



9th International Conference on **MANAGING PAVEMENT ASSETS (ICMPA9)**

GENERATING INFRASTRUCTURE FUNDS THROUGH INNOVATIVE PAVEMENT MANAGEMENT



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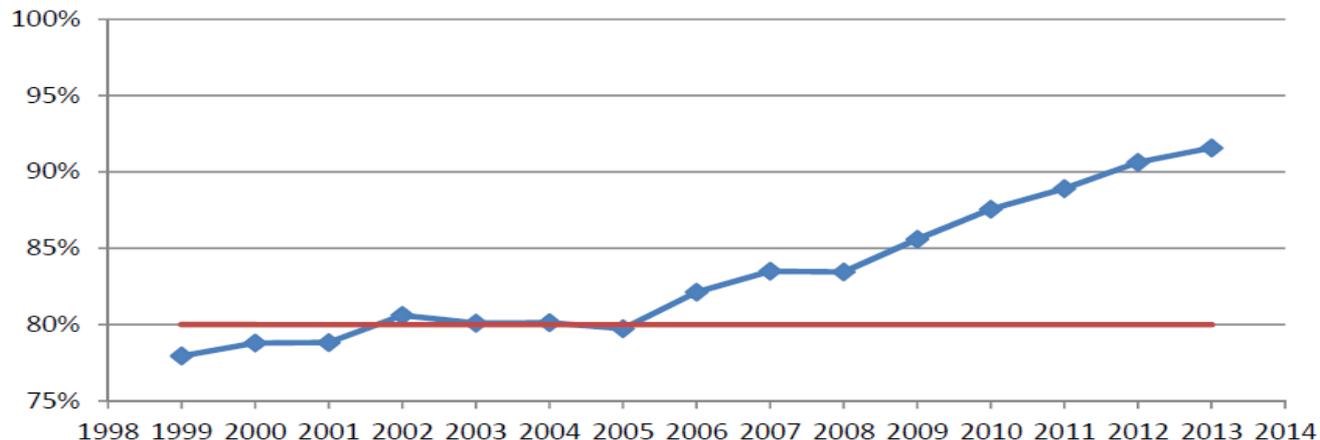
Generating Funds

- Florida Department of Transportation (FDOT) has reallocated 3 billion dollars from resurfacing work program.
- Survival Analysis
 - Characterization of behavior for different materials through different regions.
 - Part of Florida's Analysis System for Targets (FAST) program suite.
 - Historical data analysis.

FDOT

- Pavement Condition Survey (PCS) data have been collected since 1976.
- Since 2006 we have surpassed the 80 % performance standard per FL Statute.

Percent of State Highway System Meeting Standards



Pavement Condition Collection

- State Wide (SW).
 - 7 Geographical Districts.
 - Turnpike.
 - Interstate.



What is FAST?

