Superstructure, Substructure and Structural Evaluation) also, the Sufficiency Rating as the Overall “Health Index” condition. Using the NBI rating and assigned trigger values to identify the need also, to monitor and report the progress.
KS	Performance goals have been established for our bridge program. a) What are your state goals and measures? Goals: 85% in good condition & < 5% in deteriorated condition Measures: Our Measures are based on an adjusted Bridge Health Index (BHI) computed by Pontis and then adjusted for various Smart Flags collected as part of our Element Inspection. b) How did you go about establishing these measures? These measures & goals were determined by the Bridge Performance Measures Team which is required to submit updated actual performance levels annually to the Board of Directors. These measures are based on the various ranges of BHI shown on the table attached on the next page. The ranges also show what type of preservation action should be considered for various BHI ranges. These measures and goals have been revised by the Team to reflect past performance in response to actual funding levels

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?

	that KDOT as faced.																										
	<table><tr><th colspan="4">Bridge Health Index Summary</th></tr><tr><th>FY 2010 Bridge Health Index</th><th>Required Action</th><th>Rating</th><th>Current Number of Structures at Condition</th></tr><tr><td rowspan="2">> 85</td><td>No Action Needed. (100-95)</td><td rowspan="2">Good</td><td rowspan="2">4386 = 87.5%</td></tr><tr><td>Polymer Overlay Paint (No Section Loss) Minor Cracking (95-85)</td></tr><tr><td rowspan="2">70-85</td><td>Silica Fume Overlay (SFO) Paint (Some Section Loss), Some Cracking Problems (85-80)</td><td rowspan="2">Fair</td><td rowspan="2">447 = 8.9%</td></tr><tr><td>Major Patching w/ SFO or Re-deck (Future replacement candidate) Posting for loads ≥ 25-30-40 Tons (80-70)</td></tr><tr><td rowspan="2">< 70</td><td>Major Rehab, Re-deck, Replace (70-60) (Programmed for replacement – on watch list (60-50))</td><td rowspan="2">Deteriorated</td><td rowspan="2">182 = 3.6%</td></tr><tr><td>Replace (Programmed for replacement - cribbed) Posting for loads ≤ 15-25-30 Tons (<50)</td></tr></table>				Bridge Health Index Summary				FY 2010 Bridge Health Index	Required Action	Rating	Current Number of Structures at Condition	> 85	No Action Needed. (100-95)	Good	4386 = 87.5%	Polymer Overlay Paint (No Section Loss) Minor Cracking (95-85)	70-85	Silica Fume Overlay (SFO) Paint (Some Section Loss), Some Cracking Problems (85-80)	Fair	447 = 8.9%	Major Patching w/ SFO or Re-deck (Future replacement candidate) Posting for loads ≥ 25-30-40 Tons (80-70)	< 70	Major Rehab, Re-deck, Replace (70-60) (Programmed for replacement – on watch list (60-50))	Deteriorated	182 = 3.6%	Replace (Programmed for replacement - cribbed) Posting for loads ≤ 15-25-30 Tons (<50)
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KY	Our goals are to reduce the number of structurally deficient state bridges each year and to never have more than 10% of our state maintained bridges classified as structurally deficient. Also, we are to reduce the amount of deck area of structurally deficient state maintained bridges and to never exceed 12% of the total deck area of all state maintained bridges. How did you go about establishing these measures? These goals were developed in meetings with bridge maintenance folks, executive management, and state auditors.																										
LA	No.																										
MA	Please note that this question was not asked at their regional meeting.																										
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4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?	
MI	Michigan DOT performance goals are as follows: a) As a priority on the network, immediately address the needs of 100% of the structures of critical concern. b) To improve the overall condition of the freeway bridge network so that 95% of the structures on that network are rated good or fair. c) To improve the overall condition of the non-freeway bridge network so that 85% of the structures on that network are rated good or fair. How did you go about establishing these measures? Through development of Michigan's Strategic Investment Plan for Trunkline bridges.
MN	The MnDOT bridge system has structural condition targets based on NBI condition. MnDOT targets 55% in good condition (NBI 7 or greater) and 2% in poor condition (NBI 4 or less). As of 2010 we had 54% in good and 3% in poor condition. Additionally, bridge preservation and maintenance performance measures include: ■ Complete 100% of High Priority bridge maintenance need items within 1 year of identification. ■ Complete 100% of scheduled preventive maintenance items. Reduce the overall backlog of identified Medium Priority bridge maintenance items identified.
MO	Yes If so, what are your state goals and measures? MoDOT has three levels of bridge-related performance measures. The department measure is the number/percent of deficient bridges on the state system. This measure helps us determine our overall direction and adjust programming as needed. Our goal for this measure is to lower the number/percent reported. Our division measures include average bridge condition rating and the percent of bridges in good condition (rating > 6). These measures address those bridges in which preventative maintenance can or has had a positive impact. Our goal for these measures is to increase the values reported. The last measures are those established by our individual districts and are typically related to the work their field forces perform. The goal of these measures is to increase the values reported. How did you go about establishing these measures? MoDOT developed our <i>Tracker: Measures for Departmental Performance</i> over five years ago to identify how we are doing in delivering the most efficient and practical transportation services available. The department measure was included in this document as a means of tracking our overall performance in the bridge area. The division and district measures were create later to track performance in areas they could directly impact.
MS	No.

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?	
MT	Yes- they were established during the review and development of the white papers for FHWA. The measure is a modified HI that includes smart flags. We established these measures by developing a standard that uses the known data from the inspection process.
NC	The N.C. Department of Transportation is committed to measuring and improving performance. The department's Organizational Performance Dashboard serves as an indicator of how well we are meeting our mission and goals. NCDOT's mission is connecting people and places in North Carolina – safely and efficiently, with accountability and environmental sensitivity. There are 5 categories used to measure the Department's performance and bridge preservation addresses the infrastructure category. The Infrastructure Health Index measures the condition of NCDOT highway system assets against the goal of making our infrastructure last longer. The infrastructure health index is defined as a composite score based on pavement condition, bridge health index and roadside feature condition. Three comprehensive statewide surveys are used to evaluate the condition of the State highway system: (1) the Maintenance Condition Survey, (2) the Bridge Condition Survey, and (3) the Pavement Condition Survey. Bridge health is defined as the percent of bridges in good condition. A bridge is considered to be in good condition if the Level of Service (LOS) for Deck, Sub-Structure and Super Structure are all greater than or equal to 6. Further Information located at: http://www.ncdot.gov/download/performance/dashboarddetails.pdf The published values are located at the NCDOT website: https://apps.dot.state.nc.us/dot/dashboard/InfrastructureHealth.aspx The numerical grading system is 0 to 100%. Statewide Bridge Health Index • 2002 – 64.2% • 2004 – 66.0% • 2006 – 67.2% At this time, subsequent years have not been published by NCDOT management.
ND	We established service level guidelines in May 2007. We identified four maintenance areas; crack sealing, sweeping/flushing, approach slabs, and surface treatments. Bridges are swept and cleaned every spring, cracks sealed every two years, surface treatments every two years and approach slabs are lifted after two years. We have moved away from requiring a surface treatment every two years. Our maintenance forces were not equipped to do the surface treatment. We do not have sandblasting or shotblasting equipment to prepare the surface for treatment. During the spring

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?	
	cleaning, crews maintain the bearings, slope protection, beams, guardrail, etc. We have not established performance measures. b) How did you go about establishing these measures? A business plan group was established with members from our Bridge Division, District offices and central offices. This group has been inactive and has not yet established performance measures for bridge maintenance.
NE	No performance goals established for bridge preservation. General goals for all State bridges are to reduce or eliminate; fracture critical bridges, steel girders with pin and hanger devices, bridges with timber piling, and scour critical bridges.
NH	Please note that this question was not asked at their regional meeting.
NJ	Please note that this question was not asked at their regional meeting.
NM	a) Goals – less than 5% of bridges (and sqft of bridges) being structurally deficient. Measures – Number of structurally deficient bridges and square feet of structurally deficient bridges. b) How did you go about establishing these measures? Common sense (from NMDOT Deputy Chief Engineer). Data has been tracked quarterly since the first quarter of 2002. This measure has been extremely beneficial to the department. It soon became apparent that the trend needed to be reversed. In 2004 NMDOT decided and got permission from FHWA to use federal BR funding targets for bridge preventative maintenance projects and minor rehabilitation projects. NMDOT has been succesful in reversing the trend and are now less than 10% of NMDOT owned structures being Structurally deficient (from a high of 18%).

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?

	STATEWIDE- STATE OWNED STRUCTURALLY DEFICIENT BRIDGES BRIDGES WITH A CONDITION RATING OF 4 AND BELOW <table><caption>Approximate data from the graph</caption><thead><tr><th>Year</th><th>Q1</th><th>Q2</th><th>Q3</th><th>Q4</th></tr></thead><tbody><tr><td>2002</td><td>240</td><td>240</td><td>245</td><td>250</td></tr><tr><td>2003</td><td>250</td><td>255</td><td>260</td><td>265</td></tr><tr><td>2004</td><td>270</td><td>275</td><td>280</td><td>280</td></tr><tr><td>2005</td><td>275</td><td>275</td><td>270</td><td>260</td></tr><tr><td>2006</td><td>255</td><td>255</td><td>250</td><td>245</td></tr><tr><td>2007</td><td>235</td><td>235</td><td>230</td><td>225</td></tr><tr><td>2008</td><td>215</td><td>215</td><td>210</td><td>205</td></tr><tr><td>2009</td><td>195</td><td>190</td><td>185</td><td>180</td></tr><tr><td>2010</td><td>176</td><td></td><td></td><td></td></tr></tbody></table> QUARTER	Year	Q1	Q2	Q3	Q4	2002	240	240	245	250	2003	250	255	260	265	2004	270	275	280	280	2005	275	275	270	260	2006	255	255	250	245	2007	235	235	230	225	2008	215	215	210	205	2009	195	190	185	180	2010	176			
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NV	Yes. a) The Department’s Performance Measures include a goal for the reduction of the number of structurally deficient and functionally obsolete structures eligible for federal funding. b) This was a cooperative effort between NDOT’s Structures Division administration, Performance Analysis Group, and Director’s Office. This goal is one item in the Department’s Performance Measure plan reported annually to the Legislature.																																																		
NY	Please note that this question was not asked at their regional meeting.																																																		
OH	ODOT monitors bridge performances using 4 performance indices or OPIs: General Appraisal (GA), Floor Condition Rating (FR), Wearing Surface Rating (SR) and Paint Rating (PR). If the appraisal rating of a bridge drops below deficiency level on any of the OPI, the bridge is considered deficient on that OPI & is programmed to remove the relevant deficiency. Once the bridge maintenance work is completed, improvement in the deficient OPI will be observed during the subsequent inspections. Bridge work costs to remove any OPI deficiency are tracked in the Ellis. Average bridge OPIs based on the bridge deck are monitored for each District every month. All information is obtained through the bridge inspection program Current statewide goals; less than 4% deficient General Appraisal, less than 3.8% deficient Floor Condition Rating, less than 3.0% deficient Wearing Surface Rating, and less than 10% deficient Paint Rating.																																																		
OK	No If so, a) What are your state goals and measures? Even though we do not have specific performance goals, in a recent TRIP survey based on our current																																																		

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?	
	funding, we projected the following or On-system bridges: SD Bridges: from 797 in 2010 to 590 in 2015, FO Bridges: from 604 in 2010 to 550 in 2015, Posted Bridges: from 40 in 2010 to 5 in 2015 How did you go about establishing these measures? Based on our 8 year program
OR	a) ODOT's goal is to manage overall bridge conditions to achieve a certain level of non-distressed bridges based on route hierarchy. A higher percentage of bridges with "not distressed" ratings are desired with priority given to NHS routes. Bridges "not distressed" means that the bridges have not been rated as Structurally Deficient based on criteria established by the Federal Highway Administration (FHWA), or have other needs defined by ODOT. A distressed bridge is defined as a bridge with an identified freight mobility, deterioration, safety or serviceability need. Yearly we re-examine our bridge conditions and compare our results with those in the rest of the nation. Current bridge condition goals are: NHS – 90% not distressed, and Non-NHS Routes – 85% not distressed. These goals were set in recognition of the anticipated result of addressing all structural deficiencies, while leaving many lower priority conditions "as is". b) The current bridge performance measure was adopted after recognizing that strict adherence to the FHWA measures of Structurally Deficient and Functionally Obsolete were not working for us. Even after a period of high investment levels in state bridges, bridge conditions were not much improved. Although we have had limited experience with it, the new measure appears to correspond better to Oregon's bridge program by reflecting improved conditions for the types of bridge needs our projects address.
PA	Please note that this question was not asked at their regional meeting.
PR	At the moment the PRHTA has established a Plan of Action (POA) to improve the bridge program based on FHWA 2009 Process Review. This POA aims to address deficiencies in maintenance policies and implementation of such policies. State goals, to implement the POA submitted to FHWA and implement an effective process to coordinate communication with DTPW. How did we establish measures, Bridge Program Manager position has been created.
RI	Please note that this question was not asked at their regional meeting.
SC	Yes. Both reducing the no.'s of structurally deficient bridges and the deck area of structurally deficient bridges. We are also experimenting with measuring user costs by network and specific road systems. Management adopted them by considering what could be accomplished with different funding levels. We are beginning to track user costs as well, which could represent a much better measure of program and funding effectiveness on the network and specific

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	road systems.
SD	We do not have any specific target numbers for goals but for measures we do track the number of structurally deficient (SD) structures and the health index (HI). Our general goal is to keep the number of structurally deficient structures to a declining trend and/or low number and keep the health index to a stable higher number.
TN	Reduce the number of Structurally Deficient State owned bridges each year.
TX	Yes. In 2001 TxDOT was directed to take steps to ensure that 80% of all bridges (including both State and local owned bridges) were in "Good or Better" condition. A good or better bridge is one that is not structurally deficient, functionally obsolete, or is not load restricted. TxDOT was directed to meet this goal by 2011. The goal was established by the Texas Transportation Commission.
UT	a) What are your state goals and measures? Utah measures performance by bridge ratings and sufficiency rating. Utah has reduced the percentage of "poor" bridges from 10% to 2%, and aims to maintain a level of 2% or less of structurally deficient bridges. b) How did you go about establishing these measures? These measures and goals were established by correspondence between Department upper management and bridge engineers. These needs are quantified and communicated using the "Critical Bridge List," which is updated quarterly. The list is prioritized first by risk management needs (criticality), and then by importance.
VA	Virginia's global performance measure is based on the number of non-structurally deficient (SD) structures in the inventory. The goal is to maintain a ninety two (92) percent non SD performance level statewide. Other performance measures that are considered in the overall management of the bridge assets are functional obsolescence, General Condition Ratings less than 5, load posting, and Health Index. The structurally deficient measure was established by VDOT's executive management. The reason for selecting this measure is due to its common use by the States and FHWA. Performance can be easily compared to other states. Prior to establishing the global performance target for bridges, VDOT performed an assessment on the current condition of structures, current funding levels, and the desired funding levels and available resources that can facilitate achieving this goal.
VT	Please note that this question was not asked at their regional meeting.
WA	2. a) What are your state goals and measures? a. Bridge Maintenance Goals/Measurements: 1) Unrepaired Deck Spalling (asphalt & concrete): Goal = B- where B = 0.0026% to 0.015% 1. Annual measurement deck BMS by percentage of Region spalling divided by the Region deck area (SF). 2) Bridge Joint Repair: Annual program being developed

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures?	
	3) Bridge Structural Repairs: Goal = C where C = 79% – 65%, Structural Bridge Repairs are posted by Bridge Inspection, Documented when completed by Maintenance, and verified by Bridge Inspection. 1. Annual measurement is percentage of completed Priority 1 Bridge Structural Repairs divided by the total number repairs posted for the period. 4) Bridge Structural Washing: Annual program being developed, first part of this program will address flushing of steel truss bridges. Rating will be by percent of steel truss bridges washed annually. 5) Bridge Deck Cleaning: Goal = C 1. Annual sum measurement of three items: Deck Sand/Gravel Removal; Cleaning Drains; Graffiti Removal 6) Moveable/Floating Bridge Operations: Goal = B+ (B = 2.1-5%) 1. Annual measurement of delayed opening/closing due to mechanical malfunction. 2. Second measurement is being developed that will rate the crew by percent of identified preventive maintenance work accomplished. b. Bridge Preservation GASB measurement structural condition (Good, Fair, Poor) using NBI superstructure and substructure condition. WSDOT's policy is to maintain 95 percent of its bridges at a structural condition of at least fair, where fair condition is NBI condition of 6 or better. NBI deck condition was excluded in this definition due to unreliable data. b) How did you go about establishing these measures? a. Maintenance measurement was initially a "Level of Service" or "Performance Measurement" tool which has changed to a funding allocation tool. State reporting processes adopted NBI data as a nationally accepted system for reporting Bridge Condition Measurements prior to Governmental Accounting Standards Board (GASB) requirements.
WI	Several strategies to measure the condition of the system include: Load capacity, clearance issues deficient bridges NBI values. One such goal is 90 percent of the bridges are classified as not deficient. measure benefits- use statewide objectives to produce projects including safety, risk assessment, maintenance strategies preservation strategies. We verify and re-look at the strategies by looking into the data and effectiveness against our overall goals, or investigating if either deterioration current.
WV	Yes and No. We basically just use the local FHWA's current measurement of lowering Deficient bridges on the NHS and our own goal of reducing the number of posted bridges

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	in the State. None of these goals are really looked at by upper management or our legislature and are only used within the bridge community.
WY	Currently, we use the number of deficient bridges on the select list as a measure of current bridge condition. We are proposing to move to an Excellent to Poor rating index for bridges to parallel our Pavement and Safety Indexes.

This question was asked at the SE, NE(Q3), MW and WBPP meetings

5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
AK	a) Installation of cathodic protection (CP) systems on Ketchikan Viaducts. Use of microsilica modified concrete (MMC) in deck rehabilitation. b) What didn't work well? Galvanic CP systems did not provide the desired level of protection and are being converted to active systems. MMC is more difficult to correctly place. Cracks must be resealed. c) What do you think should be the future direction of bridge preservation? Allow preventive maintenance activities to be completed using Federal Bridge Funds.
AL	The benefits of bridge painting are well known. Our joint sealing and bearing replacement has resulted in a reduction in girder end repairs.
AR	a) Painting is good but we don't do enough. Recommendation to Bridge Design to use more jointless bridges – too early to tell on success. b) Open foam joint sealant c) Asset management should be strongly encouraged by the FHWA.
AZ	• Milling & Microsilica • Seal deck with Methacrylate b) What didn't work well? • Placing Polymer overlay over bridge deck provided mixed results. • The biggest challenge in our program are: - Turn over - Need annual training - Hiring experienced Professionals - Funding

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	c) What do you think should be the future direction of bridge preservation? To become proactive rather than reactive to bridge preservation needs.
CA	a. Bridge deck cracking, wearing surfaces, joints and painting represent the vast majority of all preservation dollars spent. For the bridge deck cracking and wearing surface treatments, Caltrans is currently conducting research that will correlate field observed conditions to a “life curve” of the deck. This research will define when it is most effective to seal cracks, how long we can expect the benefits of the sealing to last, which overlays are most effective and at what point along the deterioration curve for the deck is it best to apply them. For deck performance, we have also looked at our standard deck designs and construction specifications and standards to try and get the most durable deck designed and constructed to avoid the need for preservation in the early years of life. Caltrans is also fairly aggressive with our structural steel painting program. Our goal is to keep our protective coating systems in good condition to avoid section loss in our members. Painting activities are conducted by Caltrans painting crews and by contract. b. Caltrans has installed a couple of systems designed to keep floating debris (logs etc.) from accumulating on the noses of our columns and pier walls. These systems have not performed well. c. Bridge preservation falls into two general categories in my opinion; site specific needs that are related to material, design or use issues and scheduled maintenance. Using a car as an example, you can schedule oil changes, but you wouldn't likely replace your battery unless it dies. The key to sound preservation in my opinion is to have programs that are set up to address the items that can be scheduled such as joint replacement and utilize your inspection information to validate the need for the work as the scheduled date approaches. For site specific concerns, quality inspection information (testing, photos, well written reports, etc) can often times provide insight into the cause of these problems and point to the appropriate solutions. I also see an increased use of monitoring system where they make sense and to provide real time data. The monitoring arena is improving exponentially and will become a more significant feeder into preservation decision in the future. Deterioration forecasting and economic analysis also needs to be better integrated into preservation business practices.
CO	a) Waterproofing membrane and regular expansion joint maintenance and repair. b) What didn't work well? Quick deck patching. c) What do you think should be the future direction of bridge preservation? Washing and sealing structure surfaces exposed to deicing chemicals.
CT	In our Preventative Maintenance Program our strategy has been to let District-wide joint projects (Connecticut has 4 construction Districts—these projects are bid as conventional construction projects), followed by bearing replacement projects, followed by beam-end

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	repair and painting projects. Going forward we intend to combine the bearing and beam-end projects to reduce mobilization costs. One thing not working well: are the NEPA and Public Involvement requirements for using federal dollars can be cumbersome (i.e.... SHPO effect determinations for a multitude of sights for a joint project).
DC	<i>Implementing pro active program such as: Routine scupper cleaning and washing; deck Joint replacement; bridge deck sealing; Bridge deck overlay, cleaning, painting girder ends and lubricating bearings</i> <i>b) All of the above are working well except replacing deck joint with Dow-corning silicon joint repair system. For the past year we have been using R.J. Watson silicoflex. Outcome to be determined.</i> <i>c) Research to find better materials, and repair methodology and establishing Database for information sharing.</i>
DE	Bridge painting b) What didn't work well? Joints are difficult to keep up with due to the quantity and variety of types c) What do you think should be the future direction of bridge preservation? Don't know
FL	5a. Cathodic Protection, better design and construction such as a better aggregate design, Bridge Maintenance has worked with design providing input early in the design process to build bridges that have lower life cycle operation and maintenance costs. 5b. Gunite Repairs in corrosive environments, Metal Stay in Place forms in Corrosive environments, conventional repairs on chloride contaminated structural elements. 5c. More attention to bridge preservation, better analysis of the cost effectiveness of it, better publicity of the value of bridge preservation.
GA	5a) N/A 5b) N/A 5c) A standard definition of bridge preservation that contains the standard preservation measures (maintenance items). From the standard preservation measures, each DOT selects their preservation measures and determines their own criteria to address their preservation measure.
HI	Have various projects for viaduct full-depth deck repairs ongoing using rapid set concrete.
IA	Our long standing program to overlay bridge decks with a dense P.C. concrete overlay prior to significant deck deterioration (deck may have as little as 1% of area with spalls or

5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
	delaminations). Proactive program of retrofitting steel bridge members with fatigue crack prone details. Development of an inspection manual and inspection program for our sign structures, bridge mounted support frames, long mast arm structures and highmast lighting towers. Practice of in-house staff injecting epoxy into the delaminations of the dense P.C. concrete overlays to extend the life of the deck. b) What didn't work well? Conventional patch techniques to repair deterioration on the ends of pretensioned prestressed concrete I beams caused by corrosion of the prestressing strands and mild reinforcing (typically located below leaking deck joints). Contracting out the injection of epoxy into the delaminations of the dense P.C. concrete deck overlays. Approximately 10 years ago, the Iowa DOT tried some projects where the steel was spot painted. The steel was prepared to SSPC SP-10 and painted with a 3 coat system. The surrounding paint was feathered and top coated to transition to the old paint. Approximately 2 to 3 years after the spot painting, some more areas appeared. After about 5 years the paint had deteriorated enough to repaint a zone at a minimum. The deteriorated paint that caused the first spots was more generalized and the whole system was failing as was evident by the continual failing of the paint. c) What do you think should be the future direction of bridge preservation? Invest more funds in preservation activities. Determine best practices and most cost effective preservation techniques. Improve management and tracking processes.
ID	<i>See above</i>
IL	As noted above we have some preservation funding sources that are new, and have not had consistent statewide bridge preservation activities to this point. We are optimistic that the deck sealing program will be beneficial. Research on deck sealers prior to establishing the statewide funding line item showed the sealers are effective. It would be good to have best practices for various types of preventative maintenance identified nationwide along with any cost/benefit data available to support those practices. Many states could use the information for obtaining funding within their states for preservation practices. Simple guidelines for determining which bridges would benefit, and how to prioritize, would also be very useful rather than trying to rely on data hungry and complicated bridge management software for impractical levels of optimization.
IN	District-wide "Bridge Preventive Maintenance" contracts b) What didn't work well?: First time contractors (small contracts) Project Managers/Engineers c) What do you think should be the future direction of bridge preservation? 1- Develop Policy, 2- Establish Budget, 3- Implement, 4- Adjust/Revise, 5- Do More!

5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
KS	a) The State's Substantial Maintenance Program is one of our greatest success programs. Strong funding for the Bridge Set-Aside portion of this program and the ability to make most decisions at the Bridge Management Engineer's (fund manager) level provides a great deal of freedom for sound and quick decisions when needed. The support of my Director and the other fund manager for pavements is also a strong resource. Funds have been moved from one fund to another when needed. This again allows a lot of freedom to make both decisions for emergency repairs and on work additions (when a low price is offered by a contractor that is hard to walk away from.) The use of polymer overlays has been a strong bridge preservation program that so far has performed well for us. It comes at a reasonable cost and more importantly reduced time in lane drops. It has also increased tire traction for traffic and reduced noise levels. b) Handling deck drainage on and off a bridge is one of our greatest disappoints. We spend a great deal of money for repairs annually created from water damage. We are currently looking hard at our bridge drain designs and associated collection systems. Another problem area is bridge approach settlement and associated problems with joints and drainage. We have recently changed to a new joint system and have Let a project using a new approach design using a bituminous wedge between concrete pavement slabs. c) The cost of construction has dictated that DOT spends more of their resources on preservation just to be able to maintain the system at hand. In order to even consider constructing future capacity improvements the existing system will have to perform better than allowed in the past. The only way this can be possible is through a sound preservation program.
KY	We have recently put more effort into getting our District bridge crews better staffed. They can now do basic functions such as cleaning drains and deck patching. We have also began some bridge cleaning by contract. One area that did not work well is bridge overcoating with calcium sulfonate. We are seeing overcoating failures in as little as 3 years. We are aiming for a plan to do certain maintenance activities based on the age of a bridge. For example, when a bridge becomes ten years old we will apply a deck sealant. We hope to use the philosophy of spend a little money now instead of waiting to spend a lot of money later.
LA	5a. We implemented an interim Bridge Preventive Maintenance Program. This program

5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
	fills the gap between emergency repairs and major rehabilitation. We no longer have bridge maintenance crews to perform routine maintenance and so this program fills the gap for preventive maintenance needs.” 5b. “Some of our needs for the interim program were not approved by the FHWA. For example, steel grid deck replacements and relief joint repairs. When Pontis is fully implemented, we may be able to perform these repairs.” 5c. “These types of high value repairs need to be considered by key decision makers. Also, preventive maintenance needs more funding to improve the overall health of the bridge network.
MA	Unfortunately for us, bridge conditions are at such a point that a lot of effort is needed to reach our goals of bridge preservation. What has worked well for us is to do partial deck replacements when the deck has not deteriorated completely (partial deck replacement: remove the top half of the deck and replace with new concrete) and replace with a membrane waterproofing and asphalt overlay. The future direction should be to develop maintenance strategies and programs that will repair problems when they are in their infancy and protect the asset before they have a chance to grow into major problems requiring extensive work.
MD	We find doing latex concrete overlays just prior to the deck reaching a point where this is not possible to very successful. We also find repairing substructures with cast in place concrete to be a much better long term repair then other methods. b) What didn't work well? Using pneumatically applied mortar (gunite) as a long term repair. c) What do you think should be the future direction of bridge preservation? Building less new systems and maintain the existing ones first. Do not privatize roadway/bridge maintenance.
ME	Washing, sealing concrete surfaces, sealing joints, partial paint, new wearing surfaces. Pour in place joints only have a limited life.
MI	Successful preservation strategies Development of a Strategic Investment Plan for Trunkline bridges having specific condition goals. This has kept us focused. Providing specific funding for work categories; capital preventive maintenance, capital scheduled maintenance, rehabilitation, and replacement. Development of a network level forecasting tool called Bridge Condition Forecasting System (BCFS) to analyze and compare strategies, and to forecast bridge condition. Monitor bridge system condition annually in accordance to our strategic goals. Monitor number of bridges that become poor each year to measure the effectiveness of our preventive maintenance programs.
MN	In the late 1970's through mid 1980's MnDOT implemented an overlay strategy for all state bridges. Through FHWA and MnDOT research we started a latex or low slump

