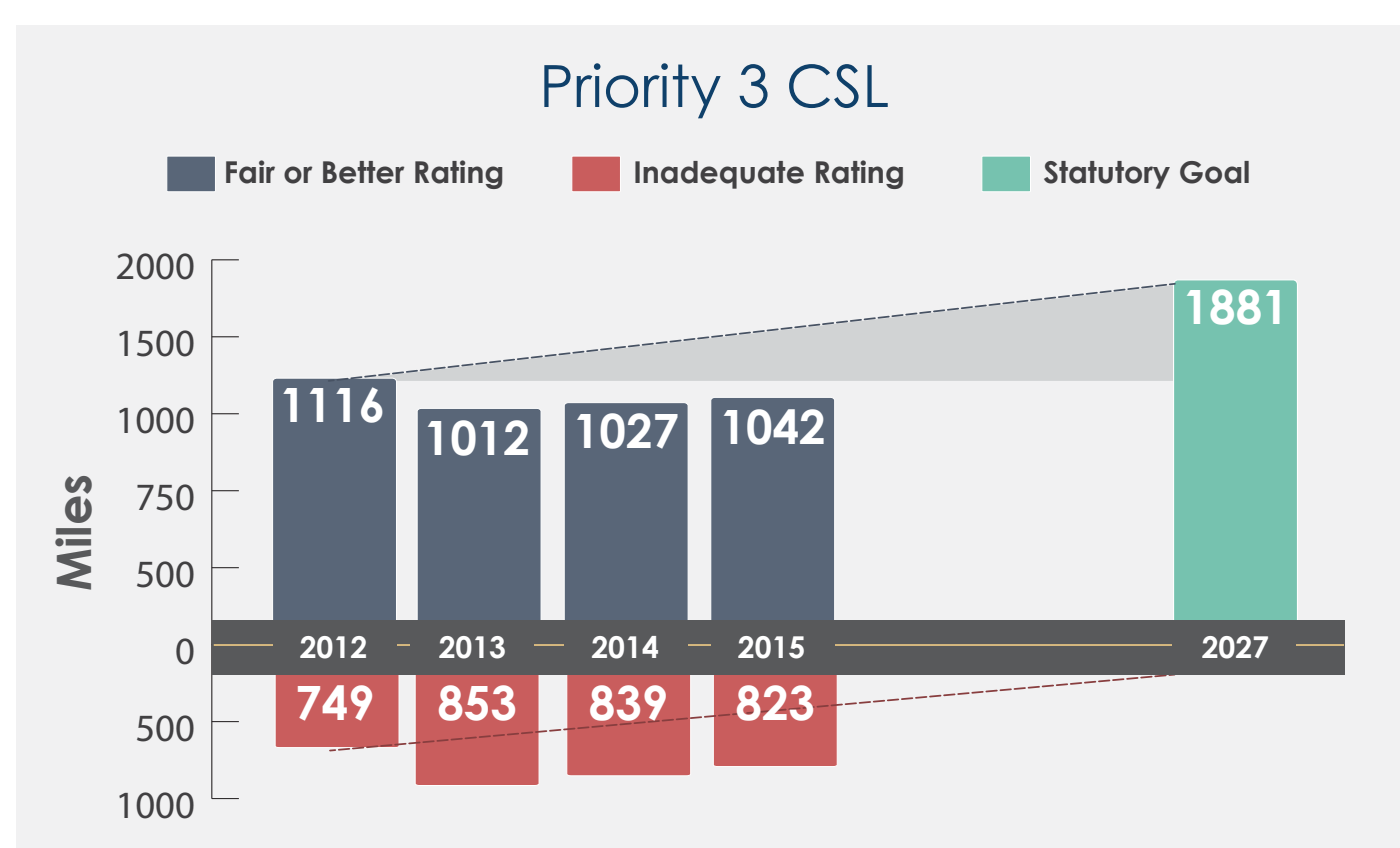