Implemented in 2008

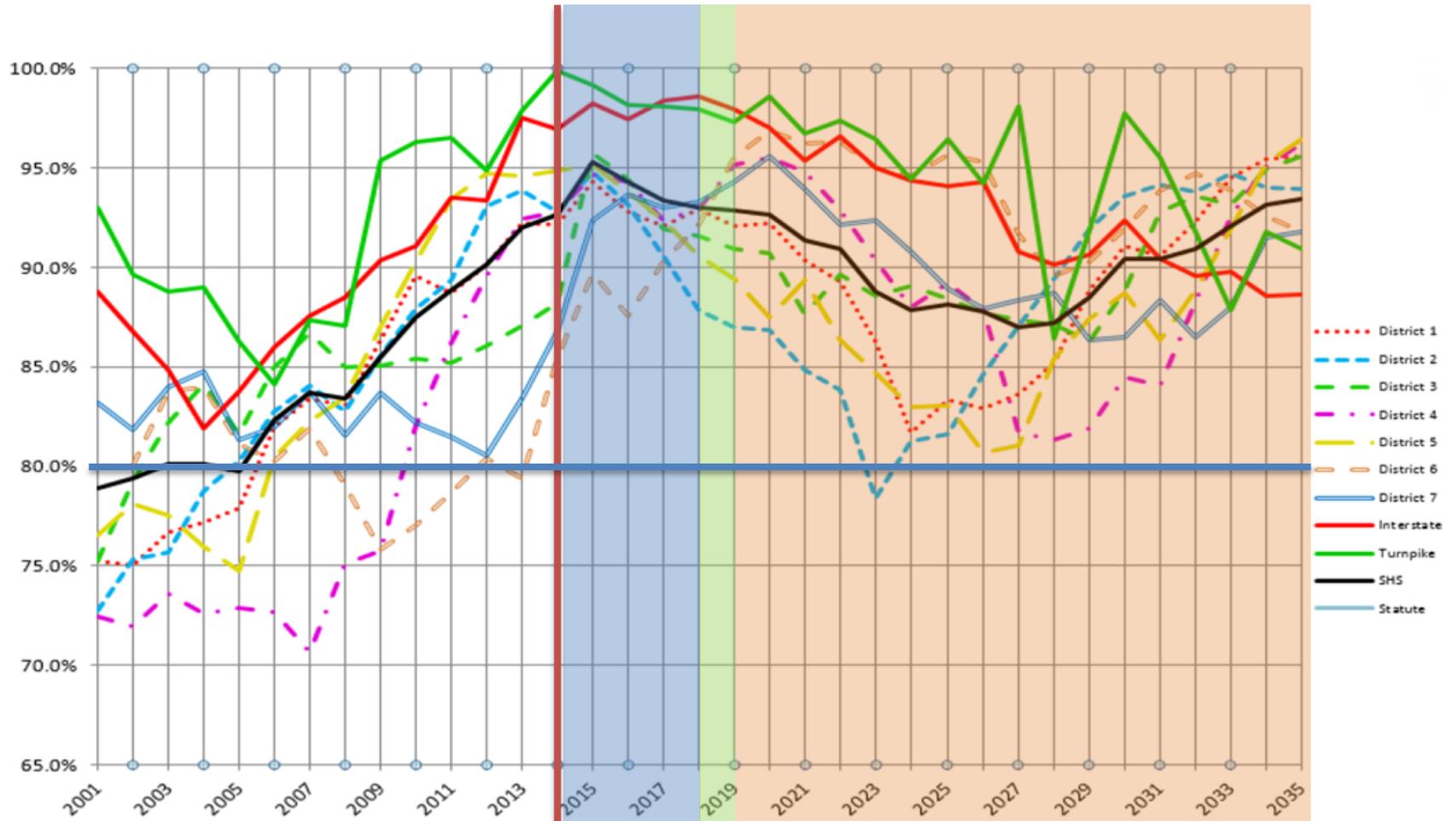
- Improves section level condition forecasts of the State Highway System (SHS).
- Able to calculate future resurfacing allocations based on forecasted conditions.
- Capable of performing impact analyses for different funding scenarios and policy decisions.

FAST Tools

These tools have been used to:

- Develop and enhance the FAST software system for predicting the rutting, cracking, and ride performance of individual pavement sections and the highway network.
- Answer frequently asked questions from the Executive Level as well as the Districts:
 - What have been the impacts of previous decisions?
 - Were the underlying assumptions valid?
 - If we take a specific action - what is the expected impact?

Historical and Predicted Percent of Lane Miles Meeting Standards



PCS Ratings

- The PCS rates pavements using three indices.

CRACK

RUT

RIDE

- The rating scale for the PCS is from 0 (worst) to 10 (best).
- A rating under 6.5 in most cases is considered deficient.