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	concrete overlay program for existing and new bridges to prevent further deck deterioration. Most overlays have lasted approximately 30 years before another overlay or re-deck. The deck deterioration rate and condition significantly improved. Targeting zone painting based on Pontis paint conditions. MnDOT District Bridge Maintenance will perform some painting at specific locations like gusset plates, hinges or joints. We have tried some bituminous overlays with and without membranes with little success. We have since removed almost all membranes and no longer use in construction. The future direction of bridge preservation is more efficient use of resources by using innovative new products, better details and preserving the good condition bridges. For Minnesota there is a bubble of interstate bridges that need either preservation or improvement repair activities.
MO	Our most notable successes include bridge deck cleaning/flush, deck sealing, approach lifting, and joint replacement programs; the use of a maintenance contracts, including job order contracting; institution of zone/spot painting; and regionalization of our bridge maintenance crews. What didn't work well? Establishing a program that set aside \$10M annually for contract painting of major bridges, as these funds were quickly moved to other non-bridge-related needs. What do you think should be the future direction of bridge preservation? We need to focus on maintaining/preserving bridge decks. They are the key to minimizing needs elsewhere and extending the life of the structure. In addition, we need avoid the worst first mentality when prioritizing maintenance activities. Our priorities should be to first ensure the safety of the structure, second to perform maintenance activities that provide us with the greatest benefit, and lastly to maintain poor condition structures as needed.
MS	Mississippi DOT does not have a dedicated bridge preservation program
MT	The sealing and filling program has reduced the number of deck replacements over that last several years. Timing seems to be the issue, especially with environmental process constraints. The future should be reviewing and streamlining the process from conception to contract.
NC	5a. NCDOT sees success in replacing deck joints, painting structural steel, and deck preservation by utilizing hydrodemolition techniques and overlaying with latex modified concrete. 5b. NCDOT found that cold weather use of very early strength latex modified concrete overlays resulted in cracking. 5c. NCDOT sees that a systematic program incorporating deck joints, painting, deck sealers and overlays is the future direction for bridge preservation.
ND	We have only been doing bridge preservation for the last two years. We have experimented with different crack sealers and spall repair products. Crack sealing

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	operations have been going very well. Crews have done a great job with the sealing and understand the importance of it. b) We did not have a good experience with a deck seal. Too much preparation with the sand blasting the entire deck. We are not set up to do full overnight lane closures. We prepare to seal just the cracks. We can perform that operation in one day.
NE	Bridge deck sealing, done by individual districts. Bridge deck overlays – silica fume concrete or asphalt over waterproof membrane. Bridge washing by State maintenance forces.
NH	Yearly washing and periodic oiling of bridges have been extremely successful in prolonging a bridge's useful life. Other activities that have been successful include deck membrane replacement combined with deck patching and deck patching combined with concrete overlays. Patching substructures has had spotty success because the underlying cause is not always fully addressed. Replacing deteriorated joints with asphaltic plug joints has worked in the short term, but these joints require a high degree of periodic maintenance. Bridge preservation activities and funding should be considered from the day a new structure is opened. Maintenance funding for <u>that new structure</u> should be included in the budget based on a periodic maintenance schedule which includes washing and sealing, repainting, replacing joints, deck membrane replacement, etc. Providing a limited pot of funding that allows us to perform required periodic maintenance on only a small percentage of the bridge inventory will continue to perpetuate the bridge conditions we see today.
NJ	Preventive Maintenance procedures used by the New Jersey DOT have been an evolving process developed throughout past years. As of right now, the following are included in the NJDOT Bridge Preventive Maintenance Program: Bridge Cleaning, Repair/Replace Joints, Repair Concrete Deck/Sidewalk, Seal Concrete Deck, Seal Cracks in Wearing Surface, Crack Sealing on Concrete Decks, Crack Sealing on Substructure, Inhibit Corrosion of Rebar, Lubricate Bearings, Substructure Concrete Repair, Sealing Concrete Substructure, Repair Approach Slabs, Repair Erosion/Scour, and Safety Improvements. b) What didn't work well? As of this writing, the New Jersey DOT has not had any issues with any item that caused it to be removed from the Bridge Preventive Maintenance Program. c) What do you think should be the future direction of bridge preservation? A cyclical, systematic approach to preserving and maintaining bridges has been established by the New Jersey DOT and the FHWA. A series of guidelines have been devised and should be followed.
NM	(a) NMDOT's primary preventative maintenance practices are polymer bridge deck overlays, deck sealing (healer sealers and methacrylates), concrete repair work and full depth expansion joint replacements. All of these are constructed using our "Statewide Bridge Repair Contract". Contract is strictly for labor. All materials are reimbursed at

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	invoice price. This allows NMDOT to select materials which will be used. Problems do arise concerning warranties with polymer bridge deck overlays. Some contractors will use only certain products. In 2004 NMDOT decided to use federal BR funding targets for bridge repair. Since then the department has made significant progress in decreasing the number of structurally deficient bridges. (b) Pourable, compression and elastomeric bridge joints have not worked in New Mexico. (c) On a national level more funding should be allocated to bridge preservation. However, how this money is spent should be left to individual states.
NV	a) Ensuring consistent/quality bridge condition data as recorded in bridge inspection reports, and verified through QC/QA audit processes. Development of in-house fatigue repair program, for small-scale fatigue crack stabilization repairs, conducted even during regularly scheduled bridge inspections. Improved communication/coordination with District Bridge Maintenance staff. b) Mixed success with asphaltic plug expansion joints. Significant incidence of early joint de-bonding and failure, state-wide. Poor success with elastomeric concrete used as joint headers with embedded joint restrainers. Widespread incidence of early de-bonding and material failure, state-wide. c) "Preservation" should be defined/recognized as any action that extends bridge life, whether proactive or reactive in nature, and allow any such activities to be completed using Federal funds. Further, consideration should be given towards the segregation of Federal preservation funding from bridge rehab and replacement funding, such that these activities do not have to compete one against the other.
NY	Use of polymer-based repair materials for expansion joint & deck waterproofing, FRPs for temporary repairs, bearing replacements (swapping steel sliders with elastomeric, use of GRP for rapid assessment – for bridge and network level info, identification of cyclical activities, skills training, Job Order Contracting, outreach to locals. b) Maintenance of steel coatings - we are not moving fast enough. c) More involvement with local owners. More stretching the limit resources. Consultants and designer moving into creative repairs and analysis to keep bridges open.
OH	Ohio biggest success is incorporating our major maintenance needs into the capital program for overlays, deck replacement, and painting.
OK	Our biggest success seems to come from replacing bridge decks. Sealing joints and eliminating joints seems to work well. b) What didn't work well? We have had some overlays which have cracked and delaminated. Some of our rehabilitated joints do not last too long. c) What do you think should be the future direction of bridge preservation? Finding

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	a way to slow down the corrosion process which is electrical in nature.
OR	<u>Group Goals</u> - What we want to achieve Bridge Operations are guided by the following goals which are accomplished by hosting the State of Oregon and the Pacific NW Bridge Maintenance Conferences: • Promote the merits of performing bridge preservation activities • Promote timely bridge preservation activities that will provide the traveling public with improved safety, mobility, reduced congestion, smoother and longer lasting bridges. • Promote improved labor force efficiency gains by sharing innovative repair techniques, productivity improvements, best practices, tricks of the trade, and lessons learned. • Promote improved equipment productivity gains by sharing innovative usage of certain types of equipment. • Promote improved Material Usage by sharing successful application Lessons Learned and promoting real life application research projects. • Promote improved Maintainability of our bridges by sharing bridge design details that will provide the following: ○ bridge designer feedback on what details function well, ○ sharing innovative designed bridge repair details / schemes, ○ bridge designer feedback on which bridge detail are easy to maintain, ○ use or re-use of Salvaged Materials, ○ Design bridges with clearances to eliminate traffic impacts ○ Design bridge foundation to eliminate scour and seismic deficiencies ○ Eliminating of deck joints, ○ Elimination of urban artists and homeless condos, ○ Placement of approach slabs and associated details, ○ Providing jacking scheme for bearing maintenance / repairs ○ Providing adequate space for easy access ○ Providing Fall Restraint Systems or measures • Promote improved Inspectability of our bridges by: ○ Elimination of Confined Spaces, ○ Elimination of Fatigue Sensitive Details, and ○ Providing easy access and installation of Fall Restraint measures. • Promote pooling of group resources to further identified Research Efforts. Provide a central point of collected information (library of information) where entities can obtain a place to start rather than re-inventing the wheel.

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- Promote a paradigm shift that will embody expending the first available dollars on Bridge Preservation Activity, rather than last.

Key Benefits Accrued from Agency Participation

Active participation in group meetings / activities, the agency will obtain the following:

- Operational In-sight – Obtain first hand knowledge on how bridge maintenance / bridge preservation issues are being couched in other agencies. Insight into the development and adoption of achievable and measurable bridge maintenance program objectives.
- Planning with an Eye on the Future - Determine how other agencies are planning now to address huge budgetary shortfalls in the future.
- Quality Decisions – Agency participation maximizes the knowledge base by providing a sounding board forum to discuss bridge maintenance issues.
- Operational Efficiency - This group will address bridge preservation terminology issues, lessons learned, set directions on how bridge preservation programs should be applied, and how their effectiveness should be measured.
- Strategizing - Opportunity to help define bridge preservation strategies which can be used to develop a network level bridge maintenance program and obtain example used by other States / Agencies.
- Learn how other agencies are querying and using bridge inspection data, to define the current condition of each bridge and match that condition with the most appropriate strategy.
- Considered Trade-offs - To ensure existing facilities are properly maintained to protect the original capital investment and to ensure a safe facility is available to the public, the Bridge maintenance managers are required to make serious trade-offs. Participation provides an opportunity for the agency to obtain insight / lessons learned on how best to navigate through these issues.
- Management Practices - Determine how other agencies are directing their attention to preserving the structures in their inventory through the use of lessons learned and best management practices.

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	- Balanced Bridge Maintenance Program - Help define what exactly a well Balanced Bridge Maintenance Program is and determine which preventive maintenance activities, will prolong the life of a bridge inventory and reduce the need for other, more costly, maintenance activities in the future. - Different Element Deficiencies do not have same effect on the service life of a bridge, the safety of the general public, or the cost of maintenance, repair, or rehabilitation. Participation will provide an opportunity to gain more insight into those differences so that better managerial decisions can be made. - Determine what level of service bridge maintenance response deficiency threshold triggers that have been successfully implemented by other agencies. - As a group, brainstorm the development of realistic, well defined business operational practices, that will promote the preservation of our bridges: - Cleaning gutters, drains, joints and tunnels twice a year – once after the leave fall and once after winter sanding operations. - Zone paint critical structural areas when the steel element CS4 > 0 like FC members, bearing areas, connections, beam ends. - Where possible remove or mitigate all fatigue category d, e, or e' details. - Pull drift off of bridge bents as soon as possible - Participation in the group activities will foster a work together climate on the art of preserving our structures, rather than working or making decisions in a silo or vacuum.
PA	Our bridge painting guidelines (for bridges greater than 100 feet long) has streamlined our painting efforts resulting in an economical method to provide corrosion protection to existing steel bridges. Concrete deck patching and waterproofing overlays (i.e. latex concrete, bituminous with membrane) has extended the deck life and improved rideability. b) What didn't work well? Repairing or replacing/installing expansion dams to ensure leak proof joints. We have had some issues keeping our joints intact after winters. The X.J.S. Expansion Joint System has been sparingly used due to bonding issues between the silicone and concrete. c) What do you think should be the future direction of bridge preservation? Taking into consideration Pennsylvania's age of the infrastructure (average age = 51 years), 3rd largest number of state-owned bridges (>25,000), and largest number of structurally deficient (SD) bridges (>5,590), bridge preservation is a strategic, economical, and critical activity needed to extend the life of a bridge. We must better strive to identify a bridge preservation life cycle that would determine the what's and when's of specific bridge preservation activities – in other

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	words – try to get the biggest bang of the buck in performing the preservation activity at the optimum time to get the most life out of a bridge.
PR	5a. The PRHTA has created the position of Bridge Program Manager to coordinate efforts with DTPW in maintenance and preservation. In the past, DTPW decisions on which bridges to repair were not based on the PRHTA NBI inspections. Since January 2010 coordination between the two agencies has been improved. Works performed by DTPW include repairs to avoid future scour and erosion of wing walls and abutments. Such repairs are new waterways, gabion walls and concrete retaining walls. 5b. Sometimes performing the job takes a lot of time due to the lack of funding. 5c. To create a permanent budget for preservation.
RI	Bridge washing is currently our only activity.
SC	Bridge painting has worked well and we are now performing more deck preservation. We are also developing strategies for deck sweeping, bridge washing, bearing maintenance, structural and cosmetic patching, expansion joint resealing and etc. Deck patching is going well overall but our SCDOT Standard Specifications need several revisions in order to accommodate a significant deck preservation program.
SD	We have identified four main areas we concentrate on through our practices. a) Decks/Slabs: Protection thru the use of overlays and sealers. We went to epoxy coated rebar and increased clear cover for our new structures in 1976. An extensive overlay program for our existing structures was initiated at that time for our decks/slabs with black resteel. That program was substantially completed by the mid to late 1980's. The overlay program continues as we are replacing some of those original overlays. We have overlays in place that are 25-30+ years old and still performing well. Our rigid concrete overlays have performed the best. We had varying success with our asphalt/membrane type overlays. We have use mainly thin overlays and sealers on our newer structures. b) Joints: Most of our girder bridges built since the 1970's are built joint-less with the use of integral abutments. Waterproofing open or leaking joints on our older bridges during our overlay program was a priority. c) Steel Girders: Zone painting near open joints. Along with our overlay and waterproofing joint effort we also included zone painting of the steel girders near these joints. d) Safety: We have also concentrated on upgrading our bridge rails to crash tested rail systems and lower maintenance type rail type systems. We have been fortunate that we were able to start and continue to fund this preservation effort since the 1970's. With the preservation effort and replacement program we have in-place our structure inventory is in pretty good condition. We

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	would like to see the available federal funding continue for preservation work.
TN	We use overlays (PMC, asphalt sandwich seal, 4 ½” reinforced, a few thin epoxy overlays) - works well, placing PMC overlays on hollow box bridges to protect the top slab (preserving the compression area) – works well, backer rod and silicone in simple span expansion joints – worked moderately well, repaint structural steel – works well.
TX	5a. When funding has been made available Texas has had very good success with projects dealing with joint cleaning and sealing, scour mitigation, substructure repairs. 5b. Cosmetic concrete repairs that did not address the root cause of the distress. 5c. Development of better funding methods and more thorough education of those responsible for prioritizing maintenance needs to ensure more equitable split between pavements and bridges.
UT	The most successful strategy has involved lobbying for funds, and then spending them in the same fiscal year. This has provided continuous funding which has allowed for flexibility in the options available for preservation. During better economic times, we receive more funding, and are able to further reduce the percentage of bridges on the Critical Bridge List. b) What didn't work well? Placing polymer overlays on bridges older than 10 years proved to give variable results, not all of which were positive (debonding and deck spalling occurred after 5+ years). c) What do you think should be the future direction of bridge preservation? The future of bridge preservation in Utah should involve engaging in preservation activities as early as possible, especially with the increase in new infrastructure. Deck treatments are now being applied to most new construction prior opening them to traffic.
VA	Virginia has an agreement with the FHWA that establishes a list of Preventive Maintenance activities that are eligible for Federal Bridge Funding and that provide a significant increase in the service life of bridges. The activities included on this list are shown below: - Seal or replace leaking joints, reconstruction of joint areas during joint replacement or elimination of deck joints. (Minimizes the deterioration of superstructure and substructure elements beneath the joints.) - Deck overlays. (Thin bonded overlays, rigid overlays, and asphalt overlays with waterproof membranes)(Significantly increases the service life of the deck by sealing the deck surface from aggressive solutions and reducing the impact of aging and weathering.) - Spot and zone painting/coating of structural steel to include bearings for prestressed concrete members. (Target areas where the paint deteriorates the fastest and slows down the deterioration process and extends the service life of the paint system.) - Painting/coating of structural steel. (Reducing the deterioration of the structural steel.)

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- Cathodic Protection (CP) Systems for Bridge Decks. (Proven technology for stopping the corrosion of reinforcing steel.)
- Cathodic Protection Systems for Substructure Elements. (Proven technology for stopping the corrosion of reinforcing steel.)
- Cathodic Protection Systems for Superstructure Elements other than decks.
- Electrochemical Chloride Extraction (ECE) Treatment for decks. (Removes the chloride ions from the vicinity of the reinforcing steel and thus eliminates the source of corrosion.)
- Electrochemical Chloride Extraction Treatment for substructure elements. (Removes the chloride ions from the vicinity of the reinforcing steel and thus eliminating the source of corrosion.) Can be very effective when the source of chlorides is eliminated, like eliminating deck joints above substructure elements.
- Scour countermeasures installation. (Protects the substructure elements from undermining and failure due to scour.)
- Removing large debris from channels. (Protects the substructure elements from scour.)
- Retrofit of fracture critical members.
- Retrofit of fatigue prone details. (Methods to increase the fatigue life of fatigue prone details, like using ultrasonic impact treatment on welds at ends of cover plates or connection plates welds not positively connected to flanges.)
- Concrete deck repairs in conjunction with installation of deck overlays, CP systems, or ECE treatment.
- Substructure concrete repairs in conjunction with installation of CP systems, ECE treatment, or galvanic anodes (when there are several sources or experimental basis when only one source). (Includes substructure units with cathodic protection jackets.)
- Application of concrete sealants, coatings, and membranes for surface protection of the concrete.
- Bridge cleaning and/or washing service. (Decks, joints, drains, superstructure and substructure horizontal elements.)

In addition to the federally eligible PM activities, VDOT established a State funded Preventive Maintenance Program for bridges, pavement, and drainage structures. Listed below are the state funded activities and associated frequencies for the bridge PM portion of the program:

Bridge PM Activities	Frequency (yrs)
Bridge Deck Washing (Concrete)	1
Bridge Deck Sweeping	1
Seats & Beam Ends Washing	2
Cutting & Removing Vegetation	2

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	Routine Maintenance of Timber Structures	2
	Scheduled Replacement of Compression Seal Joints	10
	Scheduled Replacement of Pourable Joints	6
	Cleaning and Lubricating Bearing Devices	4
	Scheduled Beam Ends Painting	10
	Installation of Thin Epoxy Concrete Overlay	15
	Removing Debris from Culverts	5
	VDOT has mandated that all newly designed bridges or replacement bridges including superstructure replacement eliminate expansion joints as much as practical. VDOT has mandated the use of Corrosion Resistance Reinforcement (CRR) in lieu of epoxy coated reinforcement on all new bridge construction. VDOT uses District wide bridge maintenance contracts to perform PM activities (deck and seat cleaning, replacing leaking joints, overlays, etc.) in addition to site specific contracts.	
VT	Recently Vermont has focused on two types of preventive programs. The 1st being membrane and pave. The 2nd cleaning and painting structural steel. With the exception of a deck needing a bit more repair than expected, we are hopeful that these projects prove beneficial. As for the future direction, getting a handle and establish the 'right' cycle for preventive measures is key.	
WA	5a) a. Quality data in Bridge Management System. Difficult to confirm or deny long term success without this tool. b. Paint structures early before full removal is required. c. Concrete overlay preparation with hydromilling vs. planing d. Proactive management of bridge asphalt by Bridge Management e. Involvement of maintenance in new bridge construction from initial scope of the project through final completion of the construction. This produces a better product that is easier to maintain. 5b) What didn't work well? a. Asphalt management on the bridge deck by pavement managers. b. Lack of attention to construction specifications. c. Moving the development and permitting of scour jobs from the regions to headquarters did not improve the time it takes to get these permitted. 5c) What do you think should be the future direction of bridge preservation? a. Focus on improved quality and longevity of construction product. b. The bridge maintenance crews are moving from a reactive maintenance program to a more balanced program that will emphasize preventive maintenance. That will emphasize keeping good bridges in good condition. WSDOT should implement spot painting of structures by maintenance.	
WI	Sealing decks has provided longer deck life. Bridge preservation practices should be included in the design process especially for costly structural assets. Use the car analogy	

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	from the design and project cost.
WV	5a) One of our Districts has tried to maintain a bridge washing program through use of local volunteer fire departments while another has employed summer interns to help with deck sealing. 5c) More commitment of resources to the smaller type work in preservation.
WY	5a) Bridge deck sealers, micro silica deck overlays 5b) Methyl methacrylate deck overlays in recent years have poor performance. 5c) To provide guidance to recognize performance indicators to become proactive rather than reactive to bridge preservation needs.

This question was asked at the SE, NE (Q4), MW and WBPP meetings

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
AK	Planning establishes the amount of funding made available to Regions for preventive maintenance activities. The Regions then propose preventive maintenance programs.
AL	Goal of 5% of HBP funds for bridge painting.
AR	Districts decide how they want to use their maintenance funds for in-house work. Any contract work for bridge preservation would have to compete against all other needs of the highway system.
AZ	a. Our funding is divided into half between Bridge preservation and Bridge rehabilitation or replacement. This is exchangeable. b. Bridge Preservation prioritizes projects based on the inspection recommendation and input from the district.
CA	The preservation funds and the rehabilitation funds are managed by one person within Caltrans. This bridge program manager has the means to move funding between preservation and rehabilitation programs to best meet the overall needs of the bridges in California. In effect these needs do not compete against each other once the funding level has been established for each. The respective funding levels are established by evaluating the past performance of the programs and forecasting future needs.
CO	10% of CDOT's bridge program funding is earmarked for planned preventive maintenance.
CT	Currently, our policy makers have prioritized bridge preservation over major rehabilitation and replacement. Our HBP program is currently committed to 2 very large

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
	projects over the next 3 or 4 years. Bridge Preservation is the next priority, and bridge rehab./replacement is the next priority to make sure that our % of poor bridges does not increase.
DC	<i>DDOT recognizes the necessity for annual bridge maintenance and preservation budget. Funds are available for Bridge Preventive maintenance Contract (\$3M-\$5M) additional funds will be available by justifying needed work to upper management.</i>
DE	We use the same priority list for all bridge needs.
FL	The Department has established that system preservation and safety have top priority.
GA	Director of Engineering, State Bridge Engineer and State Bridge Maintenance Engineer select bridges for rehabilitation and replacement bridges.
HI	HBP funding is limited so preservation funding may be constrained to one project per year.
IA	They don't. All needs are lumped together and judged on merit and prioritized accordingly. Also, addressing preservation needs using let contracts usually results in small dollar projects or projects with numerous tasks and/or sites. This results in significant costs for engineering time for plan preparation, contract administration and construction inspection. The amount of preservation work that can be accomplished is a balance between available funds, engineering and inspection capacity and capacity of contractor pool.
ID	<i>We use our BMS to determine highest benefit in an unconstrained budget, factoring in other things like route, age, ADT, and management consensus.</i>
IL	Preventative maintenance has traditionally received much less support than rehabilitation and replacement needs. However, the new preventative maintenance funding sources described above are at least a step in the right direction for us.
IN	INDOT, Bridge Asset Management Team (BAMT) has developed a Business Rules to score bridge and large culvert (4'-20') projects. A high priority is given to Preservation Projects by assigning/automatic score of 100 out of 100 points.
KS	The current administration for KDOT has done a great job of protecting the Substantial Maintenance Program. Once the funds levels were determined by past performances to meet the needs, the Executive Staff has fought hard to preserve them. During the past couple of years of severe budget problems, these funds were the last to be reduced (went from \$21M to \$10M for two years for bridges). Our new Highway Program that started in July 2010, restored \$10M of the past funds that were originally lost and also restored the annual budget of \$21M / year.
KY	Major rehab and replacement needs are done with HBP funds and are submitted to Central Office by the Districts every two years. These needs are prioritized by the Districts. The final say is determined by upper management with the intention to

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
	spread the work evenly over the state with major metropolitan areas getting more work than sparsely populated areas. Bridge preservation is done with a different set of funds. Bridge candidates are prioritized and sent in by the Districts for contract work. Central office uses Pontis and makes field visits to each bridge that has been submitted and determines the overall priority.
LA	Our agency created a separate section for systems preservation and allocated a consistent annual budget for this type of work.
MA	Primarily through the efforts of our Districts that push for specific projects to address identified problems.
MD	We do have separate budgets although when necessary we do use the BR/BH money for repair/preservation work. Our emphasis has always been to make sure our bridges are maintained first and we have delayed deck replacements, etc. in order to fund necessary bridge repair work.
ME	Since the Capital effort is not focused on preservation and rehabilitation, Bridge Maintenance efforts are required to address structural need versus preservation.
MI	Through our Call For Projects process and strategy development done with BCFS.
MN	Bridge Preservation is done by Contract and also by Bridge maintenance workers in the District. Bridge Maintenance generally performs all routine repairs like flushing, debris removal, gland replacement and small quantities of painting, concrete or steel repair. Depending on District they can also do preventative activities like overlays, deck patching, railings and joint replacement. Preservation contracts get prioritized with all other projects within the District. Each District has a Bridge Engineer who prioritizes in close coordination with the Bridge Office. Replacement and major rehab needs typically are higher priority. Increased District Bridge staff statewide and newly established performance measures emphasize need for preservation as well.
MO	Due to the number of deficient bridges and the preference of MPOs/RPGs, bridge preservation needs take a back seat to rehabilitation and replacement needs in Missouri.
MS	Our entire HBP budget is spent mainly on replacements and to a limited extent Rehabilitation.
MT	The process for preservation is established first then other capital programs compete after that.
NC	NCDOT management recognizes the need to fund bridge preservation activities and is progressively increasing funding over the next 10 years.
ND	District offices decide where they spent their district maintenance money. Bridge Division uses the PONTIS reports to prioritize the Bridge Maintenance funds. The

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
	Districts and Bridge Division has input in the STIP development in prioritizing other major bridge rehabilitations and replacements.
NE	At the present time, preservation needs compete directly with major projects for State funds. Federal funds are not used at this time for bridge preservation.
NH	Bridge Maintenance is funded separately from Bridge Design and the capital program, so priorities of maintenance versus rehabilitation/replacement are determined at the Department's overall budgeting level. The funding level for Bridge Maintenance is relatively level from year to year.
NJ	A systematic approach to choosing structures for Preventive Maintenance has been put in place by the New Jersey DOT. This approach, laid out in the Bridge Preventive Maintenance Guidelines set forth by the NJDOT and FHWA, is based on various structure and substructure ratings. If a structure falls below certain levels, it is no longer included in Preventive Maintenance and is recommended for rehabilitation or replacement.
NM	New Mexico has seen the benefits of preventative maintenance and all 6 Districts have bought into allocating funds for preservation. Annual average precipitation in most parts of New Mexico is below 10 inches per year. Deck sealing and deck overlays have proven to extend the service life of our structures. Our Districts would overlay or seal every deck if the funds were available.
NV	Preservation needs are typically state-funded, and prioritized based upon urgency (degree of threat to motorist safety), and also ability to be executed by State forces, or incorporated into other, planned or ongoing construction projects, or as stand-alone contracts. Major rehabilitation and replacement needs are programmed within NDOT's Bridge Work Program, and this information is included in the STIP.
NY	It's probably more to do with guilt or a consciousness that preservation is necessary than using an analytical approach. We do run what if scenarios with various investment strategies but defer to the more immediate needs (% deficient).
OH	The District Multi-Year Work Plans identify the Districts' long-term pavement and bridge strategies. The goal of the District Multi-Year Work Plan is to develop a fiscally constrained work program that assures safe, reliable, efficient and accessible, travel conditions, while maintaining bridge and pavement assets at agreed upon performance levels. Each District Multi-Year Work Plan consists of a listing of rehabilitation and maintenance projects and an evaluation of current and forecasted system conditions. Development and maintenance of the District Multi-Year Work Plans requires a collaborative effort between the district Planning, Production, Highway Management and Business and Human Services administrations. This process ensures the district administrations are informed of their work unit's priorities and coordinates work efforts between administrations. ODOT's Program/Funds Management Committee, responsible for recommending

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
	policies involving the allocation of capital funds and the administration of all Highway capital programs, will use the Districts' Multi-Year Work Plan systems conditions forecasts and the State of the System report as the basis for establishing system condition goals and funds allocations. It is very critical that the Districts maintain an up to date Multi-Year Work Plan and forecast of conditions.
OK	We have dedicated funds for bridge preservation.
OR	Needs are ranked by type, but bridge projects are selected on the basis on many factors including safety, urgency, timing, work load balancing, route hierarchy, and deficiency status.
PA	PennDOT's Bridge Preservation Program is \$100 million per year that is allocated to our eleven Districts based on their total deck area of bridges. Hence, every District must deliver their share of bridge preservation projects. Priorities are established using an innovative Bridge and Structure Risk Assessment System that PennDOT staff developed in 2007. The system computes risk scores for all state-owned bridges based on various risk levels of the bridge, including structure type (such as fracture critical, etc), system network, underclearances, and condition ratings. Importance factors are applied to the risk scores based on bridge size, the feature under the structure, the average daily traffic and truck traffic, scour condition, and detour length. The system also determines preliminary scopes of work and generates design and construction cost estimates.
PR	In the past bridge preservation played a minor role compared to major rehabilitations and replacements but due to the economic crisis more repair works (slab repair, scour repair, etc) are being performed. Right now the PRHTA has made an agreement with the DTPW to provide them a list of prioritized bridges that should be addressed. In the past the DTPW work completely independent from the PRHTA.
RI	We have a dedicated set aside.
SC	We used to perform such project analyses but there is no formal prioritization effort now. However, we have the tools to perform prioritizations and have performed network needs studies in the past.
SD	With the preservation program we have had in-place for some time, we have been able balance our preservation and replacement needs with the available funding we have. We are also hoping this effort will also help smooth out the potential needs bubble from aging of all the structures that were built in the 1950's and 60's. The structures built in these two decades contain a good majority of the structures in our inventory.
TN	Most of our work is State funded so we aren't really competing for HBRR funds.
TX	Bridge preservation has had a fairly low priority for a long time. It is becoming somewhat better now that bridge issues have been in the press, but there is still strong resistance to spend funds on major needs. There is resistance at the District level to allocating their

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	maintenance funds to maintaining bridges. They would just as soon wait until the condition warrants replacement and then they can try and utilize HBP funding for a new bridge.
UT	Preservation needs are prioritized as highly as possible, and receive great support from upper management. Major rehabilitation or replacements are typically funded from different sources.
VA	Funds for maintenance and rehabilitation and preventive maintenance are allocated to the districts based on needs and available funds. Replacement needs are typically funded by the construction program through a dedicated fund for replacement. Maintenance activities including ordinary, preventive, restorative and rehabilitation are funded through the maintenance program. The Code of Virginia mandates funding the maintenance needs ahead of construction needs. Although, the overall budget for the Department has been reduced significantly in the last few years, the Maintenance apportionment continues to out past the construction portion. VDOT continues to make significant increase to the bridge maintenance budget, however, additional investment is required to maintain the bridge assets at the desired level of service.
VT	Preventive maintenance projects do not get prioritized or compete with major rehabilitation / replacement needs.
WA	a. Region Administrators use past history, change in inventory, and Maintenance Accountability Process (MAP) bridge scores to determine bridge maintenance funding in each Region. These do compete with other assets, but bridge work is a top priority and receives additional funding as needed and lower priority work may be cut. b. Bridge Preservation competes directly with pavement management, safety, and roadway improvements.
WI	Program level goes by policies and rules set across the funding sources. Project level goes by guidelines in upfront cost compared to life expectancy and other metrics.
WV	Preservation, major rehabilitation and replacement are in different funding categories for us so we are only battling what we have to spend in each funding category. Each funding categories dollar amount from year to year is often at debate. It sometimes is difficult to get a shift in priorities from year to year. The only thing we are sure of is we will always have a never ending supply of bridge candidates and never enough money to pay for it all.
WY	No response.