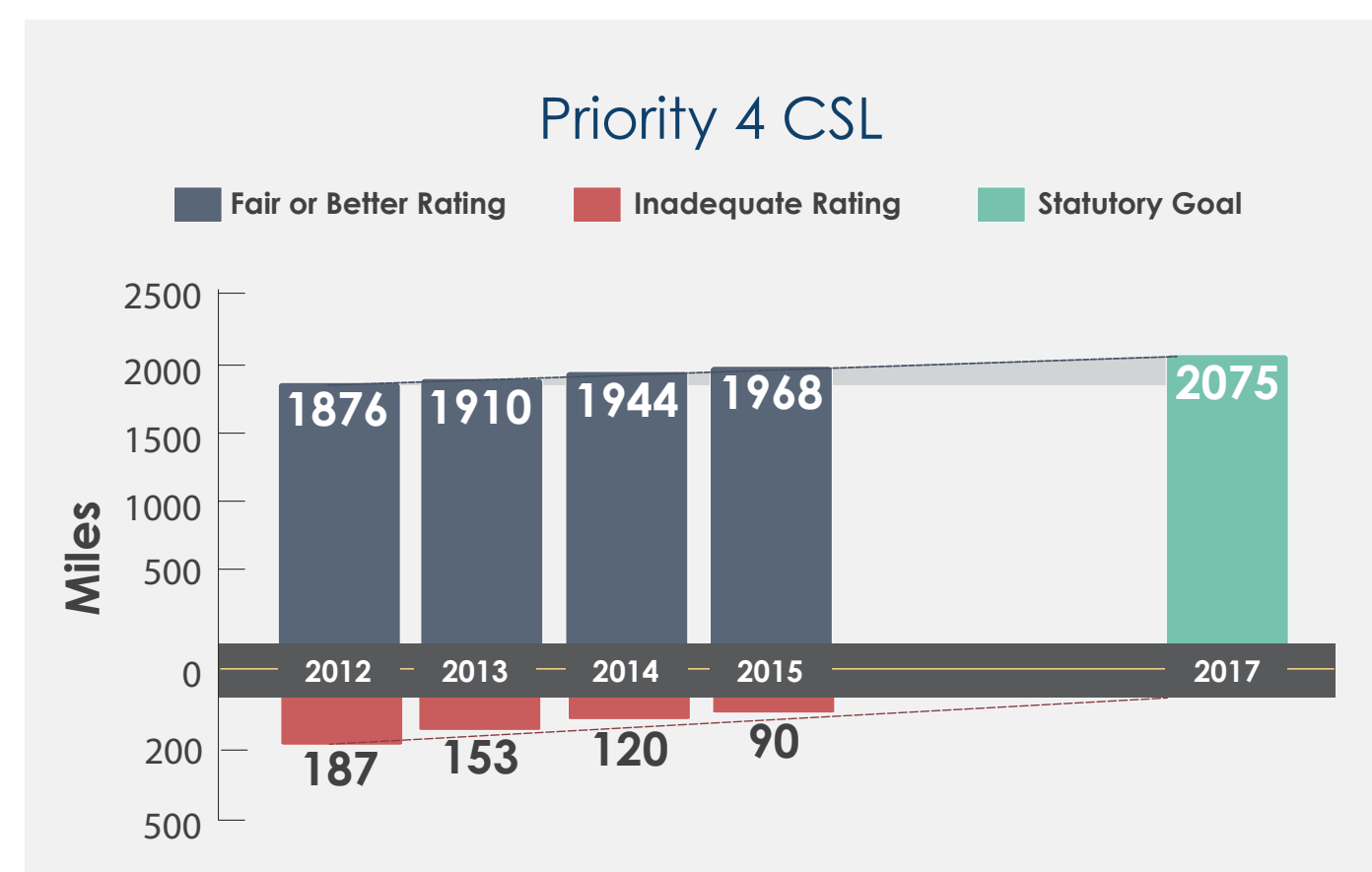