Analysis of PCS Ratings

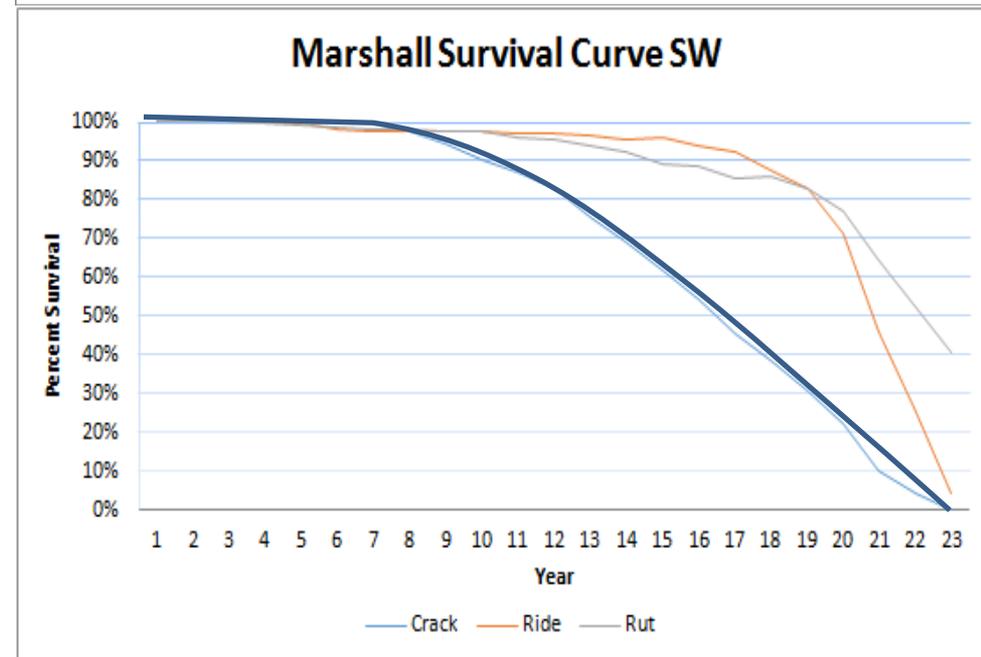
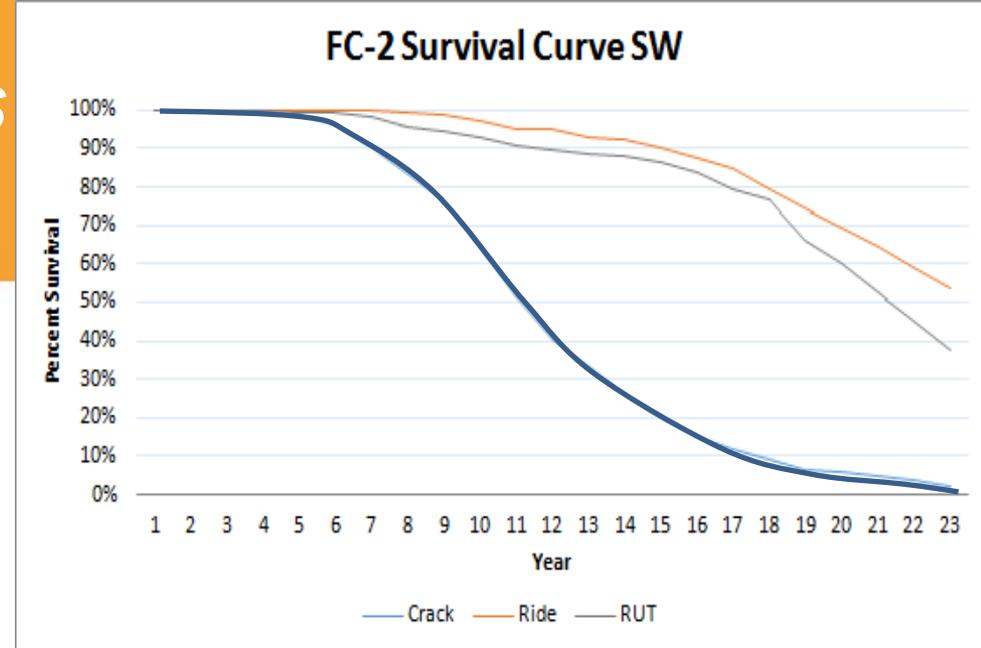
- Current Surface Types active on the SHS.

OPEN	FC-2	FC-5
DENSE	Marshall	Superpave

- FC-2 and Marshall mixes are used for normal survival curve analysis due to their extensive use in Florida dating back to the late 1970's, providing a complete life cycle.