This question was asked at the SE, NE(Q5), and WBPP meetings

7. How does your State prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	
AK	Statewide Planning prioritizes the majority of bridge activities in the Statewide Transportation Improvement Program (STIP). STIP approved for 2010 to 2013 contained about twice as much major bridge work as there are BR funds available. This was a direct effort to reduce the number of bridges with structural or functional issues. There have also been considerable state funds applied to the more urgent bridge needs in the past 3 years. Other bridge projects compete based on the STIP evaluation criteria.
AL	We have a separate allocation of funds for different assets. One is not compared against the other to prioritize.
AR	Districts decide how they want to use their maintenance funds for in-house work. Any contract work for bridge preservation would have to compete against all other needs of the highway system. (same as #6)
AZ	Our funds are allotted independently for each category.
CA	Caltrans currently uses a “needs based” approach coupled with priorities established by our Transportation Commission. The priorities were established through a process that took into consideration the various laws and mandates we operate under plus the operational and condition needs of the system. Caltrans is in the process of a formal implementation of asset management. The framework that Caltrans is proposing would utilize multi-objective optimization to rank all project regardless of funding source. Under the proposed approach, the projects will compete on their own merits regardless of the asset or assets that are being worked on. This multi-objective framework will provide incentive for projects to work on multiple assets within a defined corridor limit.
CO	This is done at the administrative level with the Transportation Commission utilizing projected future condition information for the different assets. The Department has been working on a application that integrates condition information from different asset management models and reports future condition tradeoffs for different funding scenarios.
CT	In our Engineering and Construction Bureau, bridge projects (those projects that rehabilitate or replace structurally deficient bridges) are considered a priority over capacity improvement type projects. In our Maintenance Bureau the paving/roadside program is prioritized over maintaining the bridges.
DC	<i>Based on need.</i>
DE	They are not related.
FL	Maintenance uses a budget each year based on the inventory of all assets. All sections

7. How does your State prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	
	have performance measures. The results of the performance measures are used to adjust budget.
GA	Awaiting response.
HI	In recent years, major bypass realignments have new bridges included in projects.
IA	Please note that this question was not asked at their regional meeting.
ID	Through Performance Goal reporting.
IL	Please note that this question was not asked at their regional meeting.
IN	Please note that this question was not asked at their regional meeting.
KS	Please note that this question was not asked at their regional meeting.
KY	Please note that this question was not asked at their regional meeting.
LA	Our planning section runs needs for the various assets and then the upper administration determines asset allocation
MA	Bridges are allotted a defined amount of funds, as do the other assets.
MD	Different Offices present the needs to the Administrator who decides the final yearly budgets. In general, if times are tough the resources are prioritized for bridges first.
ME	That's the \$100,000 question. Changes on a regular basis.
MI	Please note that this question was not asked at their regional meeting.
MN	Please note that this question was not asked at their regional meeting.
MO	Please note that this question was not asked at their regional meeting.
MS	Each District office determines where its Maintenance funds will be spent.
MT	They compete on the needs of the bridge project or on the combined disciplined project.
NC	Currently, NCDOT does not use a fixed system that dictates funding across the different assets. NCDOT's Director of Asset Management along with other upper management determines funding across the assets. NCDOT is in the process of integrating a Maintenance Management System (MMS), a Pavement Management System (PMS), and a Bridge Management System (BMS) that will enable the Department to evaluate various funding scenarios.
ND	Please note that this question was not asked at their regional meeting.
NE	Please note that this question was not asked at their regional meeting.
NH	Bridge Maintenance is funded separately from Highway Maintenance, so priorities of bridge maintenance versus highway maintenance are determined at the Department's overall budgeting level. The funding level for Bridge Maintenance is relatively level from year to year.
NJ	A systematic approach to choosing structures for Preventive Maintenance has been put in place by the New Jersey DOT. This approach, laid out in the Bridge Preventive

7. How does your State prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	
	Maintenance Guidelines set forth by the NJDOT and FHWA, is based on various structure and substructure ratings. If a structure falls below certain levels, it is no longer included in Preventive Maintenance and is recommended for rehabilitation or replacement.
NM	Each district in New Mexico has set up separate programs which compete for funding at the district level. Our established measures have been beneficial in promoting funding for the bridge program. Graphing number (or percent) of structurally deficient bridges for each district has ensured that all districts see where they are at compared to other districts. Funding targets are set up for each funding program. Districts are allowed to set up their programs and stay within funding target parameters.
NV	Bridge preservation needs have historically been incorporated into planned 3R projects to the maximum extent possible. NDOT Districts also establish annual budgets for reactive and routine bridge maintenance.
NY	It's probably more to do with guilt or a consciousness that preservation is necessary than using an analytical approach. We do run what if scenarios with various investment strategies but defer to the more immediate needs (% deficient).
OH	Please note that this question was not asked at their regional meeting.
OK	Please note that this question was not asked at their regional meeting.
OR	These trade-off decisions are made by the Oregon Transportation Commission and are reflected in program allocation levels.
PA	PA Facts - Pennsylvania has the highest number of state-owned SD bridges in the nation, a reflection of the system's size and age. The average age of the 25,000 state-maintained bridges is 51 years and the state has the most bridges over 75 years old. With limited resources, severe winters and widely changing temperatures, Pennsylvania saw the number of structurally deficient bridges climb to an all time high of 6,034, or 24 percent, in 2008. An average of 300 additional bridges became SD every year. With the facts mentioned above, it was quite clear how the assets were prioritized. PennDOT responded by quickly developing and implementing an aggressive new program known as the Accelerated Bridge Program. The objective was simple: reduce the SD bridge population from 24% to 8% (national average). From January 2008 to June 2010, 1,322 SD bridges had been bid, exceeding the three-year goal of 1,145 bridges. By the end of 2010, it is expected that 1,500 SD bridges will have been bid in 3 consecutive years (2008-2010). In addition to rebuilding SD bridges, approximately 1,200 bridges had their life extended through preservation work.
PR	Same answer as question #6.
RI	There is a fairly equal distribution between, highway, bridge, and traffic safety.
SC	There is no formal process although a brief attempt was made in 2007. It was concluded that the assets were too different to compare directly. The SCDOT Commission

7. How does your State prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	
	determines funding levels for each asset group.
SD	Please note that this question was not asked at their regional meeting.
TN	In TN, Structures section gets an amount of money allotted to it in the budget and is used for structures.
TX	The Department does not prioritize bridge needs nearly as well. Pavement scores are part of a District engineers's evaluation, but bridge conditions are not used in evaluating the performance of a District engineer. Pavement conditions are really emphasized because pavement work gets more public "bang for the buck".
UT	Utah uses an integrated approach to asset management, balancing the needs of all assets together; bridge and roadway needs are typically conjoined. Bridge data in PONTIS is used as part of a broader-spectrum analysis of assets and needs.
VA	The State wide bridge maintenance funding available is based on a needs assessment of all highway assets and total funding for the overall maintenance program. VDOT's main focus has been towards major assets such pavement and bridges. Both assets are funded equitably based on needs and desired level of service.
VT	Vermont has a budget committee that oversees the allocation of funds to programs (bridge, roadway, rail, etc.) The VTrans Structures Section is provided with a figure and target amount to use for budgeting.
WA	a. Region Administrators use past history, change in inventory, and Maintenance Accountability Process (MAP) bridge scores to determine bridge maintenance funding in each Region. These do compete with other assets, but bridge work is a top priority and receives additional funding as needed and lower priority work may be cut. b. Bridge Preservation competes directly with pavement management, safety, and roadway improvements.
WI	Please note that this question was not asked at their regional meeting.
WV	Our Program Planning and Administration Division along with upper management comes up with the ultimate decision on how the overall program is balanced.
WY	Currently, most bridge preservation/rehabilitation projects are introduced in the State Transportation Improvement Program by District personnel and are based pavement deficiencies. The Districts are recognizing the need for bridge preservation/rehabilitation and are beginning to add district wide bridge preservation/rehabilitation projects in the STIP. Candidate work lists are provided to the Districts identifying deficient elements.

This question was asked at the SE, NE(Q6), MW(Q9) and WBPP meetings

8. How do you capture/assess work accomplishment?	
AK	Bridge Preventive Maintenance: The Bridge Crew Foreman develops and sends to

8. How do you capture/assess work accomplishment?	
	Bridge Section a report documenting work completed and costs. Notification of completed work is included in Pontis Notes and inspector is asked to verify that the work is completed and comment on work quality.
AL	<i>All bridge work performed is entered into ABIMS.</i>
AR	Work completed is to be recorded in a newly developed database. System is new so still working out how the data can be used.
AZ	After completion of the project, accomplishment is assessed through initial bridge inspection and Bridge database is updated accordingly.
CA	<i>All work is tracked by bridge from the identification of the need to completion of construction. Work that is placed in contracts is related to the assigned contract to prevent the work from being assigned to a crew or another project. The work assigned to projects is managed as a collection of activities that have a single project schedule and status. Upon completion of a project all activities are tagged as complete. The accomplishment of the work is filed verified during the subsequent bridge inspection.</i>
CO	This will be captured and assessed in the routine bridge inspection.
CT	We have performance measures around reducing the backlog of Bridge Maintenance Memos (Directives to our Bridge Maintenance group for recommended repairs following our bridge inspections). We also have a goal of not increasing the % of poor bridges in our inventory.
DC	<i>Keep a running work progress matrix. In the future we will like to use PONTIS.</i>
DE	The work is assessed through follow-up inspections and through our Maximo Maintenance Management System.
FL	<i>The Bridge Work Order System reports the accomplishments of routine maintenance. The Financial Management System tracks repair, rehabilitation and replacement work. The subsequent inspection reports evaluate the work accomplishments.</i>
GA	<i>BIMS is linked to Highway Maintenance Management System (HMMS). During the bridge inspection, the Bridge Inspectors record maintenance issues. After the inspection report completes QC, BIMS is updated and the maintenance issues are copied to HMMS. The 7 Districts use HMMS to schedule maintenance work and record the results.</i>
HI	<i>I believe maintenance work is tracked by their bridge work code accounting system but not sure whether a formal assessment of work is done.</i>
IA	Through our recommendation tracking system we document when a repair recommendation is made and when the repair has been accomplished, either by in-house personnel or by contract. The contract work is also documented in our bridge programming system that prioritizes bridge work to be considered for our 5 year transportation program. Assessing the work that is completed is a long term process usually monitored as part of the biennial NBI inspections. The assessment is not a systematic procedure and we do not have a documentation process that keeps track of successes and failures of repair work.

8. How do you capture/assess work accomplishment?	
ID	<i>Through Performance Goal reporting</i>
IL	No response to this particular question (from Wade).
IN	Using Performance Measures to Evaluate, Monitor and Report on the Network Average Elements Conditions through the Bridge Annual Report.
KS	We print all programmed contact repairs that are not completed and the past A & B Lists recommendations on the last sheet of every Bridge Inspection Form (BIF). Contract items are not removed from this list until the next inspection cycle or an In-depth Inspection Review is completed. Once completed, contract bridge repairs are then entered in Pontis as part of our In-depth process and then printed on the front of the BIF. All past recommended maintenance activities listed on the C & D Lists are printed on the last sheet of every BIF. All maintenance activities completed for each bridge is tracked by our Area forces using Crew Cards. All of this information is listed again provided on each BIF. The Area can call or E-mail Bridge Management as they complete maintenance actions. These actions will only be removed from the various lists once a photo or a site trip by the reviewer is made that ensures that all repairs are satisfactorily completed. All Critical Findings are assigned to a specific inspector, then entered into Pontis and E-mails are generated until finalized. Critical Findings are also listed on a bulletin board placed in a location that all bridge inspectors and managers have to walk by daily until completed and removed from the board. All Critical Findings must be inspected in the field by Bridge Management Staff before being removed from the tracking system.
KY	Each year we strive to reduce the number of structurally deficient bridges. Also, when a project is completed with no change orders we consider the project a success.
LA	<i>We send out an internal survey to our District design staff soliciting feedback on the complete project process. We also make personal visits to each District office in the State and solicit comments for improvement.</i>
MA	Currently, we do not have a database that is up and running to capture preservation work, however we are working to develop one for this purpose.
MD	We are a small state with bridges “owned” by design teams. We have an intimate knowledge of our bridges so we know what has worked, etc. However, we do not have any specific measures.
ME	<i>We use the MATS system.</i>
MI	Through our MAP Project Information System which is a program that keeps track of all of our capital projects. These projects are shown along with bridge condition in our Michigan Bridge Reporting System (MBRS) which has many different type sof reports used to manage bridges. For example, a region bridge engineer can review a report showing all their poor or fair bridges and see which ones are already programmed for work.

8. How do you capture/assess work accomplishment?	
MN	Contract work is captured during the next inspection cycle with the Pontis element condition. District Bridge Maintenance has a database with prioritized work that documents needs and repair accomplishments, which are reported to the Bridge Office annually.
MO	Maintenance work items are created and closed out in our BMS.
MS	Maintenance request and the actions taken for those requests are tracked in a Pontis database. The information is input by the Bridge inspectors.
MT	With the bridge management system and program management system.
NC	NCDOT currently uses daily work reports from field supervisors that are reported through the financial management systems as a way to assess work accomplished. An increase or decrease in condition indicates the effectiveness of work. The Department recognizes this is an area that needs attention.
ND	District Maintenance Section supervisors maintain a spreadsheet to document their material usage, man hours and equipment. There is no process for assessing work accomplishments for major rehabs or repairs done by contract.
NE	If preservation measures are through the construction program, then plans are prepared and let. The as-built plans become part of our bridge data management system. We are currently working on improving our district maintenance tracking procedures. The best we have to assess the work is thought quality control of our routine bridge inspections.
NH	Work accomplishment is captured in MATS and in weekly activity reports.
NJ	It is expected that the initial cost of repairing a structure will be greater than the cost to perform the same procedures later in the structure's life. It is the goal of the New Jersey DOT's Bridge Preventive Maintenance Program to bring the structure to a level where it can be maintained regularly and prevent it from falling into a state of disrepair. Overall, the effectiveness of the Bridge Preventive Maintenance Program will be judged based on the cost per cycle to perform these activities.
NM	NMDOT measures and track number of structurally deficient bridges and square feet of structurally deficient bridges quarterly. A report is sent to each district every quarter.
NV	Each District tracks maintenance activities within a Maintenance Management System. District Bridge Maintenance Crews often report routine maintenance and contract preservation activities back to Structures Division, although this does not necessarily occur on a consistent basis, statewide.
NY	State forces use a Maintenance Information System. Capital efforts use a financial accounting system. The two have not been integrated.
OH	The Bridge Engineer reviews all bridge inspections along with related field reviews. The bridge engineer prints lists of bridge maintenance needs compiled from the annual bridge inspection cycle. The list is broken down into in-house work and contract work. The in-house work is given to the Roadway Services Manager and/or County Manager to set up and coordinate repairs. The County Work Plan (CWP) concept was conceived and implemented to more effectively manage the maintenance of Ohio's highway system. The CWP document provides a blueprint for planning prioritized work for each of Ohio's 88 counties via a one-page summary report. The plans serve as an indicator of the efficiency of resources expended toward meeting an established set of minimum system condition goals and preventive maintenance measures. The individual 88 county work plans are

8. How do you capture/assess work accomplishment?	
	utilized to establish the 12 respective district work plans, which establishes the statewide plan, providing both a micro and macro view of system conditions and goals. This process enables ODOT to track and manage its maintenance system conditions on a quarterly basis at the county, district and statewide levels. The County Work Plan lists each county's prioritized maintenance activities, the work effort, resources, and funding expended on each activity. The plan tracks the number of deficiencies in each maintenance category, the increase or decrease in deficiencies, the total dollars spent on each maintenance area, and the cost per category of maintaining the highway system. Using this information, counties and districts are able to adjust their maintenance activities to meet their most pressing needs. Additionally, the work plans enable the department to maintain statewide standards in each maintenance category, providing a more consistent and uniform highway system. The more extensive, complex and costly repairs are identified as contract maintenance and placed into the capital program. For which Ohio uses Operational Performance Index (OPI), which incorporates Structure General Appraisals, Wearing Surface, Floor Condition, and Paint Condition.
OK	We place plans for the bridge repair projects in our electronic maintenance files.
OR	Closing completed projects (financial record-keeping). Condition improvement, if any, is captured by the regular inspection cycle.
PA	PennDOT has several metrics to monitor our goals set forth every fiscal year. The metrics tracked specifically for bridge related activities are the following: a) Achieve minimum 85% of Construction \$ spent on Structurally Deficient Bridges; b) Percent of Structurally Deficient (SD) Bridges, Measured by Deck Area for State-Owned Bridges $\geq$ 8 feet - Reduce SD Deck Area to 10% (national average) by 2025. A linear decrease of approximately 0.45% of SD deck area per year is required to achieve this goal. c) Percentage of completed 0 and 1 Maintenance Priorities for Bridge Maintenance Category – Goal is to complete or mitigate 100% in seven days for Priority 0's and six months for Priority 1's.
PR	By inspection and acceptance of work performed.
RI	We need to improve on this.
SC	We use a Highway Maintenance Management System (HMMS). It can also be tracked through improved conditions in the SCDOT NBI.
SD	Pontis.
TN	We get a reduction in State owned Structurally Deficient bridges.
TX	TxDOT does not have a formal process for capturing and documenting the effectiveness of maintenance actions that are taken. The districts act on their own with respect to preferred actions and any collection system would require input from all 25 districts. Information that does exist in this area is anecdotal and is based on experience of the individuals making decisions on the best course of action.

8. How do you capture/assess work accomplishment?	
UT	Accomplishment is assessed through inspections of completed projects, and all preservation activities are recorded in the bridge database.
VA	Each District maintains a list of work accomplished. The Central Office is working to create a State wide data base of work accomplishments.
VT	Currently, based on existing performance measures (i.e. structural deficiency trends, percentages, etc.). Vermont is looking into other measure to capture the work and benefits of preventive maintenance.
WA	a. Structural Bridge Repairs are posted by Bridge Inspection, Documented when completed by Maintenance, and verified by Bridge Inspection. b. Bridge Deck BMS provides an accurate history of total spalling repaired for each bridge and the associated cost in today's dollars. c. Bridge Deck Spalling is measured and graded annually by each Region.
WI	WisDOT is currently working on system to track county work. The Highway structures information system is the tool use primarily for this activity. It has Reports (maintenance actions / activities) and notifications for safety – nbi below level, risk analysis – such as section loss or scour Routing for permitting requirements for special type and access of bridges.
WV	Preventive maintenance work is difficult because we have no data on this type of work for a bridge. I guess we only know that “intuitively” it makes sense to maintain an asset instead of letting it degrade to a State where major rehabilitation or replacement is the action that makes sense.
WY	The bridge elements are updated immediately following completion of the work and the bridge index is recalculated and compared to the previous index to determine success of the repair strategy.

This question was asked at the SE, NE (Q7), MW (Q10) and WBPP meetings

9. What research needs do you believe is needed in the area of bridge preservation?	
AK	Overcoat paint systems requiring minimal paint removal and surface preparation. Identifying a lightweight wearing surface on Yukon River Bridge? The orthotropic steel plate deck has bolted connections projecting approximately 2 inches above the deck and the bridge was designed for 2 inches of wearing surface. Currently the bridge has a timber wearing surface which requires a high level of maintenance/rehabilitation due to the steep grade and high number of trucks using chains.
AL	no response.
AR	More research is needed to show the benefits of performing preservation activities to

9. What research needs do you believe is needed in the area of bridge preservation?	
	extend the life of a structure and to demonstrate the need for an asset management system.
AZ	- Deck repair - Bridge Joint repair
CA	Primary research needs to be in the area of bridge decks. The majority of our preservation money is spent on bridge decks. There are a number of things that need to be examined form design construction and maintenance of bridge decks. See items 1 and 4 above.
CO	We need research to find ways to protect our bridges, steel and concrete, against the effects of deicing solutions.
CT	Do road salts increase the rate of deterioration on our bridges? Are there materials out there to reduce the time required for deck repairs (allow traffic back on the roadway quickly)?
DC	<i>Keep a running work progress matrix. In the future we will like to use PONTIS.</i>
DE	Effectiveness of the various preservation strategies.
FL	Research identified in the Bridge Preservation Roadmap would fulfill a lot of the need.
GA	Bridge engineers know that addressing basic maintenance issues will extend the life of a bridge. When funding/staff is cut, basic maintenance is the first thing cut. We need “numbers” to prove that basic maintenance should never be cut.
HI	- Deck repair - Bridge Joint repair
IA	Develop cost effective programs for maintaining and preserving reinforced concrete bridge decks. Determine the recommended practice and the life-cycle cost savings for preserving superstructure and substructure elements through the use and maintenance of watertight joints. Determine best practice for prevention and repair of damage caused by corrosion of prestressing strands and mild reinforcing in pretensioned prestressed concrete I beams. Develop procedures for preservation of weathering steel bridges. Develop best practices for preservation of steel bridge piles by preventing and repairing corrosion. Research methods of repair that disrupt traffic for as short a time as possible and are cost effective (particularly joint and backwall repair/replacement and PC concrete deck patching). Performance assessment of existing concrete structure corrosion prevention/mitigation technologies.
ID	Primary research needs to be in the area of bridge decks. The majority of our preservation money is spent on bridge decks. There are a number of things that need to be examined form design construction and maintenance of bridge decks. See items 1 and 4 above.
IL	See discussion in #5 above regarding best practices and supporting cost/benefit data.
IN	Streamline activities relative to Preservation, establishing assessment tools/mechanism

9. What research needs do you believe is needed in the area of bridge preservation?	
	needed to measure the impact of Preservation activities on element and overall bridge service life.
KS	a) The Pontis forecasting models needs to be improved so they actually work. We have found the models to do a reasonable job for two to four years out but after that no matter how much money you use as a funding level you never seem to improve much. b) A greater effort in being able to determine corrosion levels in post-tensioned members is needed that is cost effective and can be done by a DOT's staff as required. The cost of finding where the ducts are then drilling and scoping out the voids with a camera are just too great for an agency to consider using this technology to its full potential. c) Research in using a bed liner type of coating for a protection coating for steel superstructure is needed. Even when using weathering steel beams, using this type of coating at abutment encasements or under expansion joints would interest to us. Additional weight considerations need to be studied as well.
KY	The Kentucky Transportation Cabinet currently has a study project with the Kentucky Transportation Center to help the Cabinet develop a bridge preservation strategy which includes preventive maintenance.
LA	One area is how to deal with expansion joint performance. Are there long-lasting products or repairs that are being used? Is it practical to design new bridges without joints?
MA	Concrete repair and preservation; freeze-thaw damage; ASR remediation; better coatings and coating strategies for steel.
MD	Do states using an asset management program such as Pontis have a more efficient bridge program? Do they spend less money and have better bridges?
ME	Product evaluation. When to paint?
MI	How to show the effectiveness of preventive maintenance; i.e.- show how different work activities slow the deterioration of the element. Develop methods to evaluate bridge decks at near highway speeds.
MN	I think better research into different deck sealers would be beneficial. Silanes, siloxanes, methacrylates, epoxy crack sealers, flood sealers have all been used for concrete protection. Approved products and application procedures need to be identified for different conditions. There are innovative products for thin overlays and epoxy chipseals that need more research. Bridge maintenance constantly repairs joint material. Is there other products or procedures that would offer more protection? Knowledge sharing of different state procedures policies and products would help.
MO	Life cycle costs, effectiveness, and usage criteria for different types of repair,

9. What research needs do you believe is needed in the area of bridge preservation?	
	maintenance, and rehabilitation.
MS	Unknown.
MT	Better processes for inspection to give better guidance to the management systems.
NC	An area that needs research is the effectiveness of deck sealers and chloride extractors. Another area of interest is the effectiveness of thin epoxy deck treatments.
ND	We haven't identified any.
NE	In general, the expected longevity of various preservation techniques and the comparative costs. Examples – paint systems and amount of coverage; just under deck joints, or entire girder. Timber pile wrapping and gouting; when to apply and how long should it last. Deck overlays; concrete vs asphalt. Nebraska is currently doing research on methods to repair timber piling, and looking at research on the longevity and associated costs of various bridge deck overlays.
NH	Paint systems that do not require SP10 cleaning and systems to remove lead paint that do not require as much effort on containment and decontamination.
NJ	With developing technologies, the New Jersey DOT should pursue research into more cost effective and durable products for any of the items listed in Number 3 above.
NM	There is a lot of research that has been completed that has not trickled down to the end users. FHWA has talked about gathering some of this research and placing it in an easy to access format or website. Research is of lesser value if it is not applied by those making decisions.
NV	Research leading to the development of deterioration models for differing environmental conditions that can be utilized with a higher degree of accuracy/reliability than those currently being proposed. Additional research on long-term bridge performance.
NY	Benefit cost analysis – to quantify the benefits of bridge preservation. This would involve the influence of a poor performing minor element on the performance of a more significant element or component of a structure.
OH	Would like to see a single database of materials used in other states with a proven track record.
OK	(a) Making an expansion joint that is both economical and durable. (b) Life cycle cost study comparing bridge deck replacement to an overlay.
OR	Methods for estimating remaining service life of bridges by structure type. Also, a recommended program of maintenance and the recommended timing of these maintenance activities for the expected service life of bridge - by structure type in order to maximize the service life and cost-effectiveness of expenditures.
PA	A database needs to be established by FHWA that provides specific details on what each State is doing for bridge preservation: a) Expansion dams; b) Beam end repairs and restoration; c) Fatigue and Fracture Retrofits; d) Bridge bearings and supports; c) Spot/Zone/ Full painting; d) Deck restoration and overlays; e) Approach slabs.

9. What research needs do you believe is needed in the area of bridge preservation?	
	Life cycle cost analyses for specific types of expansion dams, deck restoration/overlays, and paint systems.
PR	no response.
RI	Concrete sealers and corrosion modeling.
SC	New materials research is always a benefit. Outside of any funding issues, the following 2 areas are interrelated and the most critical as far as bridge preservation is concerned: Preservation should be all inclusive for the network needs and not just non-replacement. The analysis tools are available, the problem is convincing senior managers and governing transportation commissions to adopt modern strategies. FHWA on one hand promotes good bridge management techniques but does not push enough for effective application or rule-making and when combined with the limiting rules for using Federal funds it hinders what the states can accomplish.
SD	Reliable and accurate automated data collection for deck/slab conditions. This is mainly methods for measuring deck/slab delamination. GPR and Infrared have been tested and used with limited success. Any new research or improvements with these testing methods?
TN	no response.
TX	Effectiveness of concrete repairs in corrosive environments.
UT	Research on integrating deck treatments with pavement rehabilitation treatment cycles appears to be the most useful area of study. Evaluation of the performance of different materials is also helpful.
VA	Consider more research and implementation of highway speed GPR for screening bridge decks at the network level.
VT	Whether it is your car, home, or a public asset most people agree that preservation / preventive maintenance is important however it remains difficult to explain why funds are being used extend the life of what may seem to be a 'good' bridge rather than one perceived to be highly in need. Research to back the benefit of preventive maintenance is needed. Answering these types of questions; does cleaning and paint structural steel really offer any life extension or is it simply making it look better? Does washing a bridge extend it life and if so, by how much?
WA	a. Focus on improved quality and longevity of construction. b. Life expectancy of different joint types. What increase in life can be expected with the use of Bridge Preservation Strategies?
WI	Guide for cost effective actions and what type of applications to use them on.
WV	Unknown.

9. What research needs do you believe is needed in the area of bridge preservation?	
WY	Bridge deck repair

APPENDIX A
Roundtable Discussion Questions and Responses
South East Bridge Preservation Partnership Meeting
Orlando, Florida
April 2010

1. Has your State adopted a particular definition for bridge preservation? a)

ALDOT: We do not have a particular definition, but preservation activities include: bridge painting, joint sealing, bearing replacement and deck sealing. **b) ARDOT: No. c)**

FDOT: Our non-official working definition is: Design, construction, maintenance and repair activities intended to extend the service life of our bridges and minimize life cycle costs. **d) GADOT:** No. I am waiting to see what the AASHTO Bridge Committees

propose and the results of this survey before I make a recommendation to GDOT Management. **e) LADOTD:** No. **f) MSDOT:** No. **g) MTDOT:** Yes- preservation is defined as extending the life of the bridge without adding capacity. **h) NCDOT:** NCDOT and FHWA have a written agreement in the “Federal Highway Administration’s National Environmental Policy Act Requirements for North Carolina Department of Transportation’s Bridge Preservation,” regarding approved bridge preservation activities. This agreement was approved and signed by the Division Administrator, April 11, 2008.