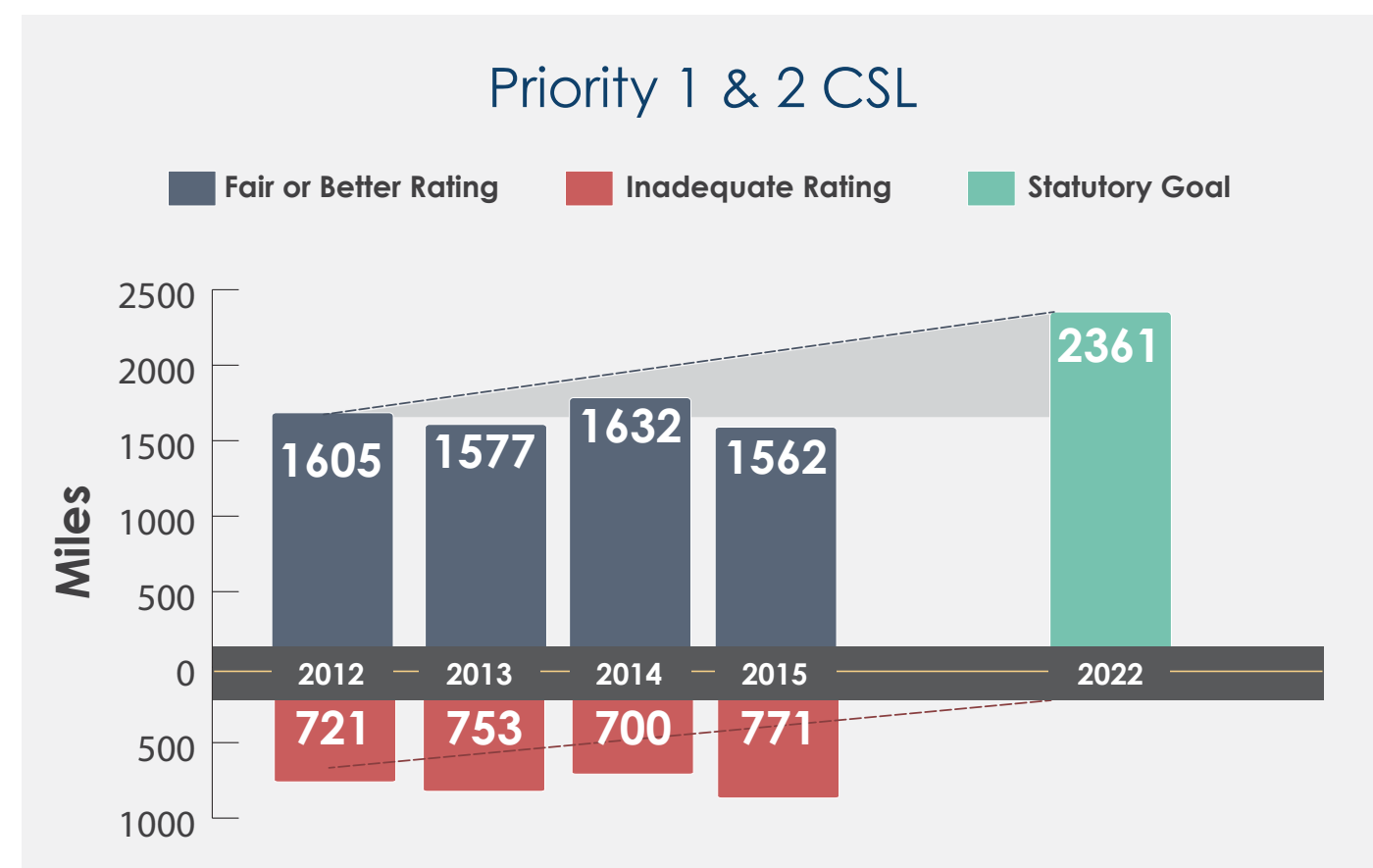