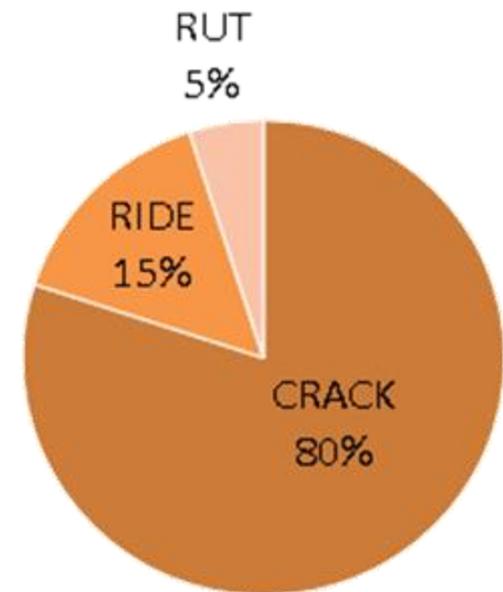
Comparison of Indices for FC-2 and Marshall

- Graph is based on percentage of sections surviving after a specific age for a State Wide System.
- Crack rating deficiency dominates on these materials.



Benefits of Using Crack Survival Curves

- Conservative Forecasting.
 - Underestimation of survival age of a section.
 - Predominate deficiency.
- More efficient analysis for new materials.



New Materials

- Service life for new materials such as FC5 and Superpave cannot be calculated until they reach 50% survival.
- When comparing them to known materials such as FC2 and Marshall an analysis can be performed.

Analysis of Materials

- **Open Vs. Dense**

- Dense is surviving 16% longer than Open.

- **Marshall Vs. SP**

- SP is surviving 6% longer than Marshall.

- **FC2 Vs. FC5**

- FC5 is surviving 20% longer than FC2.