“The Bridge Preservation Program (BPP) is a planned strategy of cost effective treatments to a bridge that prevent/retard future deterioration without increasing structural or traffic capacity. The BPP is to be used in conjunction with an effective bridge maintenance program to extend the useful life of a bridge. When implemented, the BPP will provide a preservation schedule for each type of bridge to be used as a guide to ensure preservation activities are completed in a timely manner to keep the bridge from having a reduction in the bridge’s level of service. **i) PRHTA:** The PRHTA has not adopted a particular definition for bridge preservation because our agency does not and is not in charge of the preservation and maintenance program. The DTPW (Department of Transportation and Public Works) is the agency in charge of the preservation and maintenance program. There program is based as on three criteria’s: ***Routine/scheduled, maintenance, condition-based emergency*** (an inspection driven action, actions are specific to the situation after inspection and evaluation of condition, for safety and/or to keep bridge open.), ***maintenance & rehabilitation*** (could involve any or all three major structures components after inspection and evaluation condition is performed). The information for there preservation and maintenance program of is based and submitted by the PRHTA Bridge Inspection Office. **j) SCDOT:** No formal definition but we have adopted an informal “Fix-it-First” philosophy. Basically we want to lengthen the service life while extending the use of our funding levels. **k) TNDOT:** TNDOT doesn’t have a particular definition, but our Office believes that *repairing* bridges is “*preserving*” the bridge for the future. **l) TXDOT:** The Maintenance Operation Manual states that “*the structural and operational characteristics of all highway bridge structures should be preserved as near as practical to the originally constructed or subsequently modified conditions*”. **m) VDOT:** VDOT considers preservation and maintenance as a single program. VDOT has a definition for maintenance and for specific maintenance categories. The following are the maintenance categories and their respective definitions:

Ordinary Maintenance And Condition Based Preventive Maintenance: Day-to-day maintenance activities to preserve and correct minor defects of transportation assets during their expected service life and which contribute to the safety and

comfort of the traveling public. Ordinary maintenance is performed to care for and maintain the highway and associated assets so that it retains its original intended use. This includes maintenance work on assets exhibiting wear from weather, or work designed to prevent further deterioration and damage. Ordinary maintenance includes, but is not limited to, tractor mowing, litter pick-up, premix patching, and all maintenance inspections.

Planned Preventive Maintenance (PM): Any planned activity⁸ performed in advance of a need for repair or in advance of accumulated deterioration so as to avoid such occurrences and reduce or arrest the rate of future deterioration. The activities may correct minor defects as a secondary benefit. PM is 1) planned, 2) cyclical, AND 3) not condition based. PM generally is designed to extend the useful life of the asset.
* Note: PM does not add structural capacity for pavements.

Repair/Corrective Maintenance: Any work that is required to return a damaged or deteriorated asset to design functionality and capability.

Restorative / Replacement Maintenance: The replacement or complete restoration of assets that cannot be repaired. If the asset no longer functions, is obsolete, or does not conform to current Federal or State mandates for design performance, then it must be replaced or overhauled. Examples include work performed on pavements, bridge decks, or other major assets to restore the asset to its original or reconstructed design condition, as practicable, or replaced to its originally functioning service level.

Major Rehabilitation: This maintenance work applies to bridges and pavements only. Work in this category includes full depth reconstruction where the entire pavement asset is removed and replaced. The work may also include restoring structural integrity or correcting major safety defects for bridges and pavement. Examples include restoring and/or strengthening the load carrying capacity of a bridge, recycling or reworking existing materials to maintain their structural integrity, and reworking or strengthening the base or sub-base of a pavement section.

n) WVDOH: As per the “Agreement For The Use Of Federal Funds For Preventive Maintenance Of Highway Structures in West Virginia” signed on June 16, 2009 between FHWA and WVDOH - Preventive maintenance for structures is the *planned strategy of systematic and cost-effective application of treatments to existing bridge elements that preserves or improves the current condition of such elements, retards future deterioration, and maintains or improves the functional condition of the system without increasing structural capacity.* The treatments require timely placement to ensure the maximum benefit to the element. The goal is to obtain the greatest benefit with the smallest level of investment. The planned result is an increase of the life expectancy of the particular bridge element. Preventive maintenance has the goal to restore the deteriorated element to its as-built condition.

⁸ Applies to pavement, bridge and drainage assets only.

2. How does your State identify bridge preservation needs? Please explain the process. **a) ADOT:** Bridge Painting is prioritized using the painting module in our bridge management system, ABIMS (Alabama Bridge Information Management System). Other bridge needs are identified by bridge inspectors and stored in ABIMS. **b) ARDOT:** Bridge needs are identified by bridge inspections. Districts then may use their maintenance funds or make a recommendation for a contract job. **c) FDOT:** Through the bridge inspection process and analyzing results for lessons learned to apply to similar structures. **d) GADOT:** Since I don't have a definition of preservation, I have no preservation needs. However, my preservation needs would be my top reoccurring maintenance needs:

- Replace edge beams
- Replace expansion joints
- Paint structural steel
- Rehab decks
- Bridges with an asphalt roadway – remove asphalt and rehab deck
- Concrete encasement with reinforcing steel of all steel piles from 2 feet below ground line to the bottom of cap.
- Scour repairs

Maintenance needs are identified by creating and running queries of the BIMS (Bridge Information Management System) database. BIMS contains the data from the Bridge Inspection Program. **e) LADOTD:** Bridge candidates are selected based on a *systematic process*. Each of our 9 Districts receive a list of candidate bridges and then prioritize projects or activities based on local conditions and needs, with the first priority as preservation of bridges on Interstate or Urban NHS routes, followed by Rural NHS routes and then SHS routes. Districts may combine several element-specific projects into one construction project to facilitate competitive bidding. The Bridge Preventive Maintenance Selection Committee (BPMSC) reviews the district's priority list and then makes final selections. The BPMSC consists of the: Chief of Systems Engineering, Bridge Program Manager, Bridge Maintenance Manager, Bridge Preventive Maintenance Engineer, Bridge Management Systems Engineer, and Highway Program Engineer. The approved project is sent to the districts to initiate plan development. **f) MSDOT:** No funds are dedicated for bridge preservation. Each District office identifies the Maintenance needs for the District. **g) MTDOT:** Bridge preservation needs are identified by using the Pontis BMS. The needs are restricted to deck, joint, bearings and rail work. (keeping the roof in good shape). **h) NCDOT:** NCDOT field personnel select candidates for preservation treatments. The field forces may utilize their State funds for completing preservation activities or they may submit candidates to the State Bridge Management Unit to utilize Federal funds. Most preservation activities are let to contract. NCDOT is in the transition process of implementing a new Bridge Management System and it is the Department's vision this tool will further aid in candidate selection. **h) PRHTA:** The PRHTA identifies bridge preservation needs *by inspection and evaluation* of bridges according to NBIS. This involves any of the *three major components of a bridge; deck, substructure and superstructure*. This information is then *submitted to the DTPW* by e-mail and/or memo including recommendation for decision-making. **j) SCDOT:** Through the bridge inspection process, Highway Maintenance Management System (HMMS) and Central Office oversight, the needs are identified and prioritized as A, B, C or D with A and B being the

highest priority. We then identify those needs that can be adequately addressed by maintenance forces. We also hope to begin identifying basic needs by bridge type that can be accomplished by maintenance forces on a regular cycle. Other preservation needs which are beyond the capabilities of maintenance forces are contracted out. Needs such as bridge painting and deck preservation are identified and prioritized by condition and road system by the Central Office. **k) TNDOT:** Bridges are chosen from a repair list created by our Inspection Office. The project manager also checks if the bridge is on the replacement list, as this could change the scope of repairs in the project. If there is any “preservation” work that needs to be done, it would be done at the same time as the repairs. **l) TXDOT:** For the most part, TxDOT districts are responsible for identifying and prioritizing maintenance actions that are needed. They use inspector maintenance recommendations that come from the routine safety inspections or District conducted bridge maintenance inspections. These maintenance actions utilize general maintenance funds that all districts have available to them to address all manner of maintenance needs (bridge, pavement, facilities, etc.) The one exception to this is prioritization of the dedicated bridge preventative maintenance funds. Initial prioritization of these funds and projects is done by the districts with the final selection carried out by the Maintenance and Bridge Divisions of TxDOT. In the final prioritization special attention is paid to how the project will address predefined statewide areas of concern (ie scour, substructure, joints, etc). This effort uses the NBI and Elemental condition states from safety inspections to allocate the limited funding that is dedicated for this effort. **m) VDOT:** VDOT uses the AASHTOWare Pontis as a bridge management tool. VDOT has customized Pontis to meet VDOT’s business needs. Customization of the software included updating the deterioration and cost models for major elements. Bridge maintenance needs are identified and categorized. The Central Office Bridge Management Engineer identifies the statewide needs through Pontis. This information is used for performance measures and for apportioning bridge maintenance funds to the districts. The District Structure and Bridge engineer and his staff use Pontis, inventory data and the NBI inspection reports to develop their annual maintenance plans and in the overall management of their respective districts’ program. Virginia utilizes the Structure Inventory and Bridge Management System (Pontis) to determine the total maintenance and improvement needs for bridges and culverts. The needs assessment process is conducted on an annual basis and serves as the foundation for the statewide Bridge Program Management Plan. The assessment process includes but is not limited to the following items:

- Determine the estimated maintenance and improvement costs
- Develop and generate standard simulation scenarios to assist in the determination of the statewide needs by District and system.
 - Determine the estimated needs to maintain current condition for various performance measures
 - Determine the estimated needs to improve the performance measure by one percent (1%) increments.
- Generate a prioritized list of work candidates for three (3) funding sources (Preventive Maintenance, Maintenance and Rehabilitation, and Replacement and Improvement)

n) WVDOT: Mostly at the District level with their local knowledge of the bridges along with management at the Central Office level. Please explain the process. For painting and deck overlay/replacement type work, our Central Office personnel ask our districts for candidate bridges and then prioritize the work after field and office reviews. For more minor work such as bridge washing or sealing of cracks, this type of work is usually handled at the District level with State forces as time or budgets allow.

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program or funded on as needed basis?

a) ADOT: We have a goal of 5% of HBP funds for Bridge Painting. Other preservation activities are State funded from maintenance budgets. There is not a dedicated fund.

b) ARDOT: District maintenance funds for most activities. If a contract job is programmed then general construction funds - no dedicated funds.

c) FDOT: Bridge preservation activities are funded as part of the bridge repair and bridge maintenance budgets. These are distributed to the Districts based on inventory. FDOT is decentralized and the Districts have significant latitude as long as they follow department policies and procedures.

d) GADOT: Based on the recommendations of the Director of Engineering, State Bridge Engineer and State Bridge Maintenance Engineer; the Chief Engineer allocates maintenance funds from the Bridge Replacement and Rehabilitation Program (BRRP). For the last couple of years, maintenance funds have been \$10 million of Interstate Bridges and \$5 million for State Route Bridges.

e) LADOTD: We have a dedicated annual budget of \$3 million.

f) MSDOT: Mississippi DOT does not have a dedicated bridge preservation program.

g) MTDOT: Funding is through our Federal Aid Bridge Program. The monies are set aside by developing a fund plan and projecting the needs over the STIP time frame (next 5 years).

h) NCDOT: NCDOT utilizes two major sources of funding for preservation work. Preservation activities may be funded with State dollars as a part of planned maintenance work. Currently, NCDOT allocates \$53 M/yr for bridge maintenance and \$15 M/yr for bridge preservation activities. In addition to State funding, NCDOT utilizes dedicated Federal funds for preservation work. Currently, NCDOT's Interstate Bridge Preservation program receives \$5-10M/yr and an additional \$5M/yr is set aside for the Bridge Preservation Program (FHWA HBP Funds). NCDOT anticipates increasing these amounts by 2015.

h) PRHTA: PRHTA doesn't have a major budget for preservation. DTPW has a small budget for minor repairs and rehabilitations. This is one of the major issues that PR is addressing at the moment.

j) SCDOT: We use both State and Federal funds. Some Federal funds are dedicated while most State funds are still as needed although we are trying to change that somewhat.

k) TNDOT: HBP (Federal) and 451 Funds (State). TN uses mostly State funding; we have an agreement with TN FHWA to use 5% of the allotted HBP funds for preservation.

l) TXDOT: Districts have the flexibility to use allocated maintenance funding to address bridge issues, but bridge issues must compete with pavement needs and the bridge issues almost always lose out. TxDOT does have a small dedicated bridge preventative maintenance funds that is available every year that is used to help address bridge needs. TxDOT has also made limited use of HBP funding to address bridge maintenance needs.

m) VDOT: See response to answer 2 above. Additionally, bridge preservation is funded through the maintenance budget. VDOT funds the bridge program based on needs. Virginia's code requires funding maintenance first.

n) WVDOT: IM (Interstate Maintenance), NHS and STP funds are used as the main source of funding for bridge preventive maintenance type

work. Recently the agreement between FHWA and the WVDOH opened up the use of HBP (Highway Bridge Program) funding for preventive maintenance on bridges.

4. Has your State established performance goals for your bridge program (goals and measures)? If so, a) What are your State goals and measures? b) How did you go about establishing these measures? a) ADOT: Goal to remove all posted bridges from the State network. **b) ARDOT:** No official goals. **c) FDOT:** 90% of State bridges in good or better condition. Structurally Deficient Bridges programmed for repair or replacement within 6 years of identification. These performance measures were established by the Department's Executive Board based on input of the Maintenance Office. **d) GADOT:** a) Current conditions codes are determined by the Bridge Inspection Program.

- Maintain interstate bridges such that they can carry all legal loads
- Maintain interstate bridges such that they, at a minimum, have decks that are in good condition
- Maintain U.S. Route bridges such that they can carry all legal loads
- Maintain U.S. Route bridges such that they, at a minimum, have decks that are in satisfactory condition
- Maintain State Route bridges such that they can carry all legal loads
- Maintain State Route bridges such that they, at a minimum, have decks that are in fair condition
- Maintain Off-System State-Owned bridges such that they can carry all legal loads
- Maintain Off-System State-Owned bridges such that they, at a minimum, have decks that are in fair condition

b) Director of Engineering, State Bridge Engineer, and State Bridge Maintenance Engineer established these measures. **e) LADOTD:**, No. **f) MSDOT:** No. **g) MTDOT:** Yes- they were established during the review and development of the white papers for FHWA. The measure is a modified HI that includes smart flags. We established these measures by developing a standard that uses the known data from the inspection process. **h) NCDOT:** The N.C. Department of Transportation is committed to measuring and improving performance. The department's Organizational Performance Dashboard serves as an indicator of how well we are meeting our mission and goals. NCDOT's mission is connecting people and places in North Carolina – safely and efficiently, with accountability and environmental sensitivity. There are 5 categories used to measure the Department's performance and bridge preservation addresses the infrastructure category. The Infrastructure Health Index measures the condition of NCDOT highway system assets against the goal of making our infrastructure last longer. The infrastructure health index is defined as a composite score based on pavement condition, bridge health index and roadside feature condition. Three comprehensive statewide surveys are used to evaluate the condition of the State highway system: (1) the Maintenance Condition Survey, (2) the Bridge Condition Survey, and (3) the Pavement Condition Survey. Bridge health is defined as the percent of bridges in good condition. A bridge is considered to be in good condition if the Level of Service (LOS) for Deck, Sub-Structure and Super Structure are all greater than or equal to 6.

Further Information located at:

<http://www.ncdot.gov/download/performance/dashboarddetails.pdf>

The published values are located at the NCDOT website:
<https://apps.dot.state.nc.us/dot/dashboard/InfrastructureHealth.aspx>

The numerical grading system is 0 to 100%. Statewide Bridge Health Index

- 2002 – 64.2%
- 2004 – 66.0%
- 2006 – 67.2%

At this time, subsequent years have not been published by NCDOT management. **i) PRHTA:** At the moment the PRHTA has established a Plan of Action (POA) to improve the bridge program based on FHWA 2009 Process Review. This POA aims to address deficiencies in maintenance policies and implementation of such policies. State goals, to implement the POA submitted to FHWA and implement an effective process to coordinate communication with DTPW. How did we establish measures, Bridge Program Manager position has been created. **j) SCDOT:** Yes. Both reducing the no.'s of structurally deficient bridges and the deck area of structurally deficient bridges. We are also experimenting with measuring user costs by network and specific road systems. Management adopted them by considering what could be accomplished with different funding levels. We are beginning to track user costs as well, which could represent a much better measure of program and funding effectiveness on the network and specific road systems. **k) TNDOT:** Reduce the number of Structurally Deficient State owned bridges each year. **l) TXDOT:** Yes. In 2001 TxDOT was directed to take steps to ensure that 80% of all bridges (including both State and local owned bridges) were in "Good or Better" condition. A good or better bridge is one that is not structurally deficient, functionally obsolete, or is not load restricted. TxDOT was directed to meet this goal by 2011. The goal was established by the Texas Transportation Commission. **m) VDOT:** Virginia's global performance measure is based on the number of non-structurally deficient (SD) structures in the inventory. The goal is to maintain a ninety two (92) percent non SD performance level statewide. Other performance measures that are considered in the overall management of the bridge assets are functional obsolescence, General Condition Ratings less than 5, load posting, and Health Index. The structurally deficient measure was established by VDOT's executive management. The reason for selecting this measure is due to its common use by the States and FHWA. Performance can be easily compared to other states. Prior to establishing the global performance target for bridges, VDOT performed an assessment on the current condition of structures, current funding levels, and the desired funding levels and available resources that can facilitate achieving this goal. **n) WVDOT:** Yes and No. We basically just use the local FHWA's current measurement of lowering Deficient bridges on the NHS and our own goal of reducing the number of posted bridges in the State. None of these goals are really looked at by upper management or our legislature and are only used within the bridge community.

5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the

future direction of bridge preservation? **a) ADOT:** The benefits of bridge painting are well known. Our joint sealing and bearing replacement has resulted in a reduction in girder end repairs. **b) ARDOT:** 5a) Painting is good but we don't do enough. Recommendation to Bridge Design to use more jointless bridges – too early to tell on success. 5b) Open foam joint sealant. 5c) Asset management should be strongly encouraged by the FHWA. **FDOT:** 5a. Cathodic Protection, better design and construction such as a better aggregate design, Bridge Maintenance has worked with design providing input early in the design process to build bridges that have lower life cycle operation and maintenance costs. 5b. Guniting Repairs in corrosive environments, Metal Stay in Place forms in Corrosive environments, conventional repairs on chloride contaminated structural elements. 5c. More attention to bridge preservation, better analysis of the cost effectiveness of it, better publicity of the value of bridge preservation. **d) GADOT:** 5a) N/A. 5b) N/A. 5c) A standard definition of bridge preservation that contains the standard preservation measures (maintenance items). From the standard preservation measures, each DOT selects their preservation measures and determines their own criteria to address their preservation measure. **e) LADOTD:** 5a. We implemented an interim Bridge Preventive Maintenance Program. This program fills the gap between emergency repairs and major rehabilitation. We no longer have bridge maintenance crews to perform routine maintenance and so this program fills the gap for preventive maintenance needs.” 5b. “Some of our needs for the interim program were not approved by the FHWA. For example, steel grid deck replacements and relief joint repairs. When Pontis is fully implemented, we may be able to perform these repairs.” 5c. “These types of high value repairs need to be considered by key decision makers. Also, preventive maintenance needs more funding to improve the overall health of the bridge network. **f) MSDOT:** Mississippi DOT does not have a dedicated bridge preservation program **g) MTDOT:** The sealing and filling program has reduced the number of deck replacements over that last several years. Timing seems to be the issue, especially with environmental process constraints. The future should be reviewing and streamlining the process from conception to contract. **h) NCDOT:** 5a. NCDOT sees success in replacing deck joints, painting structural steel, and deck preservation by utilizing hydrodemolition techniques and overlaying with latex modified concrete. 5b. NCDOT found that cold weather use of very early strength latex modified concrete overlays resulted in cracking. 5c. NCDOT sees that a systematic program incorporating deck joints, painting, deck sealers and overlays is the future direction for bridge preservation. **i) PRHTA:** 5a. The PRHTA has created the position of Bridge Program Manager to coordinate efforts with DTPW in maintenance and preservation. In the past, DTPW decisions on which bridges to repair were not based on the PRHTA NBI inspections. Since January 2010 coordination between the two agencies has been improved. Works performed by DTPW include repairs to avoid future scour and erosion of wing walls and abutments. Such repairs are new waterways, gabion walls and concrete retaining walls. 5b. Sometimes performing the job takes a lot of time due to the lack of funding. 5c. To create a permanent budget for preservation. **j) SCDOT:** Bridge painting has worked well and we are now performing more deck preservation. We are also developing strategies for deck sweeping, bridge washing, bearing maintenance, structural and cosmetic patching, expansion joint resealing and etc. Deck patching is going well overall but our SCDOT Standard Specifications need several revisions in order to accommodate a significant deck preservation program. **k) TNDOT:** We use overlays (PMC, asphalt

sandwich seal, 4 ½” reinforced, a few thin epoxy overlays) - works well, placing PMC overlays on hollow box bridges to protect the top slab (preserving the compression area) – works well, backer rod and silicone in simple span expansion joints – worked moderately well, repaint structural steel – works well. **l) TXDOT: 5a.** When funding has been made available Texas has had very good success with projects dealing with joint cleaning and sealing, scour mitigation, substructure repairs. **5b.** Cosmetic concrete repairs that did not address the root cause of the distress. **5c.** Development of better funding methods and more thorough education of those responsible for prioritizing maintenance needs to ensure more equitable split between pavements and bridges. **m) VDOT:** Virginia has an agreement with the FHWA that establishes a list of Preventive Maintenance activities that are eligible for Federal Bridge Funding and that provide a significant increase in the service life of bridges. The activities included on this list are shown below:

- Seal or replace leaking joints, reconstruction of joint areas during joint replacement or elimination of deck joints. (Minimizes the deterioration of superstructure and substructure elements beneath the joints.)
- Deck overlays. (Thin bonded overlays, rigid overlays, and asphalt overlays with waterproof membranes)(Significantly increases the service life of the deck by sealing the deck surface from aggressive solutions and reducing the impact of aging and weathering.)
- Spot and zone painting/coating of structural steel to include bearings for prestressed concrete members. (Target areas where the paint deteriorates the fastest and slows down the deterioration process and extends the service life of the paint system.)
- Painting/coating of structural steel. (Reducing the deterioration of the structural steel.)
- Cathodic Protection (CP) Systems for Bridge Decks. (Proven technology for stopping the corrosion of reinforcing steel.)
- Cathodic Protection Systems for Substructure Elements. (Proven technology for stopping the corrosion of reinforcing steel.)
- Cathodic Protection Systems for Superstructure Elements other than decks.
- Electrochemical Chloride Extraction (ECE) Treatment for decks. (Removes the chloride ions from the vicinity of the reinforcing steel and thus eliminates the source of corrosion.)
- Electrochemical Chloride Extraction Treatment for substructure elements. (Removes the chloride ions from the vicinity of the reinforcing steel and thus eliminating the source of corrosion.) Can be very effective when the source of chlorides is eliminated, like eliminating deck joints above substructure elements.
- Scour countermeasures installation. (Protects the substructure elements from undermining and failure due to scour.)
- Removing large debris from channels. (Protects the substructure elements from scour.)
- Retrofit of fracture critical members.
- Retrofit of fatigue prone details. (Methods to increase the fatigue life of fatigue prone details, like using ultrasonic impact treatment on welds at

- ends of cover plates or connection plates welds not positively connected to flanges.)
- Concrete deck repairs in conjunction with installation of deck overlays, CP systems, or ECE treatment.
- Substructure concrete repairs in conjunction with installation of CP systems, ECE treatment, or galvanic anodes (when there are several sources or experimental basis when only one source). (Includes substructure units with cathodic protection jackets.)
- Application of concrete sealants, coatings, and membranes for surface protection of the concrete.
- Bridge cleaning and/or washing service. (Decks, joints, drains, superstructure and substructure horizontal elements.)

In addition to the federally eligible PM activities, VDOT established a State funded Preventive Maintenance Program for bridges, pavement, and drainage structures. Listed below are the state funded activities and associated frequencies for the bridge PM portion of the program:

Bridge PM Activities	Frequency (yrs)
Bridge Deck Washing (Concrete)	1
Bridge Deck Sweeping	1
Seats & Beam Ends Washing	2
Cutting & Removing Vegetation	2
Routine Maintenance of Timber Structures	2
Scheduled Replacement of Compression Seal Joints	10
Scheduled Replacement of Pourable Joints	6
Cleaning and Lubricating Bearing Devices	4
Scheduled Beam Ends Painting	10
Installation of Thin Epoxy Concrete Overlay	15
Removing Debris from Culverts	5

VDOT has mandated that all newly designed bridges or replacement bridges including superstructure replacement eliminate expansion joints as much as practical. VDOT has mandated the use of Corrosion Resistance Reinforcement (CRR) in lieu of epoxy coated reinforcement on all new bridge construction. VDOT uses District wide bridge maintenance contracts to perform PM activities (deck and seat cleaning, replacing leaking joints, overlays, etc.) in addition to site specific contracts. **n) WVDOT: 5a. One of our Districts has tried to maintain a bridge washing program through use of local volunteer fire departments while another has employed summer interns to help with deck sealing. 5c. More commitment of resources to the smaller type work in preservation.**

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs? **a) ADOT: Goal of 5% of HBP funds for bridge painting.** **b) ARDOT:** Districts decide how they want to use their maintenance funds for in-house work. Any contract work for bridge preservation would have to compete against all other needs of the highway system. **c) FDOT: The Department has established that system preservation and safety have top priority.** **d) GADOT : Director**

of Engineering, State Bridge Engineer and State Bridge Maintenance Engineer select bridges for rehabilitation and replacement bridges. **e) LADOTD:** Our agency created a separate section for systems preservation and allocated a consistent annual budget for this type of work. **f) MSDOT:** Our entire HBP budget is spent mainly on replacements and to a limited extent Rehabilitation. **g) MTDOT:** The process for preservation is established first then other capital programs compete after that. **h) NCDOT:** NCDOT management recognizes the need to fund bridge preservation activities and is progressively increasing funding over the next 10 years. **h) PRHTA:** In the past bridge preservation played a minor role compared to major rehabilitations and replacements but due to the economic crisis more repair works (slab repair, scour repair, etc) are being performed. Right now the PRHTA has made an agreement with the DTPW to provide them a list of prioritized bridges that should be addressed. In the past the DTPW work completely independent from the PRHTA. **j) SCDOT:** We used to perform such project analyses but there is no formal prioritization effort now. However, we have the tools to perform prioritizations and have performed network needs studies in the past. **k) TNDOT:** Most of our work is State funded so we aren't really competing for HBRR funds. **l) TXDOT:** Bridge preservation has had a fairly low priority for a long time. It is becoming somewhat better now that bridge issues have been in the press, but there is still strong resistance to spend funds on major needs. There is resistance at the District level to allocating their maintenance funds to maintaining bridges. They would just as soon wait until the condition warrants replacement and then they can try and utilize HBP funding for a new bridge. **m) VDOT:** Funds for maintenance and rehabilitation and preventive maintenance are allocated to the districts based on needs and available funds. Replacement needs are typically funded by the construction program through a dedicated fund for replacement. Maintenance activities including ordinary, preventive, restorative and rehabilitation are funded through the maintenance program. The Code of Virginia mandates funding the maintenance needs ahead of construction needs. Although, the overall budget for the Department has been reduced significantly in the last few years, the Maintenance apportionment continues to out past the construction portion. VDOT continues to make significant increase to the bridge maintenance budget, however, additional investment is required to maintain the bridge assets at the desired level of service. **n) WVDOT:** Preservation, major rehabilitation and replacement are in different funding categories for us so we are only battling what we have to spend in each funding category. Each funding categories dollar amount from year to year is often at debate. It sometimes is difficult to get a shift in priorities from year to year. The only thing we are sure of is we will always have a never ending supply of bridge candidates and never enough money to pay for it all.

7. How does your State prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?

a) ADOT: We have a separate allocation of funds for different assets. One is not compared against the other to prioritize. **b) ARDOT:** Districts decide how they want to use their maintenance funds for in-house work. Any contract work for bridge preservation would have to compete against all other needs of the highway system. (same response as #6) **c) FDOT:** Maintenance uses a budget each year based on the inventory of all assets. All sections have performance measures. The results of the performance measures are used to adjust budget. **d) GADOT:** awaiting response. **e) LADOTD:** Our planning section runs needs for the various assets and then

the upper administration determines asset allocation f) **MSDOT:** Each District office determines where its Maintenance funds will be spent. g) **MTDOT:** They compete on the needs of the bridge project or on the combined disciplined project. h) **NCDOT:** Currently, NCDOT does not use a fixed system that dictates funding across the different assets. NCDOT's Director of Asset Management along with other upper management determines funding across the assets. NCDOT is in the process of integrating a Maintenance Management System (MMS), a Pavement Management System (PMS), and a Bridge Management System (BMS) that will enable the Department to evaluate various funding scenarios. h) **PRHTA:** Same answer as question #6. j) **SCDOT:** There is no formal process although a brief attempt was made in 2007. It was concluded that the assets were too different to compare directly. The SCDOT Commission determines funding levels for each asset group. k) **TNDOT:** In TN, Structures section gets an amount of money allotted to it in the budget and is used for structures. l) **TXDOT:** The Department does not prioritize bridge needs nearly as well. Pavement scores are part of a District engineers's evaluation, but bridge conditions are not used in evaluating the performance of a District engineer. Pavement conditions are really emphasized because pavement work gets more public "bang for the buck". m) **VDOT:** The State wide bridge maintenance funding available is based on a needs assessment of all highway assets and total funding for the overall maintenance program. VDOT's main focus has been towards major assets such pavement and bridges. Both assets are funded equitably based on needs and desired level of service. n) **WVDOT:** Our Program Planning and Administration Division along with upper management comes up with the ultimate decision on how the overall program is balanced.