Making the Case for Funding Highway Preservation First

James Havu, Robert Skehan, P.E., Anne Carter, P.E., Maine Department of Transportation

Challenges



The message of these graphs is that Maine is:

- Not quite holding steady on the condition of HCP 1 and 2 roads, let alone making progress toward the Title 23 goals;
- Losing ground on the condition of HCP 3 roads; and
- On track for meeting Title 23 goals for HCP 4 roadways.

Lane Miles by Highway Corridor Priority

HCP	Total LM	Built LM	Un-built LM
Interstate	1028	1028	0
1	1888	1784	103
2	1989	1841	148
3	3799	2968	831
4	4147	1401	2546
5	4741	406	4334
Totals	17592	9630	7962

Maine's non-toll built highway system will LOSE approximately 9,224 lane mile years of service life each year.

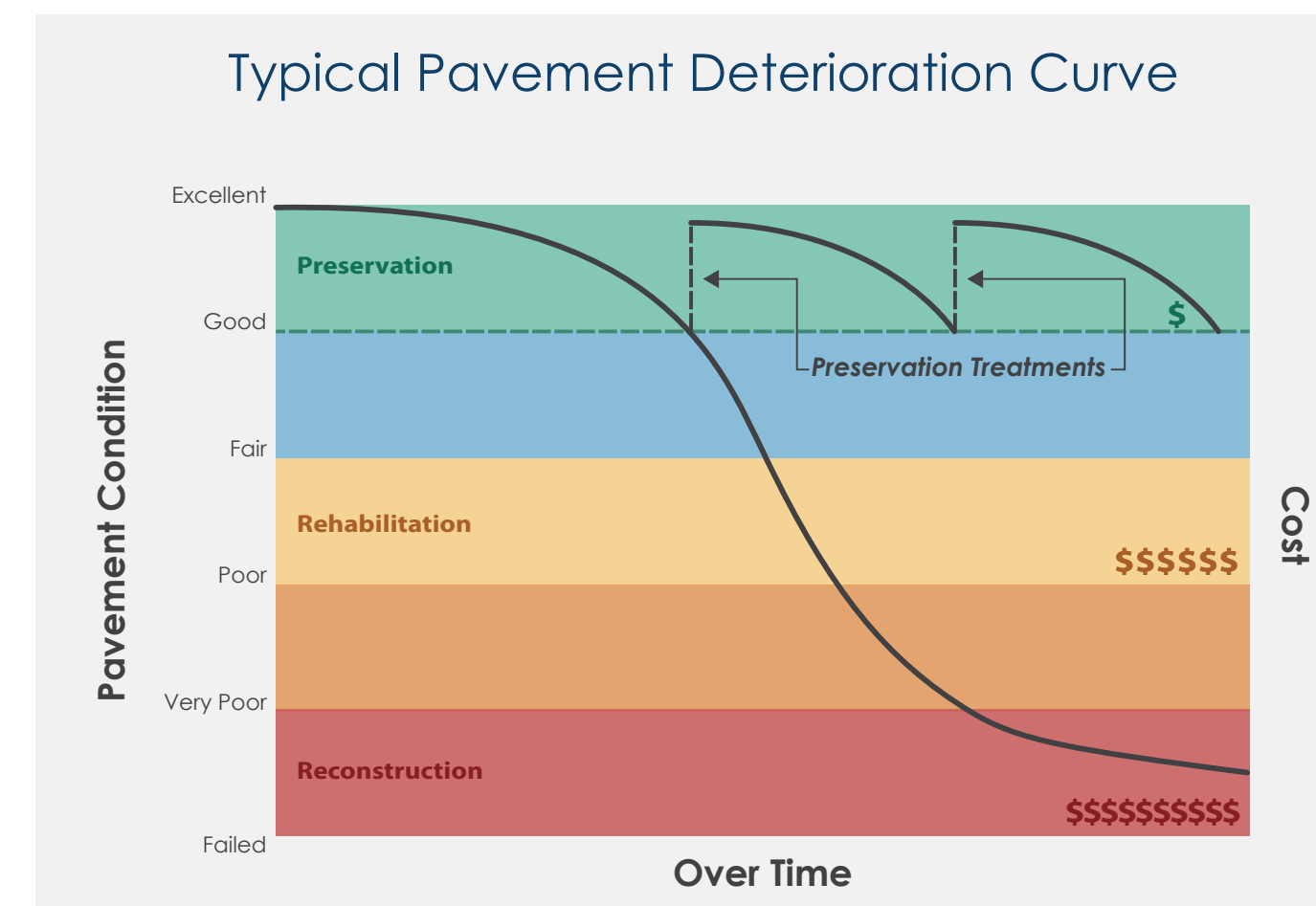
Comparison of Treatment Costs to Life Expectancy