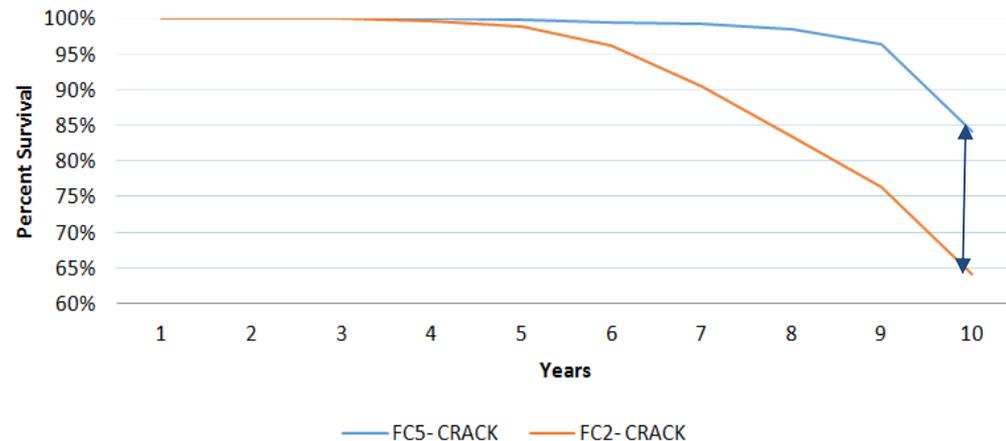
Open Vs. Dense Survival Crack Curve SW



Marshall Vs. Superpave Survival Crack Curve SW

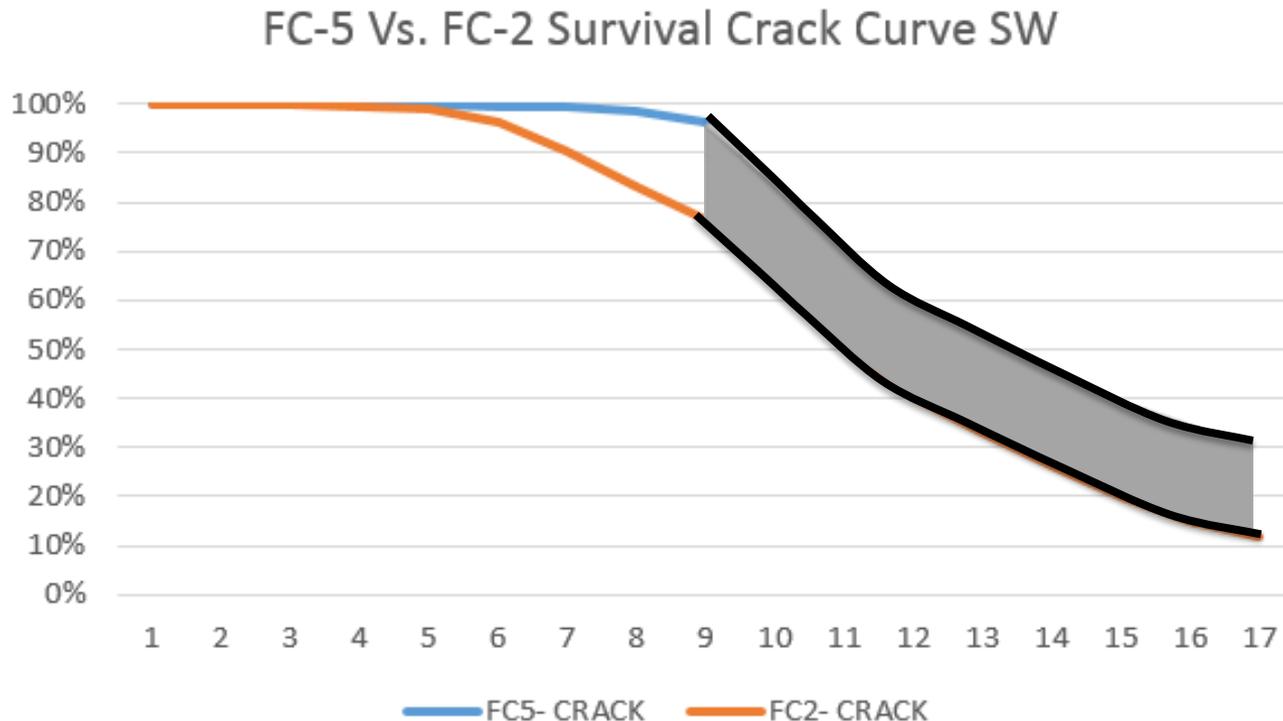


FC-5 Vs. FC-2 Survival Crack Curve SW



Forecasting

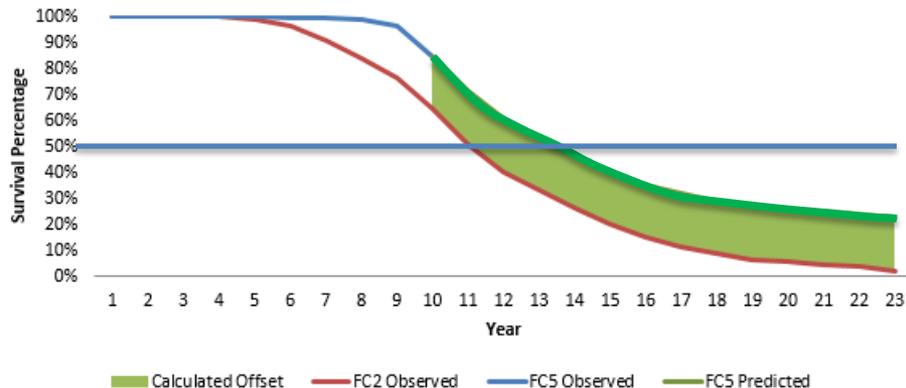
- Utilizing a known material to determine the behavior or the new material.



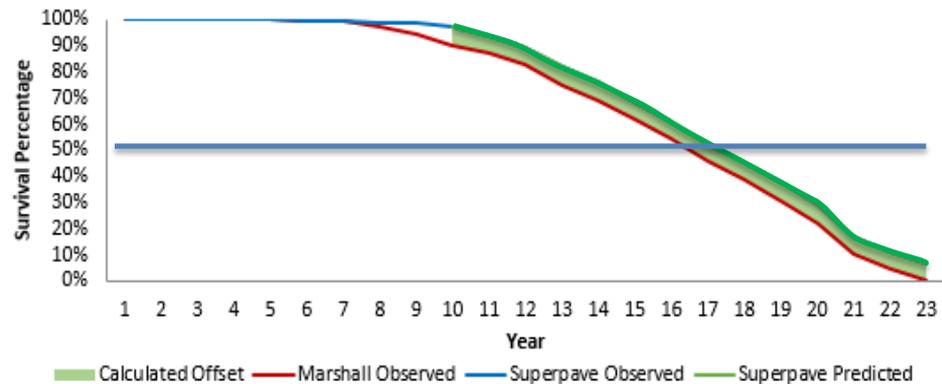
Forecasting

- Generating the Master Curve for undocumented materials from known material.
- Allows for section and system forecast.
- Survival Age of
 - **FC2: 11 yr.** **FC5: 14 yr.**
 - **Marshall: 16.5 yr.** **Superpave: 17.5 yr.**