8. How do you capture/assess work accomplishment? a) **ADOT:** All bridge work performed is entered into ABIMS. b) **ARDOT:** Work completed is to be recorded in a newly developed database. System is new so still working out how the data can be used. c) **FDOT:** The Bridge Work Order System reports the accomplishments of routine maintenance. The Financial Management System tracks repair, rehabilitation and replacement work. The subsequent inspection reports evaluate the work accomplishments. d) **GADOT:** awaiting response. e) **LADOTD:** We send out an internal survey to our District design staff soliciting feedback on the complete project process. We also make personal visits to each District office in the State and solicit comments for improvement. f) **MSDOT:** Maintenance request and the actions taken for those requests are tracked in a Pontis database. The information is input by the Bridge inspectors. g) **MTDOT:** With the bridge management system and program management system. h) **NCDOT:** NCDOT currently uses daily work reports from field supervisors that are reported through the financial management systems as a way to assess work accomplished. An increase or decrease in condition indicates the effectiveness of work. The Department recognizes this is an area that needs attention. h) **PRHTA:** By inspection and acceptance of work performed. j) **SCDOT:** We use a Highway Maintenance Management System (HMMS). It can also be tracked through improved conditions in the SCDOT NBI. k) **TNDOT:** We get a reduction in State owned Structurally Deficient bridges. l) **TXDOT:** TxDOT does not have a formal process for capturing and documenting the effectiveness of maintenance actions that are taken. The districts act on their own with respect to preferred actions and any collection system would require input from all 25 districts. Information that does exist in this area is

anecdotal and is based on experience of the individuals making decisions on the best course of action. **m) VDOT:** Each District maintains a list of work accomplished. The Central Office is working to create a State wide data base of work accomplishments. **n) WVDOT:** Preventive maintenance work is difficult because we have no data on this type of work for a bridge. I guess we only know that “intuitively” it makes sense to maintain an asset instead of letting it degrade to a State where major rehabilitation or replacement is the action that makes sense.

9. What research needs do you believe is needed in the area of bridge preservation?

a) ADOT: no response. **b) ARDOT:** More research is needed to show the benefits of performing preservation activities to extend the life of a structure and to demonstrate the need for an asset management system. **c) FDOT:** Research identified in the Bridge Preservation Roadmap would fulfill a lot of the need. **d) GADOT:** awaiting response. **e) LADOTD:** One area is how to deal with expansion joint performance. Are there long-lasting products or repairs that are being used? Is it practical to design new bridges without joints? **f) MSDOT:** Unknown. **g) MTDOT:** Better processes for inspection to give better guidance to the management systems. **h) NCDOT:** An area that needs research is the effectiveness of deck sealers and chloride extractors. Another area of interest is the effectiveness of thin epoxy deck treatments. **h) PRHTA:** no response. **j) SCDOT:** New materials research is always a benefit. Outside of any funding issues, the following 2 areas are interrelated and the most critical as far as bridge preservation is concerned: Preservation should be all inclusive for the network needs and not just non-replacement. The analysis tools are available, the problem is convincing senior managers and governing transportation commissions to adopt modern strategies. FHWA on one hand promotes good bridge management techniques but does not push enough for effective application or rule-making and when combined with the limiting rules for using Federal funds it hinders what the states can accomplish. **k) TNDOT:** no response. **l) TXDOT:** Effectiveness of concrete repairs in corrosive environments. **m) VDOT:** Consider more research and implementation of highway speed GPR for screening bridge decks at the network level. **n) WVDOT:** Unknown.

APPENDIX B
Roundtable Discussion Questions and Responses
Northeast Bridge Preservation Partnership (NEBPP) Meeting
Hartford, CT
September 29, 2010

1. Has your State adopted a particular definition for bridge preservation?	
CT	We haven't developed a bridge preservation definition. We have developed a Systematic Bridge Preventative Maintenance Program in coordination with our FHWA Division to use federal HBP funds as a means of extending the useful life of our bridges and we have developed eligible activities. The activities are element focused.
DC	<i>A program employing a network level, long term strategy that enhances bridge performance by using integrated, cost-effective set of practices that maintain, or restore the physical condition of bridge structure elements.</i>
DE	We have not adopted a formal definition for bridge preservation.
MA	We define preservation as work designed to address known deficiencies and to extend the useful service life of the bridge.
MD	We do not have a specific definition for bridge preservation.
ME	Not officially adopted.
NH	We have not adopted a specific definition. Our definition would be similar to the following: Bridge Preservation includes those activities that maintain and extend the useful life of a structure. These activities include periodic maintenance, repairs to maintain or restore capacity and function, and rehabilitation that does not increase capacity, but extends the life of the structure.
NJ	The New Jersey Department of Transportation's Bridge Preventive Maintenance Program is intended to extend the life of bridges in good-standing condition by applying cost-effective preventive maintenance treatments.
NY	No. Generally is considered synonymous with bridge maintenance – which ends with deck replacement.
PA	Actions to extend the life of a bridge without improving bridge functionality or performance (keeping good bridges good). The following bridge preservation items below are eligible for Federal Funding based on our programmatic agreement: a) Scour countermeasures; b) Expansion dams; c) Beam end repairs and restoration; d) Fatigue and fracture retrofits; e) Bridge bearings and supports; f) Spot/zone painting; g) Deck restoration and overlays; h) Painting; i) Approach slabs
RI	No.
VT	Vermont does not have a specific definition for bridge preservation however we are moving towards doing preventive maintenance projects (membrane and pave, cleaning and applying protective coatings to steel, etc) aimed at extending a bridges useful life as well as targeted repair projects to reduce the number of deficiencies.

2. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on an as needed basis?	
CT	Using the definition above, we use Maintenance Forces, Maintenance Contracting and Federal funds.
DC	<i>Bridge Fund is used for bridge preventive maintenance and preservation activities. Yearly request and justification is required.</i>
DE	We have two bridge programs. The Bridge Preservation Program is for replacements and major rehabs through out Bridge Design office. The Bridge Management Program is for structure maintenance, paint program, scour countermeasure program, in addition to the inspection program. Both of these programs have a dedicated fund.
MA	We do not have a dedicated funding. It is funded on an as needed basis.
MD	We have a dedicated yearly budget for bridge repair activities. There is a separate budget for the major bridge rehabilitation and replacements.
ME	Bridge Maintenance is 100% State Funded. Bridge Maintenance funding is thrown in the barrel with all M&O funding and a portion of that is supposed to be dedicated.
NH	Bridge Maintenance is a separately funded bureau from state highway funds and federal bridge preservation funds (BRPPI). Preservation activities are prioritized along with other bridge maintenance priorities. The Bridge Design Bureau also uses a portion of its' federal funding on bridge deck and joint preservation, on bridges within the limits of major paving projects.
NJ	Funding for the NJDOT Bridge Preventive Maintenance Program is allocated by the Federal Highway Administration. A dedicated fund every year has been established and specific guidelines governing the use of this fund have been created.
NY	State forces materials, equipment, rentals, etc are funded out of the maintenance allocation. Contract work is funded out of the capital program. NYSDOT does not have a set-aside for bridge maintenance.
PA	PennDOT's Bridge Preservation Program is \$100 million per year that is allocated to our eleven Districts based on their total deck area of bridges. The funding is part of the State Bridge funding on the TIP (Transportation Improvement Program).
RI	Federally funded.
VT	<i>There are no dedicated funds for bridge preservation. The funding, whether federal or state is part of the overall bridge program (interstate or state highway).</i>

3. What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
CT	In our Preventative Maintenance Program our strategy has been to let District-wide joint projects (Connecticut has 4 construction Districts—these projects are bid as conventional construction projects), followed by bearing replacement projects, followed by beam-end repair and painting projects. Going forward we intend to combine the bearing and beam-end projects to reduce mobilization costs. One thing not working well: are the NEPA and Public Involvement requirements for using federal dollars can be cumbersome (i.e.... SHPO effect determinations for a multitude of sights for a joint project).
MD	We find doing latex concrete overlays just prior to the deck reaching a point where this is not possible to very successful. We also find repairing substructures with cast in place concrete to be a much better long term repair then other methods. b) What didn't work well? Using pneumatically applied mortar (gunite) as a long term repair. c) What do you think should be the future direction of bridge preservation? Building less new systems and maintain the existing ones first. Do not privatize roadway/bridge maintenance.
DC	<i>Implementing pro active program such as: Routine scupper cleaning and washing; deck Joint replacement; bridge deck sealing; Bridge deck overlay, cleaning, painting girder ends and lubricating bearings</i> <i>b) All of the above are working well except replacing deck joint with Dow-corning silicon joint repair system. For the past year we have been using R.J. Watson silicoflex. Outcome to be determined.</i> <i>c) Research to find better materials, and repair methodology and establishing Database for information sharing.</i>
DE	Bridge painting b) What didn't work well? Joints are difficult to keep up with due to the quantity and variety of types c) What do you think should be the future direction of bridge preservation? Don't know
MA	Unfortunately for us, bridge conditions are at such a point that a lot of effort is needed to reach our goals of bridge preservation. What has worked well for us is to do partial deck replacements when the deck has not deteriorated completely (partial deck replacement: remove the top half of the deck and replace with new concrete) and replace with a membrane waterproofing and asphalt overlay.

3. What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
	The future direction should be to develop maintenance strategies and programs that will repair problems when they are in their infancy and protect the asset before they have a chance to grow into major problems requiring extensive work.
ME	Washing, sealing concrete surfaces, sealing joints, partial paint, new wearing surfaces. Pour in place joints only have a limited life.
NH	Yearly washing and periodic oiling of bridges have been extremely successful in prolonging a bridge's useful life. Other activities that have been successful include deck membrane replacement combined with deck patching and deck patching combined with concrete overlays. Patching substructures has had spotty success because the underlying cause is not always fully addressed. Replacing deteriorated joints with asphaltic plug joints has worked in the short term, but these joints require a high degree of periodic maintenance. Bridge preservation activities and funding should be considered from the day a new structure is opened. Maintenance funding for <u>that new structure</u> should be included in the budget based on a periodic maintenance schedule which includes washing and sealing, repainting, replacing joints, deck membrane replacement, etc. Providing a limited pot of funding that allows us to perform required periodic maintenance on only a small percentage of the bridge inventory will continue to perpetuate the bridge conditions we see today.
NJ	Preventive Maintenance procedures used by the New Jersey DOT have been an evolving process developed throughout past years. As of right now, the following are included in the NJDOT Bridge Preventive Maintenance Program: Bridge Cleaning, Repair/Replace Joints, Repair Concrete Deck/Sidewalk, Seal Concrete Deck, Seal Cracks in Wearing Surface, Crack Sealing on Concrete Decks, Crack Sealing on Substructure, Inhibit Corrosion of Rebar, Lubricate Bearings, Substructure Concrete Repair, Sealing Concrete Substructure, Repair Approach Slabs, Repair Erosion/Scour, and Safety Improvements. b) What didn't work well? As of this writing, the New Jersey DOT has not had any issues with any item that caused it to be removed from the Bridge Preventive Maintenance Program. c) What do you think should be the future direction of bridge preservation? A cyclical, systematic approach to preserving and maintaining bridges has been established by the New Jersey DOT and the FHWA. A series of guidelines have been devised and should be followed.
NY	Use of polymer-based repair materials for expansion joint & deck waterproofing, FRPs for temporary repairs, bearing replacements (swapping steel sliders with elastomeric, use of GRP for rapid assessment – for bridge and network level info, identification of cyclical activities, skills training, Job Order Contracting, outreach to locals. b) Maintenance of steel coatings - we are not moving fast enough. c) More involvement with local owners. More stretching the limit resources. Consultants

3. What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
	and designer moving into creative repairs and analysis to keep bridges open.
PA	Our bridge painting guidelines (for bridges greater than 100 feet long) has streamlined our painting efforts resulting in an economical method to provide corrosion protection to existing steel bridges. Concrete deck patching and waterproofing overlays (i.e. latex concrete, bituminous with membrane) has extended the deck life and improved rideability. b) What didn't work well? Repairing or replacing/installing expansion dams to ensure leak proof joints. We have had some issues keeping our joints intact after winters. The X.J.S. Expansion Joint System has been sparingly used due to bonding issues between the silicone and concrete. c) What do you think should be the future direction of bridge preservation? Taking into consideration Pennsylvania's age of the infrastructure (average age = 51 years), 3 rd largest number of state-owned bridges (>25,000), and largest number of structurally deficient (SD) bridges (>5,590), bridge preservation is a strategic, economical, and critical activity needed to extend the life of a bridge. We must better strive to identify a bridge preservation life cycle that would determine the what's and when's of specific bridge preservation activities – in other words – try to get the biggest bang of the buck in performing the preservation activity at the optimum time to get the most life out of a bridge.
RI	Bridge washing is currently our only activity.
VT	Recently Vermont has focused on two types of preventive programs. The 1 st being membrane and pave. The 2 nd cleaning and painting structural steel. With the exception of a deck needing a bit more repair than expected, we are hopeful that these projects prove beneficial. As for the future direction, getting a handle and establish the 'right' cycle for preventive measures is key.

4. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
CT	Currently, our policy makers have prioritized bridge preservation over major rehabilitation and replacement. Our HBP program is currently committed to 2 very large projects over the next 3 or 4 years. Bridge Preservation is the next priority, and bridge rehab./replacement is the next priority to make sure that our % of poor bridges does not increase.
DC	<i>DDOT recognizes the necessity for annual bridge maintenance and preservation budget. Funds are available for Bridge Preventive maintenance Contract (\$3M-\$5M) additional funds will be available by justifying needed work to upper management.</i>
DE	We use the same priority list for all bridge needs.
MA	Primarily through the efforts of our Districts that push for specific projects to address identified problems.

4. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
MD	We do have separate budgets although when necessary we do use the BR/BH money for repair/preservation work. Our emphasis has always been to make sure our bridges are maintained first and we have delayed deck replacements, etc. in order to fund necessary bridge repair work.
ME	Since the Capital effort is not focused on preservation and rehabilitation, Bridge Maintenance efforts are required to address structural need versus preservation.
NH	Bridge Maintenance is funded separately from Bridge Design and the capital program, so priorities of maintenance versus rehabilitation/replacement are determined at the Department's overall budgeting level. The funding level for Bridge Maintenance is relatively level from year to year.
NJ	A systematic approach to choosing structures for Preventive Maintenance has been put in place by the New Jersey DOT. This approach, laid out in the Bridge Preventive Maintenance Guidelines set forth by the NJDOT and FHWA, is based on various structure and substructure ratings. If a structure falls below certain levels, it is no longer included in Preventive Maintenance and is recommended for rehabilitation or replacement.
NY	It's probably more to do with guilt or a consciousness that preservation is necessary than using an analytical approach. We do run what if scenarios with various investment strategies but defer to the more immediate needs (% deficient).
PA	PennDOT's Bridge Preservation Program is \$100 million per year that is allocated to our eleven Districts based on their total deck area of bridges. Hence, every District must deliver their share of bridge preservation projects. Priorities are established using an innovative Bridge and Structure Risk Assessment System that PennDOT staff developed in 2007. The system computes risk scores for all state-owned bridges based on various risk levels of the bridge, including structure type (such as fracture critical, etc), system network, underclearances, and condition ratings. Importance factors are applied to the risk scores based on bridge size, the feature under the structure, the average daily traffic and truck traffic, scour condition, and detour length. The system also determines preliminary scopes of work and generates design and construction cost estimates.
RI	We have a dedicated set aside.
VT	Preventive maintenance projects do not get prioritized or compete with major rehabilitation / replacement needs.

5. How does your state prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	
CT	In our Engineering and Construction Bureau, bridge projects (those projects that rehabilitate or replace structurally deficient bridges) are considered a priority over

5. How does your state prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	
	capacity improvement type projects. In our Maintenance Bureau the paving/roadside program is prioritized over maintaining the bridges.
DC	<i>Based on need.</i>
DE	They are not related.
MA	Bridges are allotted a defined amount of funds, as do the other assets.
MD	Different Offices present the needs to the Administrator who decides the final yearly budgets. In general, if times are tough the resources are prioritized for bridges first.
ME	That's the \$100,000 question. Changes on a regular basis.
NH	Bridge Maintenance is funded separately from Highway Maintenance, so priorities of bridge maintenance versus highway maintenance are determined at the Department's overall budgeting level. The funding level for Bridge Maintenance is relatively level from year to year.
NJ	New Jersey DOT has separate funding for Bridge, Roadway, and Drainage. Since the Bridge Preventive Maintenance Program is Federally funded, a contract is put out every year to ensure the continued maintenance of the State's bridges.
NY	Bridges are important – NYSDOT does not transfer HBP or any bridge funds to other assets.
PA	PA Facts - Pennsylvania has the highest number of state-owned SD bridges in the nation, a reflection of the system's size and age. The average age of the 25,000 state-maintained bridges is 51 years and the state has the most bridges over 75 years old. With limited resources, severe winters and widely changing temperatures, Pennsylvania saw the number of structurally deficient bridges climb to an all time high of 6,034, or 24 percent, in 2008. An average of 300 additional bridges became SD every year. With the facts mentioned above, it was quite clear how the assets were prioritized. PennDOT responded by quickly developing and implementing an aggressive new program known as the Accelerated Bridge Program. The objective was simple: reduce the SD bridge population from 24% to 8% (national average). From January 2008 to June 2010, 1,322 SD bridges had been bid, exceeding the three-year goal of 1,145 bridges. By the end of 2010, it is expected that 1,500 SD bridges will have been bid in 3 consecutive years (2008-2010). In addition to rebuilding SD bridges, approximately 1,200 bridges had their life extended through preservation work.
RI	There is a fairly equal distribution between, highway, bridge, and traffic safety.
VT	Vermont has a budget committee that oversees the allocation of funds to programs (bridge, roadway, rail, etc.) The VTrans Structures Section is provided with a figure and

5. How does your state prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	
	target amount to use for budgeting.

6. How do you capture/assess work accomplishment?	
CT	We have performance measures around reducing the backlog of Bridge Maintenance Memos (Directives to our Bridge Maintenance group for recommended repairs following our bridge inspections). We also have a goal of not increasing the % of poor bridges in our inventory.
DC	<i>Keep a running work progress matrix. In the future we will like to use PONTIS.</i>
DE	The work is assessed through follow-up inspections and through our Maximo Maintenance Management System.
MA	Currently, we do not have a database that is up and running to capture preservation work, however we are working to develop one for this purpose.
MD	We are a small state with bridges “owned” by design teams. We have an intimate knowledge of our bridges so we know what has worked, etc. However, we do not have any specific measures.
ME	We use the MATS system.
NH	Work accomplishment is captured in MATS and in weekly activity reports.
NJ	It is expected that the initial cost of repairing a structure will be greater than the cost to perform the same procedures later in the structure’s life. It is the goal of the New Jersey DOT’s Bridge Preventive Maintenance Program to bring the structure to a level where it can be maintained regularly and prevent it from falling into a state of disrepair. Overall, the effectiveness of the Bridge Preventive Maintenance Program will be judged based on the cost per cycle to perform these activities.
NY	State forces use a Maintenance Information System. Capital efforts use a financial accounting system. The two have not been integrated.
PA	PennDOT has several metrics to monitor our goals set forth every fiscal year. The metrics tracked specifically for bridge related activities are the following: a) Achieve minimum 85% of Construction \$ spent on Structurally Deficient Bridges; b) Percent of Structurally Deficient (SD) Bridges, Measured by Deck Area for State-Owned Bridges $\geq$ 8 feet - Reduce SD Deck Area to 10% (national average) by 2025. A linear decrease of approximately 0.45% of SD deck area per year is required to achieve this goal. c) Percentage of completed 0 and 1 Maintenance Priorities for Bridge Maintenance Category – Goal is to complete or mitigate 100% in seven days for Priority 0’s and six months for Priority 1’s.
RI	We need to improve on this.
VT	Currently, based on existing performance measures (i.e. structural deficiency trends, percentages, etc.). Vermont is looking into other measure to capture the work and benefits of preventive maintenance.

7. What research needs do you believe is needed in the area of bridge preservation?
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7. What research needs do you believe is needed in the area of bridge preservation?	
CT	Do road salts increase the rate of deterioration on our bridges? Are there materials out there to reduce the time required for deck repairs (allow traffic back on the roadway quickly)?
DC	<i>Keep a running work progress matrix. In the future we will like to use PONTIS.</i>
DE	Effectiveness of the various preservation strategies.
MA	Concrete repair and preservation; freeze-thaw damage; ASR remediation; better coatings and coating strategies for steel.
MD	Do states using an asset management program such as Pontis have a more efficient bridge program? Do they spend less money and have better bridges?
ME	Product evaluation. When to paint?
NH	Paint systems that do not require SP10 cleaning and systems to remove lead paint that do not require as much effort on containment and decontamination.
NJ	With developing technologies, the New Jersey DOT should pursue research into more cost effective and durable products for any of the items listed in Number 3 above.
NY	Benefit cost analysis – to quantify the benefits of bridge preservation. This would involve the influence of a poor performing minor element on the performance of a more significant element or component of a structure.
PA	A database needs to be established by FHWA that provides specific details on what each State is doing for bridge preservation: a) Expansion dams; b) Beam end repairs and restoration; c) Fatigue and Fracture Retrofits; d) Bridge bearings and supports; c) Spot/Zone/ Full painting; d) Deck restoration and overlays; e) Approach slabs. Life cycle cost analyses for specific types of expansion dams, deck restoration/overlays, and paint systems.
RI	Concrete sealers and corrosion modeling.
VT	Whether it is your car, home, or a public asset most people agree that preservation / preventive maintenance is important however it remains difficult to explain why funds are being used extend the life of what may seem to be a ‘good’ bridge rather than one perceived to be highly in need. Research to back the benefit of preventive maintenance is needed. Answering these types of questions; does cleaning and paint structural steel really offer any life extension or is it simply making it look better? Does washing a bridge extend it life and if so, by how much?

APPENDIX C
Midwest Bridge Preservation Partnership Meeting
Detroit, MI
Roundtable Questions and Responses
October 13, 2010

1. Has your state adopted a particular definition for bridge preservation? If so, please provide the definition.	
IA	No.
IL	No, our state has not adopted a definition of bridge preservation.
IN	Yes, but not official yet, awaiting signature of INDOT and FHWA (Indiana Division Office) Executives. “Bridge and Culvert Preservation consists of activities performed on bridge or culvert elements or components that aim to prevent, delay, or mitigate deterioration”. “Preservation actions may be scheduled or condition driven”. “Preservation actions do not entail structural or operational improvements of an existing asset beyond its originally designed strength or capacity”.
KS	Bridge preservation: activities performed on bridge elements or components that aim to prevent, delay, or reduce deterioration. Bridge preservation activities do not entail structural or operational improvements of an existing bridge asset beyond its originally designed capacity.
KY	No.
MI	Michigan DOT defines “bridge preservation” rather broadly as follows: Preservation - Programmed work activities that restore or improve element integrity and ensure network safety and serviceability. A key assumption of the recommended strategies outlined below is that the identified maintenance activities are being performed. The following categories contain the core activities that impact the network condition, projects will be selected and prioritized with a Regional perspective. Capital Scheduled Maintenance (CSM) - Scheduled maintenance activities that maintain existing serviceability, and reduce deterioration rates on “good” structures. Work activities typically would include superstructure washing, flushing drainage systems, minor concrete patching and repairs, spot painting, concrete sealing, and joint repairs. Scheduled maintenance activities prevent “good” structures from becoming “fair” structures. Capital Preventive Maintenance (CPM) - Scheduled work activities that restore element integrity, and reduce deterioration rates on “fair” structures. Work activities typically would include joint replacement, pin and hanger replacement, zone and complete painting, scour protection, deck patching, thin overlays, and pedestrian fencing. These work activities have been modeled to equate to a “+1” condition rating improvement for the element(s) addressed. Preventive maintenance prevents “fair” structures from becoming “poor” structures. Any fix life realized is a function of the element being restored. Rehabilitation (R) - Programmed work activities that improve element integrity. Work activities typically would include deep overlays, superstructure repair (beam end repairs,

1. Has your state adopted a particular definition for bridge preservation? If so, please provide the definition.	
	bearing rehabilitation, diaphragm repair/replacement), extensive substructure repair, substructure replacement. Any fix life realized is a function of the element being improved. Rehabilitation work activities improve condition ratings to "fair" or "good". Replacement (R) - Programmed deck replacement, superstructure replacement, or full structure replacement. Replacement work activities improve condition ratings from "poor" to "good".
MN	Bridge Preservation is the repair or protection against future deterioration of a structure or an element. It extends the service life of a bridge without significantly increasing load carrying capacity or improving geometrics. Examples of bridge preservation projects include painting (spot, zone or complete), bridge joint repair/replacement, deck overlays, rail repair/replacement, scour countermeasures, minor superstructure or substructure repair. Bridge Preservation Activities should not exceed 30% of the cost of a new bridge.
MO	MoDOT has no formal bridge preservation definition. However, our Bridge Maintenance staff defines it as, "extending the life of a bridge or bridge component through appropriate maintenance or repair strategies".
OH	A term used in Bridge Preservation Funding - The goal of the preservation funding process is to achieve and maintain "steady-state" conditions – relatively low and stable level of deficiencies small enough that a predictable rate of preventive maintenance and regular repairs can sustain the desired conditions. While in the maintenance section of the Ohio DOT does not use a Preservation term but uses a preventive maintenance definition. Preventive maintenance can be defined as the act of keeping a structure in its as-built condition and/or protecting it from inevitable deterioration due to environment, traffic vibration and deicing chemicals. In some cases, structures are built with flaws such as cracks in concrete which require action to prevent moisture and chlorides from infiltrating the micro-structure and causing early deterioration.
OK	No
ND	No.
NE	No, Nebraska does not have a formal definition for bridge preservation.
SD	We do not have a formal definition. We view it as any type of periodic work needed to reach and extend beyond expected structure life.
WI	WISDOT established the long term goal to maintain structures in State as follows: Provide bridges which are cost effective, maximize service life with minimal maintenance and meet the overall expectations of the traveling public with respect to comfort, convenience and safety. To meet the goal, WISDOT is having a strategic investment plan to maintain 90 percent of our bridges in "fair or good" condition by 2015. NBI rating of 5 or more is considered as fair or good condition in Wisconsin. This statement of goals can be found in the 2003 Draft agreement for the use of Federal funds for preventive maintenance of structures. WisDOT's vision for preservation and maintenance is a Wisconsin where transportation

1. Has your state adopted a particular definition for bridge preservation? If so, please provide the definition.	
	system investment benefits are maximized through cost effective strategies that foster:: Ongoing routine maintenance Long-term preservation Continued availability of transportation services statewide

2. How does your state identify bridge preservation needs? Please explain the process.	
IA	Bridge preservation needs are identified as part of our inspection review process. Recommendations are made to correct deficiencies or do preventive maintenance that will prolong the life of the bridge or element.
IL	Bridge preservation needs are identified within each of our nine district offices by the district's Bridge Maintenance Engineer.
IN	Preservation actions and/or treatments are identified in the Preservation Policy documents. Using the National Bridge Inspections (NBI) condition rating/system and assigned trigger values to select and prioritize activities/treatments.
KS	a) Begins with actual bridge inspection and maintenance recommendations conducted on site. b) Office Review-All field inspections are in reviewed in the office. Lists are created for needed actions for each bridge inspection. Action Lists: “307 Form”: Provides a list of all required repairs to be completed by the Area or Sub-Area Forces (Light Equipment Required). A-list: Provides a list of all bridges that need or have contract repairs. B-List: Provides a list of all bridges needing a paint project. C-List: Provides a list of all signing repairs. D-List: Provides a list of all repairs to be conducted by District Forces (Heavy Equipment Required). c) An Area Review Meeting is held after the completion of the Office Review. All Lists are discussed at that time and it is then determining who, when and what actions will be taken. District and Area Staff attend the meeting to go over the lists

2. How does your state identify bridge preservation needs? Please explain the process.	
	with Bridge Management Staff. d) The annual Set-Aside Project selection are completed and let for the next fiscal year. These projects including bridge repairs, bridge painting, culvert replacements (≤ 20 feet structures), and all re-deck candidates. The following steps describe the actual selection process. iv) Area selects their priority projects using mainly the Area A & B Lists. v) District prioritizes all of the Area Requests for the District and submits their list to Bridge Management. vi) Bridge Management reviews all of the District Lists and conducts a Field Check with the Districts. vii) Bridge Management prioritizes the results to meet the overall States needs and budget restraints.
KY	The Districts send us (Central Office) their requests for bridges that need work done by a contract. The Districts will use their bridge crews for small nontechnical repairs. We will also query Pontis for bridges in need of work to include as a group project.
MI	Michigan has a state long range plan and strategic goals for pavement, bridges, and other major infrastructure. Bridge preservation needs are identified to meet our strategic plan and bridge performance goals through our Annual Call for projects and development of a rolling five year plan. Bridge forecasting and strategy is done using our BMS and included in our long range plan, and funding is allocated to each of our seven regions and our big bridge program for the work categories; capital preventive maintenance, capital scheduled maintenance, rehabilitation, and replacement, and projects are picked that meet the guidelines provided in the Call for projects letter. Projects are reviewed and approved by MDOT's Bridge System Manager and MDOT's Project Steering committee.
MN	The District performs Routine Maintenance and Pontis element level inspections for their bridges. Routine and preservation activity needs are reported to the District Bridge Engineer through inspections. Projects are then identified through these activities in coordination with the Bridge Office.
MO	We identify preservation needs during our routine safety inspections, enter this information into our BMS, and share it with district staff. On major bridges ($\geq 1000'$ in length), our inspectors write a report documenting the condition of the structure and their recommendations for preserving it. In addition, we review construction projects to ensure preservation needs are included in the scope of work.
OH	Typically - Routine cyclic preventive maintenance such as bridge deck sweeping and cleaning is performed each spring and early summer by contract or in-house crews. Other needs such as wearing surface pothole repair, scour control/correction, and concrete repairs or resetting bearings is identified and prioritized during the annual bridge inspection cycle by the bridge and inspectors.