Treatment	Expected Life	Avg. Cost per Mile	Cost per Lane-Mile-Year Extension
Reconstruction	20	\$3,800,000	\$95,000
Rehabilitation	15	\$2,000,000	\$66,667
1-1/2" HMA Overlay	11	\$430,000	\$19,545
1-1/4" HMA Overlay	10	\$314,000	\$15,700
Mill and Fill	8	\$409,000	\$25,563
3/4" HMA Overlay	9	\$233,000	\$12,944
Ultra-Thin Bonded Wearing Surface	8	\$175,000	\$10,938
Cyclical Pavement Resurfacing(CPR)*	9	\$135,000	\$7,500
Fog Seal	3	\$21,000	\$3,500
Crack Sealing	2	\$7,000	\$1,750

From an asset management perspective, the greatest challenges are:

- Condition levels on our Priority 1, 2, and 3 roads have not improved
- We are losing service life each year
- Our pavement applications are not lasting as long as expected

Methods



Highway Pavements

Our highway pavements begin to deteriorate the moment they are constructed. The rate at which deterioration occurs depends on the age of the pavement, traffic (particularly heavy trucks), drainage, and climate but follows the general deterioration curve illustrated below: The curve shows that a roadway pavement deteriorates slowly at the beginning of its projected life span (the portion of the graph where the curve is nearly horizontal). This level of deterioration per year increases drastically (the portion where the curve becomes nearly vertical) as the pavement reaches near middle-age and the effects of traffic and the environment take their toll on the material. When the pavement is near the end of its projected life span, the pavement worsens at a slower rate once again. The point where the pavement is in fair condition, before the curve drops off sharply, is considered the critical zone in the pavement's life. Before this point, it is relatively inexpensive to keep a roadway in good condition, while it becomes much more expensive to keep the roadway in good service condition beyond that point.

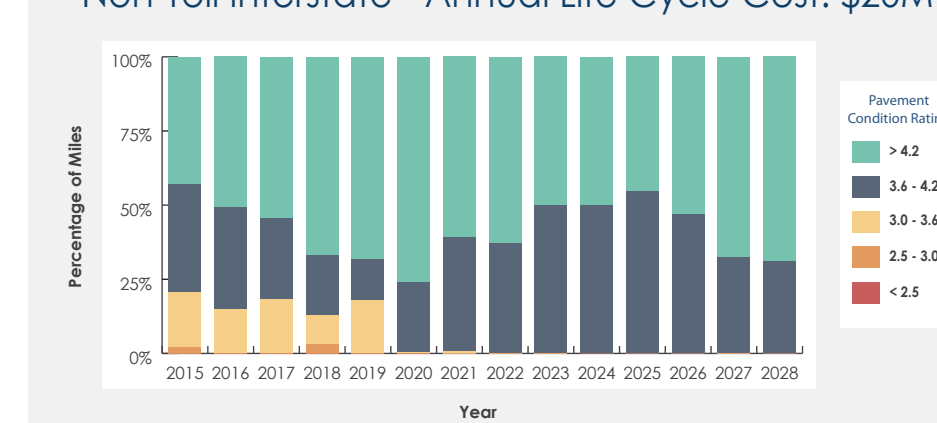
Future Highway Funding Needs

Preservation Needs Analysis

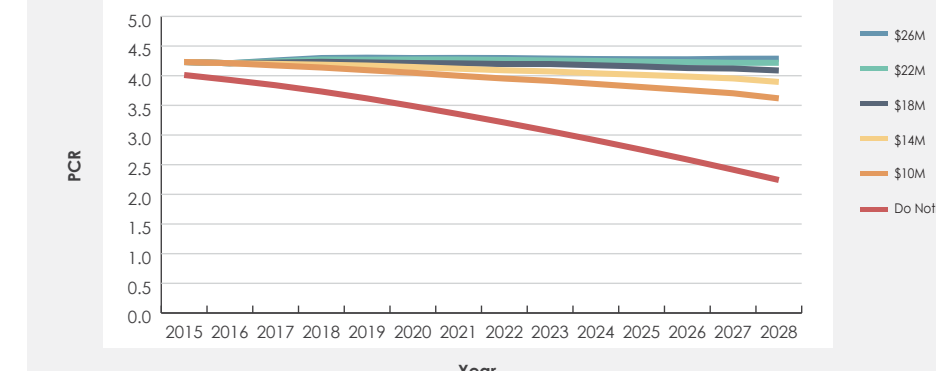
The department uses dTIMS CT asset management software to model each section in the 8,800 mile network. The model considers factors such as year of last work, traffic (AADT) and cost and effectiveness of the various treatments in the department's toolbox. It predicts deterioration on each section and evaluates many different ways of investing money over an analysis period (usually about 15 years). Once all the possibilities have been calculated out, it chooses the construction program that will deliver the highest benefit. (A construction program recommends specific treatments on specific sections of road for each year in the analysis period.) Benefit is the product of improvement in PCR multiplied by an AADT (Annual Average Daily Traffic) factor, i.e. how many drivers see that level of improvement.

Besides providing a starting point for selecting Work Plan candidates, dTIMS CT analysis can be used to visualize the long-term effects of different levels of funding. As part of its work, the Roads Report team ran analyses to determine the funding needed to preserve the parts of the network that are still preservable (i.e., unbuilt sections were excluded). In all cases a "do-nothing" budget scenario was run, to be a reference point.

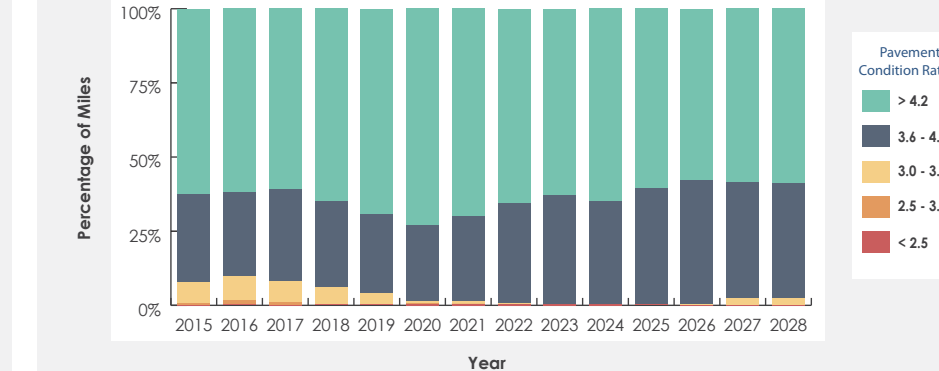
Non-Toll Interstate - Annual Life Cycle Cost: \$20M



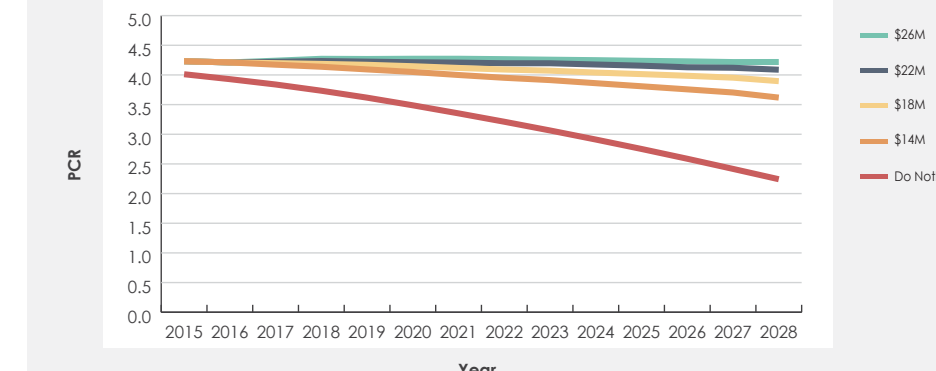
Remaining HCP 1 - Annual Funding Needed: \$22M To Keep the Average Condition Steady