2. How does your state identify bridge preservation needs? Please explain the process.	
	Additional methods are: -County Supervisors review their respective State and Federal Routes every two weeks. -Either the respective County or District Bridge Crew clean the bridge every two years. -ODOT District One has a Web Site and utilizes a Customer Inquiry Management System (CIMS) to track call in concerns
OK	Through bridge inspections and bridge management. Please explain the process. Using PONTIS, we identify locations for overlay, paint, and joint projects.
ND	Bridge Division uses PONTIS reports to identify bridges that will have maintenance done by contract. We will run these through our project development process and put them out in our regular bid opening schedule. The District Maintenance forces will schedule certain work items that have been identified by our Bridge Inspectors.
NE	Needs are determined through routine bridge inspections. A maintenance report or bridge repair report is submitted by the inspection team, and reviewed by our inspections quality control personnel.
SD	We have preservation type practices that have been identified. Potential candidates for these practices and other noted deficiencies are identified by our field inspectors thru the inspector work candidates in PONTIS; Use of PONTIS preservation/programming/planning tools; OBD staff input from previous experience.
WI	Regional bridge management engineers provide identified needs during the inspection. We also provide cyclic preservation measure like deck sealing.

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on an as needed basis?	
IA	Preservation activities can be funded through our program as needed or with dedicated bridge maintenance funds.
IL	The districts receive contract maintenance and Day Labor funding each year. These programs are typically used for repairs, overlays, joint replacements etc. However, these funding sources are not sufficient for the needs that exist. They have not been used to a great extent for preventative maintenance in the past due to the significant needs for other maintenance and repairs. Some projects for overlays, expansion joints etc. are funded through the districts' other funding sources. Starting in FY11 a statewide funding line item was established for applying deck sealers to all concrete decks that have an NBIS condition rating of 6 or greater. One fourth of these bridges are to be treated each year such that all bridges will be on a four year cycle for application of a sealer. A statewide line item was also established for preventative maintenance on our "major bridges". Major bridges were selected as those over 1000 feet in length. The funding amount is not large, but is a step in the right direction. Specific types of work are currently being identified.

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on an as needed basis?	
	A separate statewide funding line item for painting steel bridges has also been in place for many years. Although not sufficient to address all the painting needs, it does help greatly. Funding for maintenance and repair of border bridges that we share with adjacent states is discussed at annual border bridge meetings and our portion is funded by our Office of Planning and Programming.
IN	As needed basis for now.
KS	The majority of bridge preservation activities are funded through the Substantial Maintenance Program which includes 5 separate funds called the Bridge Set-Aside Program. The current funding level is set at \$21 M/year. Some additional repairs are picked up as part of Associated Bridge Work completed as part of some other major project.
KY	We can use HBP funds for major bridge rehabs and large bridge paint jobs. We can use Rural Secondary funds for bridges on rural secondary roads. We can Interstate Monies on bridges on an interstate. We have a bridge maintenance budget (\$24 million) that can be used for bridge work on any state maintained bridge.
MI	Dedicated funding is provided to MDOT's bridge preservation program.
MN	Bridge preservation funding is a combination of program delivery (construction) budget and the operating budget sources. The Districts will program preservation contract projects on an as needed basis or within their allotted program delivery budget. District Bridge Maintenance/preservation performed by internal staff is funded by operating budget according to predetermined level based on overall infrastructure operational needs of the District.
MO	Depending on scope of work, bridge preservation is either funded through our construction or maintenance program. However, there is no dedicated funding in either program for such activities. As such, these needs must compete against others for funding. Unfortunately, bridge needs take a back seat to keeping our majors in good condition and improving the condition of our minors. Notes: 1) MoDOT does not have a preventive maintenance plan approved by FHWA; so, we are not using HBP funds for preventative maintenance activities. 2) Our highway & bridge construction budget is estimated to average \$500 million per year over the next 5 years. 3) We typically spend \$12-15M of MT funds annually on bridge maintenance functions.
OH	The Funds Management Committee is an advisory body created to make fact-based recommendations on how the department should best allocate available funding based on the goals, conditions, and needs of Ohio's transportation network Committee utilizes broad-based representation from functional areas including: – Deputy Director of Planning – Chair – Rural and Urban District Senior Leadership – Finance, Highway Operations, Facilities, Local Programs, Safety, Traffic,

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on an as needed basis?	
	Structures Committee Deliverables – Recommends funding mark for getting all programs up to the established goals – Clearly documented process for allocating pavement and bridge funds to the districts – Continually monitor capital programs due to: ○ Project costs modifications and inflation, funding levels, changing pavement and bridge conditions ○ Program and funding adjustments are then made to reach goals
OK	We have dedicated \$5 million of our BR funds for Preventive Maintenance
ND	Bridge Division has a \$618,000 annual budget for bridge maintenance work. In recent years this money has, typically, gone towards painting steel bridges. Each District has their own budget line item for roads and bridges. Districts do not have a separate line item specifically for bridge maintenance. Larger scale projects such as deck overlays are programmed as construction projects and funded with federal aid.
NE	No dedicated funding for bridge preservation. State funds are used for bridge preservation, thru the construction program or district maintenance budgets, depending on the type and amount of work needed.
SD	We have a dedicated bridge fund which includes funding for preservation work. Bridge preservation work is sometimes paid by other funds when included with mainline work.
WI	Try to include actual bridge preservation whenever possible in projects that serve multiple purposes. Finding what should be spent depends combining risk and what the policies may be.

4. Has your state established performance goals for your bridge program (goals and measures)? If so, a) What are your state goals and measures?	
IA	As a result of a funding needs study we established a goal to reduce the number of structurally deficient bridges by half (120 bridges) in ten years. We have a performance measure to assure that no less than 95% of the State maintained bridges do not have a lower Sufficiency Rating with respect to the previous year based on the following criteria: 1. Sufficiency Rating must drop more than 3 points (to be statistically significant). 2. Border Bridges are not included. 3. New bridges and recently reconstructed bridges without initial inspections for comparison to previous data will not be included. How did you go about establishing these measures? We need to replace or repair 12 more bridges than the number of bridges that become structurally deficient in a year.
IL	No.
IN	Practically yes, officially no! Goals are to improve and maintain the bridge elements

4. Has your state established performance goals for your bridge program (goals and measures)? If so, a) What are your state goals and measures?	conditions which are identified in the bridge Performance Measure Goals at or above the thresholds. How did you go about establishing these measures?: Bridge elements were selected based on their Maintenance Cycles (Paint, Wearing Surface, and Deck) and bridge Structural Integrity (Superstructure, Substructure and Structural Evaluation) also, the Sufficiency Rating as the Overall “Health Index” condition. Using the NBI rating and assigned trigger values to identify the need also, to monitor and report the progress.
KS	Performance goals have been established for our bridge program. a) What are your state goals and measures? Goals: 85% in good condition & < 5% in deteriorated condition Measures: Our Measures are based on an adjusted Bridge Health Index (BHI) computed by Pontis and then adjusted for various Smart Flags collected as part of our Element Inspection. b) How did you go about establishing these measures? These measures & goals were determined by the Bridge Performance Measures Team which is required to submit updated actual performance levels annually to the Board of Directors. These measures are based on the various ranges of BHI shown on the table attached on the next page. The ranges also show what type of preservation action should be considered for various BHI ranges. These measures and goals have been revised by the Team to reflect past performance in response to actual funding levels that KDOT as faced.

4. Has your state established performance goals for your bridge program (goals and measures)? If so,

a) What are your state goals and measures?

Bridge Health Index Summary			
FY 2010 Bridge Health Index	Required Action	Rating	Current Number of Structures at Condition
> 85	No Action Needed. (100-95)	Good	4386 = 87.5%
	Polymer Overlay Paint (No Section Loss) Minor Cracking (95-85)		
70-85	Silica Fume Overlay (SFO) Paint (Some Section Loss), Some Cracking Problems (85-80)	Fair	447 = 8.9%
	Major Patching w/ SFO or Re-deck (Future replacement candidate) Posting for loads ≥ 25-30-40 Tons (80-70)		
< 70	Major Rehab, Re-deck, Replace (70-60) (Programmed for replacement – on watch list (60-50))	Deteriorated	182 = 3.6%
	Replace (Programmed for replacement - cribbed) Posting for loads ≤ 15-25-30 Tons (<50)		
KY	Our goals are to reduce the number of structurally deficient state bridges each year and to never have more than 10% of our state maintained bridges classified as structurally deficient. Also, we are to reduce the amount of deck area of structurally deficient state maintained bridges and to never exceed 12% of the total deck area of all state maintained bridges. How did you go about establishing these measures? These goals were developed in meetings with bridge maintenance folks, executive management, and state auditors.		
MI	Michigan DOT performance goals are as follows: a) As a priority on the network, immediately address the needs of 100% of the structures of critical concern. b) To improve the overall condition of the freeway bridge network so that 95% of the structures on that network are rated good or fair. c) To improve the overall condition of the non-freeway bridge network so that 85% of the structures on that network are rated good or fair. How did you go about establishing these measures? Through development of Michigan’s Strategic Investment Plan for Trunkline bridges.		
MN	The MnDOT bridge system has structural condition targets based on NBI condition. MnDOT targets 55% in good condition (NBI 7 or greater) and 2% in poor condition (NBI		

4. Has your state established performance goals for your bridge program (goals and measures)? If so, a) What are your state goals and measures?	
	4 or less). As of 2010 we had 54% in good and 3% in poor condition. Additionally, bridge preservation and maintenance performance measures include: ■ Complete 100% of High Priority bridge maintenance need items within 1 year of identification. ■ Complete 100% of scheduled preventive maintenance items. ■ Reduce the overall backlog of identified Medium Priority bridge maintenance items identified.
MO	Yes If so, what are your state goals and measures? MoDOT has three levels of bridge-related performance measures. The department measure is the number/percent of deficient bridges on the state system. This measure helps us determine our overall direction and adjust programming as needed. Our goal for this measure is to lower the number/percent reported. Our division measures include average bridge condition rating and the percent of bridges in good condition (rating > 6). These measures address those bridges in which preventative maintenance can or has had a positive impact. Our goal for these measures is to increase the values reported. The last measures are those established by our individual districts and are typically related to the work their field forces perform. The goal of these measures is to increase the values reported. How did you go about establishing these measures? MoDOT developed our <i>Tracker: Measures for Departmental Performance</i> over five years ago to identify how we are doing in delivering the most efficient and practical transportation services available. The department measure was included in this document as a means of tracking our overall performance in the bridge area. The division and district measures were create later to track performance in areas they could directly impact.
OH	ODOT monitors bridge performances using 4 performance indices or OPIs: General Appraisal (GA), Floor Condition Rating (FR), Wearing Surface Rating (SR) and Paint Rating (PR). If the appraisal rating of a bridge drops below deficiency level on any of the OPI, the bridge is considered deficient on that OPI & is programmed to remove the relevant deficiency. Once the bridge maintenance work is completed, improvement in the deficient OPI will be observed during the subsequent inspections. Bridge work costs to remove any OPI deficiency are tracked in the Ellis. Average bridge OPIs based on the bridge deck are monitored for each District every month. All information is obtained through the bridge inspection program Current statewide goals; less than 4% deficient General Appraisal, less than 3.8% deficient Floor Condition Rating, less than 3.0% deficient Wearing Surface Rating, and less than 10% deficient Paint Rating.
OK	No If so, a) What are your state goals and measures? Even though we do not

4. Has your state established performance goals for your bridge program (goals and measures)? If so, a) What are your state goals and measures?	
	have specific performance goals, in a recent TRIP survey based on our current funding, we projected the following or On-system bridges: SD Bridges: from 797 in 2010 to 590 in 2015, FO Bridges: from 604 in 2010 to 550 in 2015, Posted Bridges: from 40 in 2010 to 5 in 2015 How did you go about establishing these measures? Based on our 8 year program
ND	We established service level guidelines in May 2007. We identified four maintenance areas; crack sealing, sweeping/flushing, approach slabs, and surface treatments. Bridges are swept and cleaned every spring, cracks sealed every two years, surface treatments every two years and approach slabs are lifted after two years. We have moved away from requiring a surface treatment every two years. Our maintenance forces were not equipped to do the surface treatment. We do not have sandblasting or shotblasting equipment to prepare the surface for treatment. During the spring cleaning, crews maintain the bearings, slope protection, beams, guardrail, etc. We have not established performance measures. b) How did you go about establishing these measures? A business plan group was established with members from our Bridge Division, District offices and central offices. This group has been inactive and has not yet established performance measures for bridge maintenance.
NE	No performance goals established for bridge preservation. General goals for all State bridges are to reduce or eliminate; fracture critical bridges, steel girders with pin and hanger devices, bridges with timber piling, and scour critical bridges.
SD	We do not have any specific target numbers for goals but for measures we do track the number of structurally deficient (SD) structures and the health index (HI). Our general goal is to keep the number of structurally deficient structures to a declining trend and/or low number and keep the health index to a stable higher number.
WI	Several strategies to measure the condition of the system include: Load capacity, clearance issues deficient bridges NBI values. One such goal is 90 percent of the bridges are classified as not deficient. measure benefits- use statewide objectives to produce projects including safety, risk assessment, maintenance strategies preservation strategies. We verify and re-look at the strategies by looking into the data and effectiveness against our overall goals, or investigating if either deterioration current.

5. What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
IA	Our long standing program to overlay bridge decks with a dense P.C. concrete overlay prior to significant deck deterioration (deck may have as little as 1% of area with spalls or delaminations). Proactive program of retrofitting steel bridge members with fatigue crack prone details. Development of an inspection manual and inspection program for our sign structures, bridge mounted support frames, long mast arm structures and highmast lighting towers. Practice of in-house staff injecting epoxy into the delaminations of the dense P.C. concrete overlays to extend the life of the deck. b) What didn't work well? Conventional patch techniques to repair deterioration on the ends of pretensioned prestressed concrete I beams caused by corrosion of the prestressing strands and mild reinforcing (typically located below leaking deck joints). Contracting out the injection of epoxy into the delaminations of the dense P.C. concrete deck overlays. Approximately 10 years ago, the Iowa DOT tried some projects where the steel was spot painted. The steel was prepared to SSPC SP-10 and painted with a 3 coat system. The surrounding paint was feathered and top coated to transition to the old paint. Approximately 2 to 3 years after the spot painting, some more areas appeared. After about 5 years the paint had deteriorated enough to repaint a zone at a minimum. The deteriorated paint that caused the first spots was more generalized and the whole system was failing as was evident by the continual failing of the paint. c) What do you think should be the future direction of bridge preservation? Invest more funds in preservation activities. Determine best practices and most cost effective preservation techniques. Improve management and tracking processes.
IL	As noted above we have some preservation funding sources that are new, and have not had consistent statewide bridge preservation activities to this point. We are optimistic that the deck sealing program will be beneficial. Research on deck sealers prior to establishing the statewide funding line item showed the sealers are effective. It would be good to have best practices for various types of preventative maintenance identified nationwide along with any cost/benefit data available to support those practices. Many states could use the information for obtaining funding within their states for preservation practices. Simple guidelines for determining which bridges would benefit, and how to prioritize, would also be very useful rather than trying to rely on data hungry and complicated bridge management software for impractical levels of optimization.
IN	District-wide "Bridge Preventive Maintenance" contracts b) What didn't work well?: First time contractors (small contracts) Project Managers/Engineers c) What do you think should be the future direction of bridge preservation? 1- Develop Policy, 2- Establish Budget, 3- Implement, 4- Adjust/Revise, 5- Do More!

5. What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
KS	a) The State's Substantial Maintenance Program is one of our greatest success programs. Strong funding for the Bridge Set-Aside portion of this program and the ability to make most decisions at the Bridge Management Engineer's (fund manager) level provides a great deal of freedom for sound and quick decisions when needed. The support of my Director and the other fund manager for pavements is also a strong resource. Funds have been moved from one fund to another when needed. This again allows a lot of freedom to make both decisions for emergency repairs and on work additions (when a low price is offered by a contractor that is hard to walk away from.) The use of polymer overlays has been a strong bridge preservation program that so far has performed well for us. It comes at a reasonable cost and more importantly reduced time in lane drops. It has also increased tire traction for traffic and reduced noise levels. b) Handling deck drainage on and off a bridge is one of our greatest disappoints. We spend a great deal of money for repairs annually created from water damage. We are currently looking hard at our bridge drain designs and associated collection systems. Another problem area is bridge approach settlement and associated problems with joints and drainage. We have recently changed to a new joint system and have Let a project using a new approach design using a bituminous wedge between concrete pavement slabs. c) The cost of construction has dictated that DOT spends more of their resources on preservation just to be able to maintain the system at hand. In order to even consider constructing future capacity improvements the existing system will have to perform better than allowed in the past. The only way this can be possible is through a sound preservation program.
KY	We have recently put more effort into getting our District bridge crews better staffed. They can now do basic functions such as cleaning drains and deck patching. We have also began some bridge cleaning by contract. One area that did not work well is bridge overcoating with calcium sulfonate. We are seeing overcoating failures in as little as 3 years. We are aiming for a plan to do certain maintenance activities based on the age of a bridge. For example, when a bridge becomes ten years old we will apply a deck sealant. We hope to use the philosophy of spend a little money now instead of waiting to spend a lot of money later.
MI	Successful preservation strategies Development of a Strategic Investment Plan for Trunkline bridges having specific

	5. What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?
	condition goals. This has kept us focused. Providing specific funding for work categories; capital preventive maintenance, capital scheduled maintenance, rehabilitation, and replacement. Development of a network level forecasting tool called Bridge Condition Forecasting System (BCFS) to analyze and compare strategies, and to forecast bridge condition. Monitor bridge system condition annually in accordance to our strategic goals. Monitor number of bridges that become poor each year to measure the effectiveness of our preventive maintenance programs.
MN	In the late 1970's through mid 1980's MnDOT implemented an overlay strategy for all state bridges. Through FHWA and MnDOT research we started a latex or low slump concrete overlay program for existing and new bridges to prevent further deck deterioration. Most overlays have lasted approximately 30 years before another overlay or re-deck. The deck deterioration rate and condition significantly improved. Targeting zone painting based on Pontis paint conditions. MnDOT District Bridge Maintenance will perform some painting at specific locations like gusset plates, hinges or joints. We have tried some bituminous overlays with and without membranes with little success. We have since removed almost all membranes and no longer use in construction. The future direction of bridge preservation is more efficient use of resources by using innovative new products, better details and preserving the good condition bridges. For Minnesota there is a bubble of interstate bridges that need either preservation or improvement repair activities.
MO	Our most notable successes include bridge deck cleaning/flush, deck sealing, approach lifting, and joint replacement programs; the use of a maintenance contracts, including job order contracting; institution of zone/spot painting; and regionalization of our bridge maintenance crews. What didn't work well? Establishing a program that set aside \$10M annually for contract painting of major bridges, as these funds were quickly moved to other non-bridge-related needs. What do you think should be the future direction of bridge preservation? We need to focus on maintaining/preserving bridge decks. They are the key to minimizing needs elsewhere and extending the life of the structure. In addition, we need avoid the worst first mentality when prioritizing maintenance activities. Our priorities should be to first ensure the safety of the structure, second to perform maintenance activities that provide

5. What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
	us with the greatest benefit, and lastly to maintain poor condition structures as needed.
OH	Ohio's biggest success is incorporating our major maintenance needs into the capital program for overlays, deck replacement, and painting.
OK	Our biggest success seems to come from replacing bridge decks. Sealing joints and eliminating joints seems to work well. b) What didn't work well? We have had some overlays which have cracked and delaminated. Some of our rehabilitated joints do not last too long. c) What do you think should be the future direction of bridge preservation? Finding a way to slow down the corrosion process which is electrical in nature.
ND	We have only been doing bridge preservation for the last two years. We have experimented with different crack sealers and spall repair products. Crack sealing operations have been going very well. Crews have done a great job with the sealing and understand the importance of it. b) We did not have a good experience with a deck seal. Too much preparation with the sand blasting the entire deck. We are not set up to do full overnight lane closures. We prepare to seal just the cracks. We can perform that operation in one day.
NE	Bridge deck sealing, done by individual districts. Bridge deck overlays – silica fume concrete or asphalt over waterproof membrane. Bridge washing by State maintenance forces.
SD	We have identified four main areas we concentrate on through our practices. a) Decks/Slabs: Protection thru the use of overlays and sealers. We went to epoxy coated rebar and increased clear cover for our new structures in 1976. An extensive overlay program for our existing structures was initiated at that time for our decks/slabs with black resteel. That program was substantially completed by the mid to late 1980's. The overlay program continues as we are replacing some of those original overlays. We have overlays in place that are 25-30+ years old and still performing well. Our rigid concrete overlays have performed the best. We had varying success with our asphalt/membrane type overlays. We have use mainly thin overlays and sealers on our newer structures. b) Joints: Most of our girder bridges built since the 1970's are built joint-less with the use of integral abutments. Waterproofing open or leaking joints on our older bridges during our overlay program was a priority. c) Steel Girders: Zone painting near open joints. Along with our overlay and waterproofing joint effort we also included zone painting of the steel girders near these joints. d) Safety: We have also concentrated on upgrading our bridge rails to crash tested

5. What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
	rail systems and lower maintenance type rail type systems. We have been fortunate that we were able to start and continue to fund this preservation effort since the 1970's. With the preservation effort and replacement program we have in-place our structure inventory is in pretty good condition. We would like to see the available federal funding continue for preservation work.
WI	Sealing decks has provided longer deck life. Bridge preservation practices should be included in the design process especially for costly structural assets. Use the car analogy from the design and project cost.

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
IA	They don't. All needs are lumped together and judged on merit and prioritized accordingly. Also, addressing preservation needs using let contracts usually results in small dollar projects or projects with numerous tasks and/or sites. This results in significant costs for engineering time for plan preparation, contract administration and construction inspection. The amount of preservation work that can be accomplished is a balance between available funds, engineering and inspection capacity and capacity of contractor pool.
IL	Preventative maintenance has traditionally received much less support than rehabilitation and replacement needs. However, the new preventative maintenance funding sources described above are at least a step in the right direction for us.
IN	INDOT, Bridge Asset Management Team (BAMT) has developed a Business Rules to score bridge and large culvert (4'-20') projects. A high priority is given to Preservation Projects by assigning/automatic score of 100 out of 100 points.
KS	The current administration for KDOT has done a great job of protecting the Substantial Maintenance Program. Once the funds levels were determined by past performances to meet the needs, the Executive Staff has fought hard to preserve them. During the past couple of years of severe budget problems, these funds were the last to be reduced (went from \$21M to \$10M for two years for bridges). Our new Highway Program that started in July 2010, restored \$10M of the past funds that were originally lost and also restored the annual budget of \$21M / year.
KY	Major rehab and replacement needs are done with HBP funds and are submitted to Central Office by the Districts every two years. These needs are prioritized by the Districts. The final say is determined by upper management with the intention to spread the work evenly over the state with major metropolitan areas getting more work than sparsely populated areas. Bridge preservation is done with a different set of funds. Bridge candidates are prioritized and sent in by the Districts for contract work. Central office

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
	uses Pontis and makes field visits to each bridge that has been submitted and determines the overall priority.
MI	Through our Call For Projects process and strategy development done with BCFS.
MN	Bridge Preservation is done by Contract and also by Bridge maintenance workers in the District. Bridge Maintenance generally performs all routine repairs like flushing, debris removal, gland replacement and small quantities of painting, concrete or steel repair. Depending on District they can also do preventative activities like overlays, deck patching, railings and joint replacement. Preservation contracts get prioritized with all other projects within the District. Each District has a Bridge Engineer who prioritizes in close coordination with the Bridge Office. Replacement and major rehab needs typically are higher priority. Increased District Bridge staff statewide and newly established performance measures emphasize need for preservation as well.
MO	Due to the number of deficient bridges and the preference of MPOs/RPGs, bridge preservation needs take a back seat to rehabilitation and replacement needs in Missouri.
OH	The District Multi-Year Work Plans identify the Districts' long-term pavement and bridge strategies. The goal of the District Multi-Year Work Plan is to develop a fiscally constrained work program that assures safe, reliable, efficient and accessible, travel conditions, while maintaining bridge and pavement assets at agreed upon performance levels. Each District Multi-Year Work Plan consists of a listing of rehabilitation and maintenance projects and an evaluation of current and forecasted system conditions. Development and maintenance of the District Multi-Year Work Plans requires a collaborative effort between the district Planning, Production, Highway Management and Business and Human Services administrations. This process ensures the district administrations are informed of their work unit's priorities and coordinates work efforts between administrations. ODOT's Program/Funds Management Committee, responsible for recommending policies involving the allocation of capital funds and the administration of all Highway capital programs, will use the Districts' Multi-Year Work Plan systems conditions forecasts and the State of the System report as the basis for establishing system condition goals and funds allocations. It is very critical that the Districts maintain an up to date Multi-Year Work Plan and forecast of conditions.
OK	We have dedicated funds for bridge preservation.
ND	District offices decide where they spent their district maintenance money. Bridge Division uses the PONTIS reports to prioritize the Bridge Maintenance funds. The Districts and Bridge Division has input in the STIP development in

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
	prioritizing other major bridge rehabilitations and replacements.
NE	At the present time, preservation needs compete directly with major projects for State funds. Federal funds are not used at this time for bridge preservation.
SD	With the preservation program we have had in-place for some time, we have been able balance our preservation and replacement needs with the available funding we have. We are also hoping this effort will also help smooth out the potential needs bubble from aging of all the structures that were built in the 1950's and 60's. The structures built in these two decades contain a good majority of the structures in our inventory.
WI	Program level goes by policies and rules set across the funding sources. Project level goes by guidelines in upfront cost compared to life expectancy and other metrics.

7. Does your agency have an approved systematic process for bridge preservation? If no, why?	
IA	Yes, all inspections of bridges with deterioration issues are reviewed by an engineer who makes recommendations for repair, rehabilitation, or replacement. These recommendations are entered into a management system that tracks the progress of each recommendation and has provided a picture of how well or how poorly we have been preserving our bridge inventory. The short comings of our system are the ability to fund and design preservation work. Each District has a bridge repair crew that has not been able to make all the recommended repairs. This is due to many factors including staffing, equipment, funding, and weather.
IL	No (aside from the deck sealing program described above). See #6 above.
IN	The BMS software (dTIMS/Bridge has not been officially approved or endorsed by the FHWA yet. But, INDOT uses other means of 'systematic' process to identify, select and prioritize bridge and large culvert projects (example: BAMT, Scoring System)
KS	KDOT has an approved systematic internal process for bridge preservation as described in Answer No. 2 above. We have not made a requested to the FWHA for using federal bridge funds for bridge preservation yet. Our administration doesn't like using federal dollars for preservation. They want those dollars to be used on existing route preservation (which includes bridge replacements) and expansion projects. Some inquires were made to FHWA, during the past budget problems, as to what would be required if things did get worse. We did start the development of a Bridge Preservation Manual.
KY	This is still a work in progress. Until recently all funds went to the worst bridges with nothing being done to keep bridge from becoming one of the worst.
MI	Yes.
MN	MnDOT does have a systematic process for bridge preservation. The Bridge

7. Does your agency have an approved systematic process for bridge preservation? If no, why?	
	Office has a Tech memo for all Bridge Preservation, Improvement and Replacement Guidelines that is approved by FHWA that Districts use.
MO	No. If no, why? This is not necessary since all HBP funds coming to MoDOT are used to rehabilitate or replace bridges through our construction program.
OH	No – Currently HBP fund are redirected to rehabilitate or replace bridges through the capital program.
OK	Yes
ND	We have established service level guidelines, but not identified systematic bridge preservation strategies. Our Bridge Division has identified bridge maintenance projects by reviewing NBI data and PONTIS reports. It is our intention to make use of PONTIS for helping to identify bridge preservation activities. But we feel that we currently do not have accurate enough data (deterioration rates and repair costs) to rely strictly on PONTIS to pick our maintenance activities.
NE	No, but our plan is to put a systematic process in place in 2011. Nebraska is putting additional emphasis and focus on bridge management and bridge preservation.
SD	Yes
WI	No sign off by FHWA – was not sure of the BMS term and systematic process.