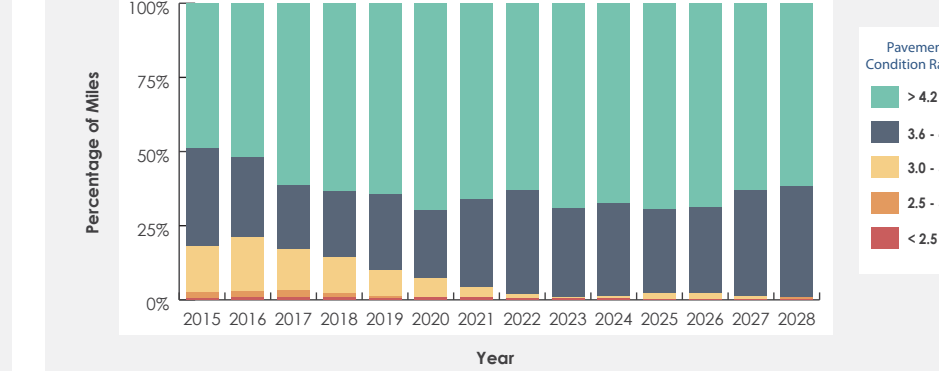
Remaining HCP 1 - Annual Life Cycle Cost: \$22M



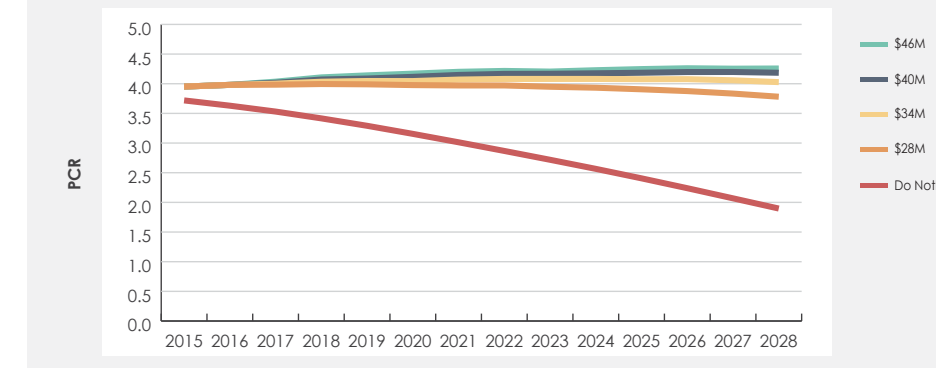
HCP 2 - Annual Funding Needed: \$22M To Keep the Average Condition Steady



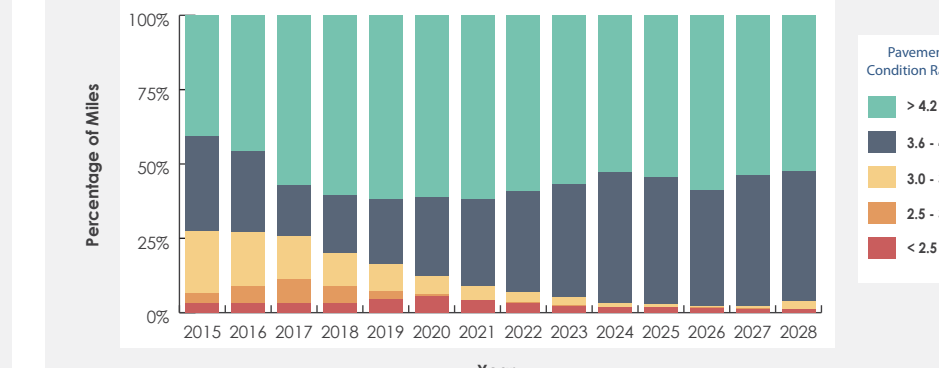
HCP 2 - Annual Life Cycle Cost: \$22M



HCP 3 - Annual Funding Needed: \$40M To Keep the Average Condition Steady



HCP 3 - Annual Life Cycle Cost: \$40M



Conclusions

Proposed Changes to HCP Groupings

Current Priority	Proposed Priority	Miles	Treatment
HCP 1	HCP 1	1485	PPP
HCP 2 + HCP 3A	HCP 2	1872	PPP
HCP 3B + HCP 4A	HCP 3	1852	CPR
HCP 4B + HCP 5	HCP 4	3450	LCP
HCP 6	HCP 6	14,300	Municipality

PPP = Pavement Preservation Program, CPR = Cyclical Pavement Resurfacing, LCP = Light Capital Paving.