8. How do you determine the right fix for a bridge? Do you do a detailed scope? Including cost comparisons? Including life cycle cost comparison?	
IA	The bridge maintenance engineer, in concert with the bridge design unit or District bridge repair crew, makes the determination of how a repair is to be done. This determination is usually based on previous experience with same/similar situations and engineering judgement. A detailed scope is only done when the work is to be done by a contract. Cost comparisons and a life cycle cost are not normally a documented part of the process but are considered in an informal way when making a decision on a repair method.
IL	Our district offices typically initiate bridge projects with identification of the need coming from the Bridge Maintenance Engineer and Programming Engineer. A Bridge Condition Report is prepared to document the condition of the bridge and to provide cost comparisons of various rehabilitation options and replacement. Life cycle cost comparisons are not typically made, but general guidelines to determine when existing structure elements are economical for reuse are provided in our “Bridge Condition Report Procedures and Practices” found at http://www.dot.il.gov/bridges/brmanuals.html
IN	Bridge Engineers (Inspectors) will recommend the initial fix/improvement to their respective district System Asset Managers (SAM) if agreed, SAM will propose the

8. How do you determine the right fix for a bridge? Do you do a detailed scope? Including cost comparisons? Including life cycle cost comparison?	
	Work Type in the Scheduling Project Management System (SPMS). The BAMT will review and score the proposed project based on the Work Type proposed given the element Condition rating (example: Wearing Surface rating for the Deck Overlay project) and the Cost-Effectiveness Factors. Therefore, if the “right” fix is not proposed, project will be scored and ranked low until district revises the scope considering factors (mainly element condition and cost) in order to score and rank higher in the priority list!
KS	For all general Set-Aside bridge preservation projects, the actual solution for the selected fix involves input from the Bridge Management Engineer, the Bridge Maintenance Plans Engineer, District and often a Road Design Squad. Major problems may require input from the Director of Design or even the Chief Engineer. District Staff is always required to have the Locals perspectives on the various options and that is also factored into the final conclusion. For all replacement we have a set process that involves the use of two different methods for the selection tools for all bridge replacements (Pontis and the PO Formula) followed by sound Engineering judgement to ensure that we spend our funds wisely. Decisions to replace or repair is generally made by presenting the cost comparisons of both methods at the monthly Program Review Committee Meeting (PRC) attended by all concerns parties (Executive Staff, Bureau Chiefs, District Staff and Designers). The case is presented and our Chief Engineer makes the final decision. Often for major projects, a life cycle cost comparison or a study is requested before these types of decisions are made. District Staff is always required to have the Locals perspectives on the various options and that is also factored into the final conclusion.
KY	Central Office folks meet with the District folks at the bridge site to make sure all necessary bridge needs are addressed. Various options are discussed for repairs and maintenance that include costs. We are currently not using life cycle cost comparison.
MI	Michigan DOT does a detailed scope which includes doing a detailed inspection including chain dragging the bridge deck, sounding concrete superstructure and substructures, measuring section loss on steel beams, doing cost comparison of different fixes, sometimes using life cycle cost analysis.
MN	The Bridge Office prepares a detailed preservation recommendation in coordination with the District that defines the scope. Cost comparisons including simple life cycle costs could be included in the analysis for the recommendation but are not required. If preservation activities exceed 30% of the cost of new bridge then the Bridge Office could expand scope to a Bridge Improvement project. Improvement projects generally increase the NBI condition and appraisal ratings to a 6 or higher. Example Improvements projects include redecking, widening, increased load capacity with 50+ year life expectancy.
MO	The scope of work on a bridge is determined by district design, construction, and

8. How do you determine the right fix for a bridge? Do you do a detailed scope? Including cost comparisons? Including life cycle cost comparison?	
	maintenance and central office bridge and bridge maintenance personnel based on the bridges specific needs, field testing, past experience with similar bridges, products, processes, etc. and does, on occasion, include some cost comparisons (e.g., initial and life cycle).
OH	Bridge repairs and replacement is driven by several factors, Maintenance items are determined by engineering judgment, past experience, and history of repair materials. Replacement and rehabilitation require several groups to give input into the decision process which may include structure type studies and life cycle costs. The level of involvement may depend upon cost of the project or historical significance.
OK	There may not be one right fix, but our project engineers do their best to come up with an economical fix that will last 10 to 25 years or more. Do you do a detailed scope? Only for new bridges. Including cost comparisons? Sometimes. Including life cycle cost comparison? No
ND	It is difficult to determine if we have the right fix for a bridge. We do not have a process to try to do that. Maintenance activities performed by the Districts are based on the service level guidelines. Maintenance projects that are identified by Bridge Division, typically, go through our normal project development process which includes scoping and cost comparisons, but not life cycle costs.
NE	We don't scope preservation projects, but for other bridge projects we go through a scoping process; determine all possible solutions, estimate costs, limited estimated life cycle cost comparison.
SD	When a project is identified we do an initial scope based on the need and our identified practices. A detailed estimate is included. For major projects such as widening or deck replacements, we will perform detailed cost comparisons and life cycle costs for the various scopes.
WI	WisDOT is currently working to break down barriers on fundamental engineering and life cycle decisions. The regions rely on BMS and other data to make life cycle decisions.

9. How do you capture/assess work accomplishment?	
IA	Through our recommendation tracking system we document when a repair recommendation is made and when the repair has been accomplished, either by in-house personnel or by contract. The contract work is also documented in our bridge programming system that prioritizes bridge work to be considered for our 5 year transportation program. Assessing the work that is completed is a long term process usually monitored as part of the biennial NBI inspections. The assessment is not a systematic procedure and we do not have a documentation process that keeps track of successes and failures of repair work.

9. How do you capture/assess work accomplishment?	
IL	No response to this particular question (from Wade).
IN	Using Performance Measures to Evaluate, Monitor and Report on the Network Average Elements Conditions through the Bridge Annual Report.
KS	We print all programmed contact repairs that are not completed and the past A & B Lists recommendations on the last sheet of every Bridge Inspection Form (BIF). Contract items are not removed from this list until the next inspection cycle or an In-depth Inspection Review is completed. Once completed, contract bridge repairs are then entered in Pontis as part of our In-depth process and then printed on the front of the BIF. All past recommended maintenance activities listed on the C & D Lists are printed on the last sheet of every BIF. All maintenance activities completed for each bridge is tracked by our Area forces using Crew Cards. All of this information is listed again provided on each BIF. The Area can call or E-mail Bridge Management as they complete maintenance actions. These actions will only be removed from the various lists once a photo or a site trip by the reviewer is made that ensures that all repairs are satisfactorily completed. All Critical Findings are assigned to a specific inspector, then entered into Pontis and E-mails are generated until finalized. Critical Findings are also listed on a bulletin board placed in a location that all bridge inspectors and managers have to walk by daily until completed and removed from the board. All Critical Findings must be inspected in the field by Bridge Management Staff before being removed from the tracking system.
KY	Each year we strive to reduce the number of structurally deficient bridges. Also, when a project is completed with no change orders we consider the project a success.
MI	Through our MAP Project Information System which is a program that keeps track of all of our capital projects. These projects are shown along with bridge condition in our Michigan Bridge Reporting System (MBRS) which has many different type sof reports used to manage bridges. For example, a region bridge engineer can review a report showing all their poor or fair bridges and see which ones are already programmed for work.
MN	Contract work is captured during the next inspection cycle with the Pontis element condition. District Bridge Maintenance has a database with prioritized work that documents needs and repair accomplishments, which are reported to the Bridge Office annually.
MO	Maintenance work items are created and closed out in our BMS.
OH	The Bridge Engineer reviews all bridge inspections along with related field reviews. The bridge engineer prints lists of bridge maintenance needs complied from the annual bridge inspection cycle. The list is broken down into in-house work and contract work. The in-house work is given to the Roadway Services Manager and/or County Manager to set up and coordinate repairs. The County Work Plan (CWP) concept was conceived and implemented to more effectively manage the maintenance of Ohio's highway system. The CWP document provides a blueprint for planning prioritized work for each of Ohio's 88 counties via a one-

9. How do you capture/assess work accomplishment?	
	page summary report. The plans serve as an indicator of the efficiency of resources expended toward meeting an established set of minimum system condition goals and preventive maintenance measures. The individual 88 county work plans are utilized to establish the 12 respective district work plans, which establishes the statewide plan, providing both a micro and macro view of system conditions and goals. This process enables ODOT to track and manage its maintenance system conditions on a quarterly basis at the county, district and statewide levels. The County Work Plan lists each county's prioritized maintenance activities, the work effort, resources, and funding expended on each activity. The plan tracks the number of deficiencies in each maintenance category, the increase or decrease in deficiencies, the total dollars spent on each maintenance area, and the cost per category of maintaining the highway system. Using this information, counties and districts are able to adjust their maintenance activities to meet their most pressing needs. Additionally, the work plans enable the department to maintain statewide standards in each maintenance category, providing a more consistent and uniform highway system. The more extensive, complex and costly repairs are identified as contract maintenance and placed into the capital program. For which Ohio uses Operational Performance Index (OPI), which incorporates Structure General Appraisals, Wearing Surface, Floor Condition, and Paint Condition.
OK	We place plans for the bridge repair projects in our electronic maintenance files.
ND	District Maintenance Section supervisors maintain a spreadsheet to document their material usage, man hours and equipment. There is no process for assessing work accomplishments for major rehabs or repairs done by contract.
NE	If preservation measures are through the construction program, then plans are prepared and let. The as-built plans become part of our bridge data management system. We are currently working on improving our district maintenance tracking procedures. The best we have to assess the work is thought quality control of our routine bridge inspections.
SD	Pontis.
WI	WisDOT is currently working on system to track county work. The Highway structures information system is the tool use primarily for this activity. It has Reports (maintenance actions / activities) and notifications for safety – nbi below level, risk analysis – such as section loss or scour Routing for permitting requirements for special type and access of bridges.

10. What research needs do you believe is needed in the area of bridge preservation?	
IA	Develop cost effective programs for maintaining and preserving reinforced concrete bridge decks. Determine the recommended practice and the life-cycle cost savings for preserving superstructure and substructure elements through the use and maintenance of watertight joints. Determine best practice for prevention and repair of damage caused by corrosion of prestressing strands and mild

10. What research needs do you believe is needed in the area of bridge preservation?	
	reinforcing in pretensioned prestressed concrete I beams. Develop procedures for preservation of weathering steel bridges. Develop best practices for preservation of steel bridge piles by preventing and repairing corrosion. Research methods of repair that disrupt traffic for as short a time as possible and are cost effective (particularly joint and backwall repair/replacement and PC concrete deck patching). Performance assessment of existing concrete structure corrosion prevention/mitigation technologies.
IL	See discussion in #5 above regarding best practices and supporting cost/benefit data.
IN	Streamline activities relative to Preservation, establishing assessment tools/mechanism needed to measure the impact of Preservation activities on element and overall bridge service life.
KS	a) The Pontis forecasting models needs to be improved so they actually work. We have found the models to do a reasonable job for two to four years out but after that no matter how much money you use as a funding level you never seem to improve much. b) A greater effort in being able to determine corrosion levels in post-tensioned members is needed that is cost effective and can be done by a DOT's staff as required. The cost of finding where the ducts are then drilling and scoping out the voids with a camera are just too great for an agency to consider using this technology to its full potential. c) Research in using a bed liner type of coating for a protection coating for steel superstructure is needed. Even when using weathering steel beams, using this type of coating at abutment encasements or under expansion joints would interest to us. Additional weight considerations need to be studied as well.
KY	The Kentucky Transportation Cabinet currently has a study project with the Kentucky Transportation Center to help the Cabinet develop a bridge preservation strategy which includes preventive maintenance.
MI	How to show the effectiveness of preventive maintenance; i.e.- show how different work activities slow the deterioration of the element. Develop methods to evaluate bridge decks at near highway speeds.
MN	I think better research into different deck sealers would be beneficial. Silanes, siloxanes, methacrylates, epoxy crack sealers, flood sealers have all been used for concrete protection. Approved products and application procedures need to be identified for different conditions. There are innovative products for thin overlays and epoxy chipseals that need more research. Bridge maintenance constantly repairs joint material. Is there other products or

10. What research needs do you believe is needed in the area of bridge preservation?	
	procedures that would offer more protection? Knowledge sharing of different state procedures policies and products would help.
MO	Life cycle costs, effectiveness, and usage criteria for different types of repair, maintenance, and rehabilitation.
OH	Would like to see a single database of materials used in other state with a proven track record.
OK	(a) Making an expansion joint that is both economical and durable. (b) Life cycle cost study comparing bridge deck replacement to an overlay.
ND	We haven't identified any.
NE	In general, the expected longevity of various preservation techniques and the comparative costs. Examples – paint systems and amount of coverage; just under deck joints, or entire girder. Timber pile wrapping and gouting; when to apply and how long should it last. Deck overlays; concrete vs asphalt. Nebraska is currently doing research on methods to repair timber piling, and looking at research on the longevity and associated costs of various bridge deck overlays.
SD	Reliable and accurate automated data collection for deck/slab conditions. This is mainly methods for measuring deck/slab delamination. GPR and Infrared have been tested and used with limited success. Any new research or improvements with these testing methods?
WI	Guide for cost effective actions and what type of applications to use them on.

APPENDIX D
Western Bridge Preservation Partnership Meeting
Roundtable Questions and Responses
Sacramento, CA
December 2010

1. What are your Bridge preservation activities?	
AK	Annual bridge preventive maintenance activities in the Northern and Central Regions using State forces. Typical activities included: concrete deck patching, install asphalt overlays, repair/replace bridge deck joints, repair/replace bridge railing, install timber running planks, repair damaged concrete and steel bridge members. State forces no longer perform painting activities due to environment and safety concerns. Painting program. Recent project to paint weathering steel bridges and developing project to paint bridges in remote locations. Cathodic protection (CP) program. Install CP systems on structures in marine environments. (Ketchikan Viaducts, Safety Sound in Nome) Deck rehabilitation and overlay. Strategies include concrete deck removal below the top rebar mat and replacing with microsilica modified concrete; One polyester overlay installed.
AZ	• Structural Repair • Deck Treatment • Bridge Joint Repair • Scour countermeasure
CA	The most common bridge preservation activities used by Caltrans include bridge deck crack sealing using methacrylate, polyester concrete deck overlays, regular joint seal replacement, and structural steel painting. Caltrans also employs regionally based crews that address concrete spalling, minor joint repairs, deck drain cleaning etc. that are all important to preserving the life of our bridges. Caltrans is currently leading a TRB Bridge Preservation Committee effort that will be looking to develop an action based listing of activities that fall into the categories of bridge operations, maintenance, preservation, rehabilitation, and improvement.
CO	The following are activity definitions for Region discretionary bridge maintenance funded by CDOT's maintenance program: deck repair, superstructure repair, painting, rail repair, bearing repair, substructure repair, approach slab repair and expansion joint. In addition to this CDOT has recently initiated a planned preventive maintenance program funded by CDOT's bridge program. The current activities are waterproofing bridge decks and repairing leaking expansion joints. We are considering adding the following activities: seal bare concrete decks, seal thin and rigid overlay concrete decks, clean and paint steel bridge elements, wash bearing

	seats and seal concrete in the splash zones.
HI	See attached program guidelines.
ID	<i>In Idaho we have a MOU with our FHWA Idaho Division that describes a number of activities regarding preventive bridge maintenance that we in essence consider bridge preservation activities. Most of these activities are done with contract construction forces, but some are done by in-house bridge maintenance crews. Activities include</i> <i>• Deck rehabilitation or repair including applying modified concrete deck overlays</i> <i>• Eliminating deck joints in old bridges</i> <i>• Repairing or installing new expansion dams</i> <i>• Joint resealing</i> <i>• Restoring or replacing bridge bearings</i> <i>• Repairing or replacing bridge approach slabs</i> <i>• Repairing bridge beam ends and beam bearing areas</i> <i>• Installation of scour countermeasures</i> <i>• Seismic Retrofit</i> <i>• Spot and Zone Painting</i> <i>• Substructure repairs</i> <i>• Cathodic protection systems for bridge decks, superstructure or substructure elements</i> <i>• Application of concrete sealers, coatings, and membranes for surface protection</i> <i>• Repair of collision damaged members</i>
MT	Maintaining and preserving joint, bearings and deck surface. Basically maintaining the “roof” of the house (bridge).
NV	Seismic retrofit, scour mitigation, major deck repair, deck overlay, deck replacement, structural strengthening, expansion joint replacement, concrete spall/crack repairs, bearing rehab or replacement, fatigue repairs or retrofits, recoating, bridge widening, bridge rail retrofits/repairs
NM	NMDOT’s primary preventative maintenance practices are polymer bridge deck overlays, deck sealing (healer sealers and methacrylates), concrete repair work and full depth expansion joint replacements. All of these are constructed using our “Statewide Bridge Repair Price Agreement”. Contract is strictly for labor. All materials are reimbursed at invoice price. This allows NMDOT to select materials which will be used. Multiple contractors are on each agreement. Problems do arise concerning warranties with polymer bridge deck overlays. Some contractors will use only certain products. In 2004 NMDOT decided to use federal BR funding targets for bridge repair. Since then the department has made significant progress in decreasing the number of structurally deficient bridges.

OR	Steel Bridge Painting; Placement of Cathodic Protection System on coast concrete structures; Strengthening bridge members for load capacity deficiencies; Seismic Retrofit; Scour Countermeasures; Monitoring and increasing Vertical Clearances on Freight Corridors; Bridge Rail Retrofits which include strengthening deck overhang / supports; Bridge Widening to address corridor functionality issues; Development of a Bridge Design Manual to make structures constructible, accessible, inspectable, and maintainable.
UT	Our preservation activities include variable deck treatments, sealing structural components in splash zones, approach slab jacking, modification/replacement of expansion joints, super/substructure repair, strengthening concrete bent caps, columns and girders with FRP wrap, and painting of steel structures.
WA	a. State maintenance crews do the following: 1) Deck Patching 2) Bridge Joint Repair 3) Bridge Structural Repairs 4) Steel Truss Bridge Washing 5) Bridge Deck and Drain Cleaning 6) Moveable/Floating Bridge Preventive Maintenance and Operations 7) Emergency Repairs 8) Paint the Two Tacoma Narrows Suspension Bridges 9) Service Navigation Lights b. Bridge Preservation funds contracted work, grouped into the following categories: 1) Painting 2) Deck Rehab/Replacement 3) Scour Repair 4) Seismic Retrofit 5) Miscellaneous Structures & Bridge Joint Repair 6) Major Structural Repairs 7) Moveable Structures 8) Bridge Rehab/Replacement
WY	Bridge preservation activities include bridge deck repair, bridge deck sealers, bridge deck overlays, superstructure painting, rail repair, substructure repair, approach slab repair.

2. How does your State identify bridge preservation needs? Please explain the process.	
AK	Bridge maintenance needs are identified during bridge inspections and by Region Maintenance personnel. Bridge preventive maintenance activities are identified by the Regions and submitted to Bridge Section for concurrence.

	Addressing bridge needs which are included within the limits of a roadway project (3R type projects).
AZ	ADOT prioritizes bridge repair projects based on the inspection recommendations. Bridge deck rehabilitation candidates are generated from: a. Routine Bridge Inspection; b. Bridge deck in-depth inspection; c. District input; d. Field Review.
CA	Bridge preservation needs, and other bridge needs, are primarily identified by routine bridge inspections. Work recommendations are made by engineers performing bridge inspections. These work recommendations are reviewed by Structure Maintenance staff that assembles them into fairly large projects that normally involve multiple bridges in a geographic area. The projects are designed by in-house staff and let out for construction. Bridge painting is managed separately from this process and some routine preservation activities are carried out by bridge crews.
CO	Region discretionary bridge maintenance is based on Pontis information for the above activities. For each activity a letter grade is assigned based on the quantity of the associated bridge components that are not in condition state 1. The planned preventive maintenance program is also based on Pontis information to identify bridge preservation needs. Reseal or Replace Bridge Deck Joints: <u>PPM10 – Clean and Paint Steel Bridge Elements (EA):</u> Applies to all of the element in Condition State 2, 3 and 4 for the following elements: - 147 - Steel - Cable not embedded in concrete (Coated) - 161 - Steel - Pin and Hanger Assembly - Painted - 202 - Steel - Column or Pile Extension - Painted The Pontis Bridge Inspection Coding Guide can be found at the following web site: http://www.coloradodot.info/library/bridge/inspection-code-guide .
HI	HDOT Bridge Design request candidate projects from Districts based on preliminary Pontis printout of recommended bridge MR&R work.
ID	<i>Bridge preservation needs are identified as work candidates in our Pontis Bridge Management System</i>
MT	Bridge preservation needs are identified by using the Pontis BMS. The needs are restricted to deck, joint, bearings and rail work. (keeping the roof in good shape)
NV	Preservation needs are initially identified during ongoing bridge inspections, as well as by identification and reporting by bridge owners and NDOT District maintenance personnel. Contracting needs are further identified, refined, and prioritized during the project scoping and preliminary design.
NM	Priority lists are generated from PONTIS. Each district (6) gets 6 lists; Interstates, US highways, NM Routes, local routes, culverts and scour projects. Lists are generated by state office from PONTIS based on NBI ratings and sufficiency ratings. State office personnel, district personnel and FHWA then meet and further prioritize lists based on engineering input. Lists are then used to update STIP. NMDOT targets bridges with condition rating “Fair” for minor rehabilitation and preservation projects. Bridges with condition rating “Good” are targeted for

	preservation projects, specifically deck overlay or deck sealing.
OR	Oregon's State Bridge Program identifies rehabilitation and replacement projects based on twelve need categories. Oregon also has a Major Bridge Maintenance Program and a Local Bridge Program. The Major Bridge Maintenance (MBM) Program is funded separately from routine Bridge Maintenance. Currently the MBM program projects are selected based on Inspector critical and urgent recommendations and District recommendations. The Local Bridge Program priorities (generally replacements) are selected based on a Technical Ranking System adopted for use of the local program only.
UT	Utah uses bridge inspection data to determine which bridges require which treatments at what time. Benefit-cost ratios assist in deciding the most efficient use of funds. We also work to integrate preservation work with roadway projects to ensure maximum efficiency of use of funds.
WA	a. Bridge Maintenance identifies bridge maintenance needs based on customer complaint, internal notice, or bridge structural repair list provided by Bridge Inspections. One region does annual bridge maintenance inspections of all their bridges. The other five regions are not funded to do this preservation work. b. Bridge Preservation funded contracts based on Bridge Management System needs. i. BMS data identifies and prioritizes need. ii. Preservation action defined and cost estimate assigned for budget.
WY	Bridge preservation/rehabilitation candidates are generated from a combination of routine bridge inspection, in-depth inspections, and district input.

3. How is your bridge preservation activities funded? i.e. do you have a dedicated fund for the program, or funded on as needed basis?	
AK	Annually use federal funds for eligible preventive maintenance activities. Bridge related activities must compete against roadway activities from a fixed amount of funding.
AZ	HBP funds are split as shown below: Local - 30% State - 70% The current total allocation: \$23M (approx) Bridge Rehabilitation & Replacement - \$12M Inspection & Repair – \$4.5 M Deck Rehabilitation - \$4.5M Scour Retrofit – \$2M Only Bridge Replacement and major rehabilitation is funded from Highway Bridge Program. The Deck rehabilitation, scour retrofit, inspection and repair were funded other federal funds.

CA	We have a dedicated fund for bridge preservation projects. Currently the fund is about 100 million per year. We also employ bridge crews and paint crews in our regional districts.
CO	10% of CDOT's bridge program funding is dedicated to planned preventive maintenance. A portion of the CDOT's maintenance budget is dedicated to Region discretionary bridge maintenance.
HI	Use HBP funds. One line item in STIP for Interstate viaduct deck repair work is recommended.
ID	Bridge Preservation is funded at \$10,000,000 in our STIP.
MT	Funding is through our Federal Aid Bridge Program. The monies are set aside by developing a fund plan and projecting the needs over the STIP time frame (next 5 years)
NV	Bridge preservation activities are typically state/local agency funded, and no dedicated funding source exists for State preservation activities. Seismic retrofit work is primarily funded with Federal HBR funds, while recently identified scour mitigation needs are anticipated to be partially funded with HBR funds. NDOT Districts each maintain their own budgets for bridge maintenance activities.
NM	Funding is allocated to districts. New Mexico is not a centralized state. District allocates funding as needed. Bridge priority lists are used by districts. Our main preventative practices are deck overlays and deck sealing. All districts allocate funds for this. NMDOT uses BR Funding for bridge preservation projects.
OR	With the exception of the Local Bridge Program, all ODOT bridge programs are funded based on allocations approved by the Oregon Transportation Commission. Generally the State Bridge Program projects meet the Highway Bridge Program eligibility restrictions. We have limited flexibility to use other federal fund sources. Oregon does not currently have a FHWA approved preventive maintenance program.
UT	Utah uses state funds to provide for preservation needs. This ties funding to the health of the economy; annual funding has ranged from \$1M to \$12M. Bridge engineers "sell" the idea of preservation to upper management and legislators.
WA	a. Six Region Administrators allocate a portion of the Region maintenance budget to address Bridge Maintenance needs. This is based on history, increase in inventory, and how the crews are doing to meet their performance goals. b. Bridge Preservation contract funding is submitted to and approved by State Legislature.
WY	No response.

4. Has your state established performance goals for your bridge program (goals and measures)? If so, a) What are your state goals and measures? b) How did you go about

establishing these measures?	
AK	Decrease the deck area of bridges classified by the FHWA as structurally deficient or functionally obsolete using a five year average. b) How did you go about establishing these measures? State metric established to match FHWA's metric used to monitor the State's performance.
AZ	a) The purpose of Bridge Inspection and Repair Program is to maintain state highway bridges so that the condition rating index exceeds 92.5%. b) How did you go about establishing these measures? Condition Rating Index is based on Deck (N58) , Superstructure (N59), Substructure (N60) condition ratings higher than 4. The bridge joints condition rating is an Arizona specific rating item not included in the FHWA condition rating guidelines.
CA	Caltrans uses four performance measures for bridges. For bridge maintenance and preservation work, we use a “backlog” measure that tracks the time period a maintenance or preservation action has been unaddressed. Typically, our expectation is that any maintenance or preservation action is addressed within two years of being identified. For risk mitigation projects (scour, seismic) and rehabilitation projects, we track the number of bridges that have these needs. Bridges with risk mitigation needs or rehabilitation needs are considered “distressed” and the total number of distressed bridges is reported regularly. At a network level, Caltrans uses the Bridge Health Index to capture the network picture of how we are doing. Caltrans also tracks and reports the number of structurally deficient bridges mainly because nationwide reports often use this measure. Caltrans does not make project related decisions based on the structurally deficient status of a bridge. b) How did you go about establishing these measures? <i>The bridge health index was developed in Caltrans to utilize the detailed element inspection information that was being collected and to develop a direct link between condition and asset value. The “backlog bridge” time frame was established based on reasonable project project delivery time frames. The “distressed bridge” measure is really just a count of the number of bridges with major needs, but is very effective at showing the overall performance of our rehabilitation programs.</i>
CO	The goal of the Region discretionary bridge maintenance program is to reach a letter grade of at least B, where an A represents bridge components in a Pontis condition state 1. The goal of the planned preventive maintenance is to reduce the number of leaking bridge expansion devices and unsealed bridge decks. We are in the process of determining goals for the other planned preventive maintenance activities. In regards to the CDOT bridge program, CDOTs goal is to eliminate all poor bridges based on the sufficiency ratings and select list status.
HI	<i>Not aware of HDOT goals specifically established for bridge preservation.</i>
ID	<i>ITD has established the goal of having 80% of our bridges on the state highway system as being in “good condition”. For the purposes of this performance</i>

	<i>measure we have defined “good” as an NBI rating of Deck, Super, Sub of 6 or better. Currently we are at 71% in good condition as measure by square foot area.</i> b) How did you go about establishing these measures? <i>Benchmarked surrounding states. Fiscally realistic.</i>
MT	a) What are your state goals and measures? Yes- they were established during the review and development of the white papers for FHWA. The measure is a modified HI that includes smart flags. b) How did you go about establishing these measures? By developing a standard that uses the known data from the inspection process.
NV	Yes. a) The Department’s Performance Measures include a goal for the reduction of the number of structurally deficient and functionally obsolete structures eligible for federal funding. b) This was a cooperative effort between NDOT’s Structures Division administration, Performance Analysis Group, and Director’s Office. This goal is one item in the Department’s Performance Measure plan reported annually to the Legislature.
NM	a) Goals – less than 5% of bridges (and sqft of bridges) being structurally deficient. Measures – Number of structurally deficient bridges and square feet of structurally deficient bridges. b) How did you go about establishing these measures? Common sense (from NMDOT Deputy Chief Engineer). Data has been tracked quarterly since the first quarter of 2002. This measure has been extremely beneficial to the department. It soon became apparent that the trend needed to be reversed. In 2004 NMDOT decided and got permission from FHWA to use federal BR funding targets for bridge preventative maintenance projects and minor rehabilitation projects. NMDOT has been succesful in reversing the trend and are now less than 10% of NMDOT owned structures being Structurally deficient (from a high of 18%).