One recommendation of the Roads Report was to reclassify our Highway Corridor Priorities to better address our highway asset management needs and get the priorities in line with the treatment they will receive. We also decided to create a new treatment, Cyclical Pavement Resurfacing to better maintain the Priority 3 roads.

Summary of Annual Funding Needs

Highway Corridor Priority	Historical Preservation Funding (2010-2014)	Annual Preservation Funding Need	Historical Rehab + Constr. Funding
Interstate	\$16M per year	\$16-20M per year	\$ 3.5M per year
Non-interstate HCP 1	\$11.7M per year	\$22M per year	\$14.7M per year
HCP 2	\$13.7M per year	\$22M per year	\$10.7M per year
HCP 3	\$13.5M per year	\$40M per year	\$22M per year
HCP 4A	\$ 2.5M per year	\$18 M per year	\$ 5M per year
Total	\$57.4M per year	\$122M per year	\$55.9M per year

Current total funding of \$113M per year is not enough to cover the annual preservation funding need of \$122M per year, even if no investment was made in reconstruction/rehabilitation. Applying all of the currently available funding (\$113.3M) to preservation is one option.

This would be a significant shift in policy, but it is one way to keep more miles from falling out of the preservable category into the rehabilitation category. The miles of unbuilt roads would remain stagnant as there would be nearly no remaining funding for treatments to properly construct these roadways. These unbuilt roadways, in many cases, represent the CSLDs and Fs in the MaineDOT system.

1. Fully fund the preservation needs of our built highway network

The cornerstone of the Department's asset management plan is the preservation of investments made in the built highway network. The cost to preserve the network using current pavement preservation treatments and highway corridor priorities would be \$122 million per year.

By adopting the new highway corridor priority system and implementing the Cyclical Pavement Resurfacing (CPR) program proposed in this document, the Department can meet preservation needs at the lower cost of \$107 million per year, paving approximately 430 centerline miles each year.

This strategy would add enough service life extension to the built highway system each year to meet or exceed the annual service life loss for that system.

2. Continue historic funding of Light Capital Paving (LCP)

This cost-effective treatment is the only tool currently available to maintain safety and serviceability of our unbuilt and lowest priority roadways and is generally applied to approximately 600 centerline miles each year. Historical funding of \$33 million per year is sufficient to continue this successful program.

3. Continue historic funding of safety and spot improvement projects

Safety and spot improvements have historically been funded at approximately \$20 million per year.

4. Fully fund the drainage structure maintenance needs of our highway network.

Funded at \$22 million per year.

5. Continue historic funding of PMRAP

The department has generally funded the PMRAP program at \$8 million per year. This cost-effective treatment is used to correct structural and/or geometric deficiencies on approximately 30 miles per year of our lower priority highways (unbuilt HCP 3 and HCP 4) to reduce annual maintenance costs and increase safety for the traveling public.

The Roads Report team recommends fully funding the first five priorities (\$191 million) in this section before allocating funds to highway reconstruction/rehabilitation.

6. Strategic investment in highway reconstruction/rehabilitation

Investment in highway reconstruction/rehabilitation generally returns a highway to new condition by repairing structural, geometric, and drainage issues. The resulting pavements are then in a condition where they can be preserved using cost-effective pavement preservation treatments for an extended period of time. Possible sources of funding include TIGER and FASTLANE grants, and municipal-state partnerships.

Status quo funding level: \$56 million per year

This is the average annual expenditure for these activities from 2011 to 2015 and addresses approximately 34 miles-per-year on average.

If \$191M is not available, the order of the list should be followed: i.e., fully fund #1 before applying any funds to #2, etc. If more than \$191M per year is available, reconstruction/rehabilitation needs could be addressed, with the understanding that those miles will then need to be preserved.