	STATEWIDE- STATE OWNED STRUCTURALLY DEFICIENT BRIDGES BRIDGES WITH A CONDITION RATING OF 4 AND BELOW <table><caption>Estimated data for Statewide- State Owned Structurally Deficient Bridges</caption><thead><tr><th>Year</th><th>Q1</th><th>Q2</th><th>Q3</th><th>Q4</th></tr></thead><tbody><tr><td>2002</td><td>240</td><td>235</td><td>245</td><td>245</td></tr><tr><td>2003</td><td>250</td><td>255</td><td>255</td><td>260</td></tr><tr><td>2004</td><td>265</td><td>270</td><td>275</td><td>280</td></tr><tr><td>2005</td><td>275</td><td>275</td><td>270</td><td>260</td></tr><tr><td>2006</td><td>255</td><td>255</td><td>250</td><td>245</td></tr><tr><td>2007</td><td>235</td><td>235</td><td>230</td><td>225</td></tr><tr><td>2008</td><td>215</td><td>215</td><td>210</td><td>205</td></tr><tr><td>2009</td><td>195</td><td>185</td><td>180</td><td>175</td></tr><tr><td>2010</td><td>176</td><td></td><td></td><td></td></tr></tbody></table> QUARTER	Year	Q1	Q2	Q3	Q4	2002	240	235	245	245	2003	250	255	255	260	2004	265	270	275	280	2005	275	275	270	260	2006	255	255	250	245	2007	235	235	230	225	2008	215	215	210	205	2009	195	185	180	175	2010	176			
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OR	a) ODOT’s goal is to manage overall bridge conditions to achieve a certain level of non-distressed bridges based on route hierarchy. A higher percentage of bridges with “not distressed” ratings are desired with priority given to NHS routes. Bridges “not distressed” means that the bridges have not been rated as Structurally Deficient based on criteria established by the Federal Highway Administration (FHWA), or have other needs defined by ODOT. A distressed bridge is defined as a bridge with an identified freight mobility, deterioration, safety or serviceability need. Yearly we re-examine our bridge conditions and compare our results with those in the rest of the nation. Current bridge condition goals are: NHS – 90% not distressed, and Non-NHS Routes – 85% not distressed. These goals were set in recognition of the anticipated result of addressing all structural deficiencies, while leaving many lower priority conditions “as is”. b) The current bridge performance measure was adopted after recognizing that strict adherence to the FHWA measures of Structurally Deficient and Functionally Obsolete were not working for us. Even after a period of high investment levels in state bridges, bridge conditions were not much improved. Although we have had limited experience with it, the new measure appears to correspond better to Oregon’s bridge program by reflecting improved conditions for the types of bridge needs our projects address.																																																		
UT	a) What are your state goals and measures? Utah measures performance by bridge ratings and sufficiency rating. Utah has reduced the percentage of “poor” bridges from 10% to 2%, and aims to maintain a level of 2% or less of structurally deficient bridges.																																																		

	b) How did you go about establishing these measures? These measures and goals were established by correspondence between Department upper management and bridge engineers. These needs are quantified and communicated using the “Critical Bridge List,” which is updated quarterly. The list is prioritized first by risk management needs (criticality), and then by importance.
WA	3. a) What are your state goals and measures? a. Bridge Maintenance Goals/Measurements: 7) Unrepaired Deck Spalling (asphalt & concrete): Goal = B- where B = 0.0026% to 0.015% 1. Annual measurement deck BMS by percentage of Region spalling divided by the Region deck area (SF). 8) Bridge Joint Repair: Annual program being developed 9) Bridge Structural Repairs: Goal = C where C = 79% – 65%, Structural Bridge Repairs are posted by Bridge Inspection, Documented when completed by Maintenance, and verified by Bridge Inspection. 1. Annual measurement is percentage of completed Priority 1 Bridge Structural Repairs divided by the total number repairs posted for the period. 10) Bridge Structural Washing: Annual program being developed, first part of this program will address flushing of steel truss bridges. Rating will be by percent of steel truss bridges washed annually. 11) Bridge Deck Cleaning: Goal = C 1. Annual sum measurement of three items: Deck Sand/Gravel Removal; Cleaning Drains; Graffiti Removal 12) Moveable/Floating Bridge Operations: Goal = B+ (B = 2.1-5%) 1. Annual measurement of delayed opening/closing due to mechanical malfunction. 2. Second measurement is being developed that will rate the crew by percent of identified preventive maintenance work accomplished. b. Bridge Preservation GASB measurement structural condition (Good, Fair, Poor) using NBI superstructure and substructure condition. WSDOT’s policy is to maintain 95 percent of its bridges at a structural condition of at least fair, where fair condition is NBI condition of 6 or better. NBI deck condition was excluded in this definition due to unreliable data. b) How did you go about establishing these measures? b. Maintenance measurement was initially a “Level of Service” or “Performance Measurement” tool which has changed to a funding allocation tool. c. State reporting processes adopted NBI data as a nationally accepted

	system for reporting Bridge Condition Measurements prior to Governmental Accounting Standards Board (GASB) requirements.
WY	Currently, we use the number of deficient bridges on the select list as a measure of current bridge condition. We are proposing to move to an Excellent to Poor rating index for bridges to parallel our Pavement and Safety Indexes.

5. a) What are some specific examples of successful preservation strategies that you have employed? b) What didn't work well? c) What do you think should be the future direction of bridge preservation?	
AK	Installation of cathodic protection (CP) systems on Ketchikan Viaducts. Use of microsilica modified concrete (MMC) in deck rehabilitation. b) What didn't work well? Galvanic CP systems did not provide the desired level of protection and are being converted to active systems. MMC is more difficult to correctly place. Cracks must be resealed. c) What do you think should be the future direction of bridge preservation? Allow preventive maintenance activities to be completed using Federal Bridge Funds.
AZ	• Milling & Microsilica • Seal deck with Methacrylate b) What didn't work well? • Placing Polymer overlay over bridge deck provided mixed results. • The biggest challenge in our program are: - Turn over - Need annual training - Hiring experienced Professional - Funding c) What do you think should be the future direction of bridge preservation? To become proactive rather than reactive to bridge preservation needs.
CA	a. Bridge deck cracking, wearing surfaces, joints and painting represent the vast majority of all preservation dollars spent. For the bridge deck cracking and wearing surface treatments, Caltrans is currently conducting research that will correlate field observed conditions to a "life curve" of the deck. This research will define when it is most effective to seal cracks, how long we can expect the benefits of the sealing to last, which overlays are most effective and at what point along the deterioration curve for the deck is it best to apply them. For deck performance, we have also looked at our standard deck designs and construction specifications and standards to try and get the most durable deck designed and constructed to avoid the need for preservation in the early years of life. Caltrans is also fairly

	aggressive with our structural steel painting program. Our goal is to keep our protective coating systems in good condition to avoid section loss in our members. Painting activities are conducted by Caltrans painting crews and by contract. b. Caltrans has installed a couple of systems designed to keep floating debris (logs etc.) from accumulating on the noses of our columns and pier walls. These systems have not performed well. c. Bridge preservation falls into two general categories in my opinion; site specific needs that are related to material, design or use issues and scheduled maintenance. Using a car as an example, you can schedule oil changes, but you wouldn't likely replace your battery unless it dies. The key to sound preservation in my opinion is to have programs that are set up to address the items that can be scheduled such as joint replacement and utilize your inspection information to validate the need for the work as the scheduled date approaches. For site specific concerns, quality inspection information (testing, photos, well written reports, etc) can often times provide insight into the cause of these problems and point to the appropriate solutions. I also see an increased use of monitoring system where they make sense and to provide real time data. The monitoring arena is improving exponentially and will become a more significant feeder into preservation decision in the future. Deterioration forecasting and economic analysis also needs to be better integrated into preservation business practices.
CO	a) Waterproofing membrane and regular expansion joint maintenance and repair. b) What didn't work well? Quick deck patching. c) What do you think should be the future direction of bridge preservation? Washing and sealing structure surfaces exposed to deicing chemicals.
HI	Have various projects for viaduct full-depth deck repairs ongoing using rapid set concrete.
ID	<i>See above</i>
MT	The sealing and filling program has reduced the number of deck replacements over that last several years. Timing seems to be the issue, especially with environmental process constraints. The future should be reviewing and streamlining the process from conception to contract.
NV	a) Ensuring consistent/quality bridge condition data as recorded in bridge inspection reports, and verified through QC/QA audit processes. Development of in-house fatigue repair program, for small-scale fatigue crack stabilization repairs, conducted even during regularly scheduled bridge inspections. Improved communication/coordination with District Bridge Maintenance staff.

	b) Mixed success with asphaltic plug expansion joints. Significant incidence of early joint de-bonding and failure, state-wide. Poor success with elastomeric concrete used as joint headers with embedded joint restrainers. Widespread incidence of early de-bonding and material failure, state-wide. c) “Preservation” should be defined/recognized as any action that extends bridge life, whether proactive or reactive in nature, and allow any such activities to be completed using Federal funds. Further, consideration should be given towards the segregation of Federal preservation funding from bridge rehab and replacement funding, such that these activities do not have to compete one against the other.
NM	(a) NMDOT’s primary preventative maintenance practices are polymer bridge deck overlays, deck sealing (healer sealers and methacrylates), concrete repair work and full depth expansion joint replacements. All of these are constructed using our “Statewide Bridge Repair Contract”. Contract is strictly for labor. All materials are reimbursed at invoice price. This allows NMDOT to select materials which will be used. Problems do arise concerning warranties with polymer bridge deck overlays. Some contractors will use only certain products. In 2004 NMDOT decided to use federal BR funding targets for bridge repair. Since then the department has made significant progress in decreasing the number of structurally deficient bridges. (b) Pourable, compression and elastomeric bridge joints have not worked in New Mexico. (c) On a national level more funding should be allocated to bridge preservation. However, how this money is spent should be left to individual states.
OR	<u>Group Goals - What we want to achieve</u> Bridge Operations are guided by the following goals which are accomplished by hosting the State of Oregon and the Pacific NW Bridge Maintenance Conferences. : • Promote the merits of performing bridge preservation activities • Promote timely bridge preservation activities that will provide the traveling public with improved safety, mobility, reduced congestion, smoother and longer lasting bridges. • Promote improved labor force efficiency gains by sharing innovative repair techniques, productivity improvements, best practices, tricks of the trade, and lessons learned. • Promote improved equipment productivity gains by sharing innovative usage of certain types of equipment. • Promote improved Material Usage by sharing successful application Lessons Learned and promoting real life application research projects.

- Promote improved Maintainability of our bridges by sharing bridge design details that will provide the following:
 - bridge designer feedback on what details function well,
 - sharing innovative designed bridge repair details / schemes,
 - bridge designer feedback on which bridge detail are easy to maintain,
 - use or re-use of Salvaged Materials,
 - Design bridges with clearances to eliminate traffic impacts
 - Design bridge foundation to eliminate scour and seismic deficiencies
 - Eliminating of deck joints,
 - Elimination of urban artists and homeless condos,
 - Placement of approach slabs and associated details,
 - Providing jacking scheme for bearing maintenance / repairs
 - Providing adequate space for easy access
 - Providing Fall Restraint Systems or measures
- Promote improved Inspectability of our bridges by:
 - Elimination of Confined Spaces,
 - Elimination of Fatigue Sensitive Details, and
 - Providing easy access and installation of Fall Restraint measures.
- Promote pooling of group resources to further identified Research Efforts. Provide a central point of collected information (library of information) where entities can obtain a place to start rather than re-inventing the wheel.
- Promote a paradigm shift that will embody expending the first available dollars on Bridge Preservation Activity, rather than last.

Key Benefits Accrued from Agency Participation

Active participation in group meetings / activities, the agency will obtain the following:

- Operational In-sight – Obtain first hand knowledge on how bridge maintenance / bridge preservation issues are being couched in other agencies. Insight into the development and adoption of achievable and measurable bridge maintenance program objectives.
- Planning with an Eye on the Future - Determine how other agencies are planning now to address huge budgetary shortfalls in the future.
- Quality Decisions – Agency participation maximizes the knowledge base by providing a sounding board forum to discuss bridge

	maintenance issues. • Operational Efficiency - This group will address bridge preservation terminology issues, lessons learned, set directions on how bridge preservation programs should be applied, and how their effectiveness should be measured. • Strategizing - Opportunity to help define bridge preservation strategies which can be used to develop a network level bridge maintenance program and obtain example used by other States / Agencies. • Learn how other agencies are querying and using bridge inspection data, to define the current condition of each bridge and match that condition with the most appropriate strategy. • Considered Trade-offs - To ensure existing facilities are properly maintained to protect the original capital investment and to ensure a safe facility is available to the public, the Bridge maintenance managers are required to make serious trade-offs. Participation provides an opportunity for the agency to obtain insight / lessons learned on how best to navigate through these issues. • Management Practices - Determine how other agencies are directing their attention to preserving the structures in their inventory through the use of lessons learned and best management practices. • Balanced Bridge Maintenance Program - Help define what exactly a well Balanced Bridge Maintenance Program is and determine which preventive maintenance activities, will prolong the life of a bridge inventory and reduce the need for other, more costly, maintenance activities in the future. • Different Element Deficiencies do not have same effect on the service life of a bridge, the safety of the general public, or the cost of maintenance, repair, or rehabilitation. Participation will provide an opportunity to gain more insight into those differences so that better managerial decisions can be made. • Determine what level of service bridge maintenance response deficiency threshold triggers that have been successfully implemented by other agencies.
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	- As a group, brainstorm the development of realistic, well defined business operational practices, that will promote the preservation of our bridges: - Cleaning gutters, drains, joints and tunnels twice a year – once after the leave fall and once after winter sanding operations. - Zone paint critical structural areas when the steel element CS4 > 0 like FC members, bearing areas, connections, beam ends. - Where possible remove or mitigate all fatigue category d, e, or e' details. - Pull drift off of bridge bents as soon as possible - Participation in the group activities will foster a work together climate on the art of preserving our structures, rather than working or making decisions in a silo or vacuum.
UT	The most successful strategy has involved lobbying for funds, and then spending them in the same fiscal year. This has provided continuous funding which has allowed for flexibility in the options available for preservation. During better economic times, we receive more funding, and are able to further reduce the percentage of bridges on the Critical Bridge List. b) What didn't work well? Placing polymer overlays on bridges older than 10 years proved to give variable results, not all of which were positive (debonding and deck spalling occurred after 5+ years). c) What do you think should be the future direction of bridge preservation? The future of bridge preservation in Utah should involve engaging in preservation activities as early as possible, especially with the increase in new infrastructure. Deck treatments are now being applied to most new construction prior opening them to traffic.
WA	a. Quality data in Bridge Management System. Difficult to confirm or deny long term success without this tool. b. Paint structures early before full removal is required. c. Concrete overlay preparation with hydromilling vs. planing d. Proactive management of bridge asphalt by Bridge Management e. Involvement of maintenance in new bridge construction from initial scope of the project through final completion of the construction. This produces a better product that is easier to maintain. b) What didn't work well? d. Asphalt management on the bridge deck by pavement managers. e. Lack of attention to construction specifications. f. Moving the development and permitting of scour jobs from the regions to headquarters did not improve the time it takes to get these permitted. c) What do you think should be the future direction of bridge preservation? c. Focus on improved quality and longevity of construction product. d. The bridge maintenance crews are moving from a reactive maintenance program to a more balanced program that will

	emphasize preventive maintenance. That will emphasize keeping good bridges in good condition. e. WSDOT should implement spot painting of structures by maintenance.
WY	5a) Bridge deck sealers, micro silica deck overlays 5b) What didn't work well? Methyl methacrylate deck overlays in recent years have poor performance. 5c) What do you think should be the future direction of bridge preservation? To provide guidance to recognize performance indicators to become proactive rather than reactive to bridge preservation needs.

6. How does the bridge preservation needs get prioritized against competing major rehabilitation and replacement needs?	
AK	Planning establishes the amount of funding made available to Regions for preventive maintenance activities. The Regions then propose preventive maintenance programs.
AZ	a. Our funding is divided into half between Bridge preservation and Bridge rehabilitation or replacement. This is exchangeable. b. Bridge Preservation prioritizes projects based on the inspection recommendation and input from the district.
CA	<i>The preservation funds and the rehabilitation funds are managed by one person within Caltrans. This bridge program manager has the means to move funding between preservation and rehabilitation programs to best meet the overall needs of the bridges in California. In effect these needs do not compete against each other once the funding level has been established for each. The respective funding levels are established by evaluating the past performance of the programs and forecasting future needs.</i>
CO	10% of CDOT's bridge program funding is earmarked for planned preventive maintenance.
HI	<i>HBP funding is limited so preservation funding may be constrained to one project per year.</i>
ID	<i>We use our BMS to determine highest benefit in an unconstrained budget, factoring in other things like route, age, ADT, and management consensus.</i>
MT	The process for preservation is established first then other capital programs compete after that.
NV	Preservation needs are typically state-funded, and prioritized based upon urgency (degree of threat to motorist safety), and also ability to be executed by State forces, or incorporated into other, planned or ongoing construction projects, or as stand-alone contracts. Major rehabilitation and replacement needs are programmed within NDOT's Bridge Work Program, and this information is included in the

	STIP.
NM	New Mexico has seen the benefits of preventative maintenance and all 6 Districts have bought into allocating funds for preservation. Annual average precipitation in most parts of New Mexico is below 10 inches per year. Deck sealing and deck overlays have proven to extend the service life of our structures. Our Districts would overlay or seal every deck if the funds were available.
OR	Needs are ranked by type, but bridge projects are selected on the basis on many factors including safety, urgency, timing, work load balancing, route hierarchy, and deficiency status.
UT	Preservation needs are prioritized as highly as possible, and receive great support from upper management. Major rehabilitation or replacements are typically funded from different sources.
WA	a. Region Administrators historical precedence and preference. b. Bridge Preservation needs are separated into eight distinct groups in order to allocate funding appropriate to the need, see 1B. For example, painting will never be funded when competing against structural repairs; therefore, painting is separate and funded based on the need to paint steel structures.
WY	No response.

7. How does your state prioritize the bridge needs in relation to other assets, such as pavement, roadside, etc.?	
AK	Statewide Planning prioritizes the majority of bridge activities in the Statewide Transportation Improvement Program (STIP). STIP approved for 2010 to 2013 contained about twice as much major bridge work as there are BR funds available. This was a direct effort to reduce the number of bridges with structural or functional issues. There have also been considerable state funds applied to the more urgent bridge needs in the past 3 years. Other bridge projects compete based on the STIP evaluation criteria.
AZ	Our funds are allotted independently for each category.
CA	Caltrans currently uses a “needs based” approach coupled with priorities established by our Transportation Commission. The priorities were established through a process that took into consideration the various laws and mandates we operate under plus the operational and condition needs of the system. Caltrans is in the process of a formal implementation of asset management. The framework that Caltrans is proposing would utilize multi-objective optimization to rank all project regardless of funding source. Under the proposed approach, the projects will compete on their own merits regardless of the asset or assets that are being worked on. This multi-objective framework will provide incentive for projects to work on multiple assets within a defined corridor limit.

CO	This is done at the administrative level with the Transportation Commission utilizing projected future condition information for the different assets. The Department has been working on a application that integrates condition information from different asset management models and reports future condition tradeoffs for different funding scenarios.
HI	<i>In recent years, major bypass realignments have new bridges included in projects.</i>
ID	<i>Management set Bridge Preservation Funding at \$10,000,000 in recognition of Performance Goals</i>
MT	They compete on the needs of the bridge project or on the combined disciplined project.
NV	Bridge preservation needs have historically been incorporated into planned 3R projects to the maximum extent possible. NDOT Districts also establish annual budgets for reactive and routine bridge maintenance.
NM	<i>Each district in New Mexico has set up separate programs which compete for funding at the district level. Our established measures have been beneficial in promoting funding for the bridge program. Graphing number (or percent) of structurally deficient bridges for each district has ensured that all districts see where they are at compared to other districts. Funding targets are set up for each funding program. Districts are allowed to set up their programs and stay within funding target parameters.</i>
OR	<i>These trade-off decisions are made by the Oregon Transportation Commission and are reflected in program allocation levels.</i>
UT	<i>Utah uses an integrated approach to asset management, balancing the needs of all assets together; bridge and roadway needs are typically conjoined. Bridge data in PONTIS is used as part of a broader-spectrum analysis of assets and needs.</i>
WA	a. Region Administrators use past history, change in inventory, and Maintenance Accountability Process (MAP) bridge scores to determine bridge maintenance funding in each Region. These do compete with other assets, but bridge work is a top priority and receives additional funding as needed and lower priority work may be cut. b. Bridge Preservation competes directly with pavement management, safety, and roadway improvements.
WY	Currently, most bridge preservation/rehabilitation projects are introduced in the State Transportation Improvement Program by District personnel and are based pavement deficiencies. The Districts are recognizing the need for bridge preservation/rehabilitation and are beginning to add district wide bridge preservation/rehabilitation projects in the STIP. Candidate work lists are provided to the Districts identifying deficient elements.

8. How do you capture/assess work accomplishment?

AK	Bridge Preventive Maintenance: The Bridge Crew Foreman develops and sends to Bridge Section a report documenting work completed and costs. Notification of completed work is included in Pontis Notes and inspector is asked to verify that the work is completed and comment on work quality.
AZ	After completion of the project, accomplishment is assessed through initial bridge inspection and Bridge database is updated accordingly.
CA	All work is tracked by bridge from the identification of the need to completion of construction. Work that is placed in contracts is related to the assigned contract to prevent the work from being assigned to a crew or another project. The work assigned to projects is managed as a collection of activities that have a single project schedule and status. Upon completion of a project all activities are tagged as complete. The accomplishment of the work is filed verified during the subsequent bridge inspection.
CO	This will be captured and assessed in the routine bridge inspection.
HI	I believe maintenance work is tracked by their bridge work code accounting system but not sure whether a formal assessment of work is done.
ID	<i>Through Performance Goal reporting</i>
MT	With the bridge management system and program management system
NV	Each District tracks maintenance activities within a Maintenance Management System. District Bridge Maintenance Crews often report routine maintenance and contract preservation activities back to Structures Division, although this does not necessarily occur on a consistent basis, statewide.
NM	NMDOT measures and track number of structurally deficient bridges and square feet of structurally deficient bridges quarterly. A report is sent to each district every quarter.
OR	Closing completed projects (financial record-keeping). Condition improvement, if any, is captured by the regular inspection cycle.
UT	Accomplishment is assessed through inspections of completed projects, and all preservation activities are recorded in the bridge database.
WA	a. Structural Bridge Repairs are posted by Bridge Inspection, Documented when completed by Maintenance, and verified by Bridge Inspection. b. Bridge Deck BMS provides an accurate history of total spalling repaired for each bridge and the associated cost in today's dollars. c. Bridge Deck Spalling is measured and graded annually by each Region.
WY	The bridge elements are updated immediately following completion of the work and the bridge index is recalculated and compared to the previous index to determine success of the repair strategy.

9. What research needs do you believe is needed in the area of bridge preservation?

AK	Overcoat paint systems requiring minimal paint removal and surface preparation. Identifying a lightweight wearing surface on Yukon River Bridge? The orthotropic steel plate deck has bolted connections projecting approximately 2 inches above the deck and the bridge was designed for 2 inches of wearing surface. Currently the bridge has a timber wearing surface which requires a high level of maintenance/rehabilitation due to the steep grade and high number of trucks using chains.
AZ	- Deck repair - Bridge Joint repair
CA	Primary research needs to be in the area of bridge decks. The majority of our preservation money is spent on bridge decks. There are a number of things that need to be examined form design construction and maintenance of bridge decks. See items 1 and 4 above.
CO	We need research to find ways to protect our bridges, steel and concrete, against the effects of deicing solutions.
HI	- Deck repair - Bridge Joint repair
ID	Primary research needs to be in the area of bridge decks. The majority of our preservation money is spent on bridge decks. There are a number of things that need to be examined form design construction and maintenance of bridge decks. See items 1 and 4 above.
MT	We need research to find ways to protect our bridges, steel and concrete, against the effects of deicing solutions.
NV	Research leading to the development of deterioration models for differing environmental conditions that can be utilized with a higher degree of accuracy/reliability than those currently being proposed. Additional research on long-term bridge performance.
NM	There is a lot of research that has been completed that has not trickled down to the end users. FHWA has talked about gathering some of this research and placing it in an easy to access format or website. Research is of lesser value if it is not applied by those making decisions.
OR	Methods for estimating remaining service life of bridges by structure type. Also, a recommended program of maintenance and the recommended timing of these maintenance activities for the expected service life of bridge - by structure type in order to maximize the service life and cost-effectiveness of expenditures.
UT	Research on integrating deck treatments with pavement rehabilitation treatment cycles appears to be the most useful area of study. Evaluation of the performance of different materials is also helpful.
WA	a. Focus on improved quality and longevity of construction. b. Life expectancy of different joint types. What increase in life can be expected

	with the use of Bridge Preservation Strategies?
WY	Bridge deck repair

10. Is the majority of your bridge maintenance work accomplished by contract or state forces?	
AK	State forces.
AZ	- By Contractor
CA	Caltrans employs crews that work on bridge (paint and bridge) that accomplish about 10% of the annual accomplishments, with about 90% being accomplished by contracts.
CO	Typical maintenance is performed by our region bridge maintenance forces. Complicated work is performed by contractors.
HI	State forces
ID	Contract
MT	Reactionary maintenance is predominantly done with state forces. Preservation is done by contract.
NV	For state-owned assets, the majority of smaller and simpler maintenance tasks (spall repair, crack sealing, spot-painting and graffiti eradication, small erosion repairs, joint/drain cleaning, simple joint replacements) are accomplished using state forces, while the nearly all of the more costly/complicated/equipment-intensive work is contracted.
NM	Contract. Approximately 80% of all maintenance and preservation work is done using Price Agreements.
OR	State forces.
UT	The majority of bridge maintenance work is currently handled by contract.
WA	a. Fiscal Year 2010, (July 2009 – June 2010) - Total State Maintenance budget of \$11 million which pays for 90% of the total annual man hours of bridge preservation work completed. b. Year 2010 – Total State Bridge Preservation contract funding of \$56 million which pays of the other 10% of the total annual man hours of bridge preservation work completed. c. Ordinary maintenance is not contracted out. Some work is done by either State Forces or goes to contract. Maintenance will patch decks to maintain them until a total deck rehabilitation contract is let. Expansion joints may be replaced either by State Forces or may go to contract. This depends on the complexity of the joint and if enough work is available in an area to make a viable contract. This also goes for structural repairs.

WY	Deck patching and rail repair are the major items typically performed by State forces. All other work is contracted out.
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11. Approximately what percent of your maintenance expenditures are for reactive or corrective maintenance versus cyclic or preventive maintenance activities?	
AK	Approximately 90% are reactive.
AZ	- 90 / 10
CA	Approximately 70% of our expenditure are for cyclical preservation activities. These activities are not “scheduled” in time; rather they rely on feedback from inspection to trigger the timing. The reaming 30% would be reaction to specific deterioration or damage on the bridges.
CO	10% of the CDOT bridge program goes to reactive or corrective maintenance (Essential Repairs) and 10% of the CDOT bridge program goes to planned preventive maintenance.
HI	Will request % from HDOT.
ID	<i>Good question</i>
MT	100% of the budget for “maintenance” is for reactive. There are some cyclic activities, but it is very small percentage of the budget.
NV	Corrective bridge maintenance costs constitute about 75% of NDOT’s approximate \$2.2 million total, annual expenditures for corrective and preventive maintenance. Note that some work items, such as a deck overlay for example, could be considered as either corrective or preventive in nature. Perhaps it is most appropriate to simply consider both reactive and proactive actions as “preservative”.
NM	50% proactive (deck overlays, deck sealers, expansion joint replacement, paint) 50% reactive (deck repair, substructure repair, bearing repair/replacement, girder end repair, bridge rail repair)
OR	Most of the Bridge Maintenance funds are spent on reactive or corrective maintenance. A small amount is spent on cyclic activities. In the MBM Program, a small amount is spent on reactive or corrective maintenance. The major portion of MBM is spent on preventive maintenance activities.
UT	On average, no more than 15% of Utah’s bridge maintenance expenditures go towards reactive or corrective maintenance (e.g. emergency shoring, blow-through repairs, girder collision repair/replacement, and pin and hanger replacement).
WA	Maintenance work is almost exclusively reactive or corrective maintenance for 3400+ fixed bridges. For about 20 movable bridges maintenance work follows

	maintenance instructions provided at design is cyclic and preventive.
WY	Approximately 90 percent

12. What barriers does your State have regarding the use of new bridge preservation products?	
AK	Unavailability of Federal Bridge Funds for maintenance activities. Institutional. Conservative approach taken. Climatic. Need to focus on products suitable for cold regions. Difficult logistics. Many bridges accessible only by seasonal barge and/or air access.
AZ	- Need performance specification on new products. - Historical Performance - Due to the exclusive use of FA funding proprietary product are difficult to acquire.
CA	<i>The primary barrier is limited resources to evaluate new products</i>
CO	Generally the Department is very open to and interested in products that cost effectively improve bridge preservation activities.
HI	<i>HIDOT does not have a QPL.</i>
ID	<i>We would like to know proven effectiveness and years of bridge life added by various products.</i>
MT	The biggest barrier is the lack of a QPL for products. There is a lack of support for product that do not have a proven track record in-state or in neighboring states. With limited funding, we do not have funding for experimentation.
NV	The myriad of products that are being proposed; very time consuming to investigate the suitability of the products; references from other DOT usage/evaluation not always available or provided. Often times, field trial installation is deemed to be the best method of evaluation, which significantly extends the evaluation period.
NM	No response to this question.
OR	a. Bridge Maintenance Crews in the State of Oregon are not restricted from using only products specified in the “ODOT Qualified Product List (QPL)”. In fact, we tend to use bridge maintenance as the testing ground for our product approval process. However, they are charged with the responsibility of researching each product and talking it over with the material experts within ODOT to assure material compatibility, as well as, choosing wisely to avoid fixing a problem twice.

	b. Construction projects (major repairs, rehabilitation, and replacements) that are contracted out are required to only use products listed on the QPL. If the project designer or contractor wishes to use some other product, they have to file a design deviation. All design deviations are reviewed and approved before use, by the Bridge Design Standards and Materials Sections. The only barrier here resides in the time it takes for a product to run the gamut to obtain usage approval or go through the design deviation approval process.
UT	The primary barrier that Utah has is the New Products Evaluation Panel. However, quality products, fair prices, adherence to specs, long term track records, and good customer service have allowed new bridge preservation products to be used while a formal evaluation is still being conducted.
WA	a. Washington does not have maintenance restrictions for use of products. They choose wisely to avoid fixing a problem twice. Maintenance crews use the QPL as a reference but are not bound by it. They can try any products to test them. b. Bridge preservation and rehabilitation by contract has design barriers such as a Qualified Products List and historical performance of the product. Vendors have to gain design approval for their product and if necessary get a specification change for their product to be used in construction.
WY	Resources are limited to evaluate new products.