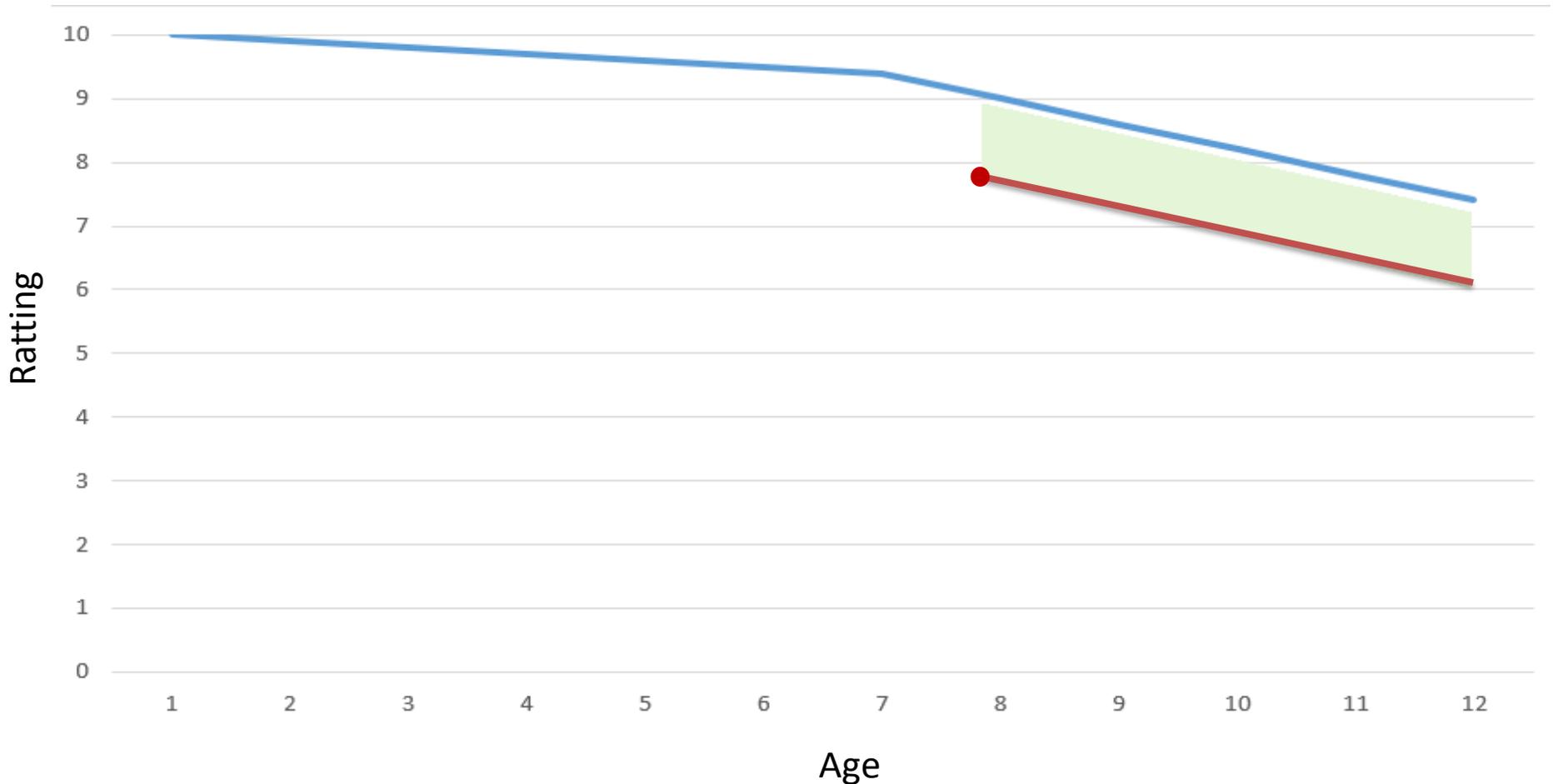
FC5 Predicted From FC2 Crack



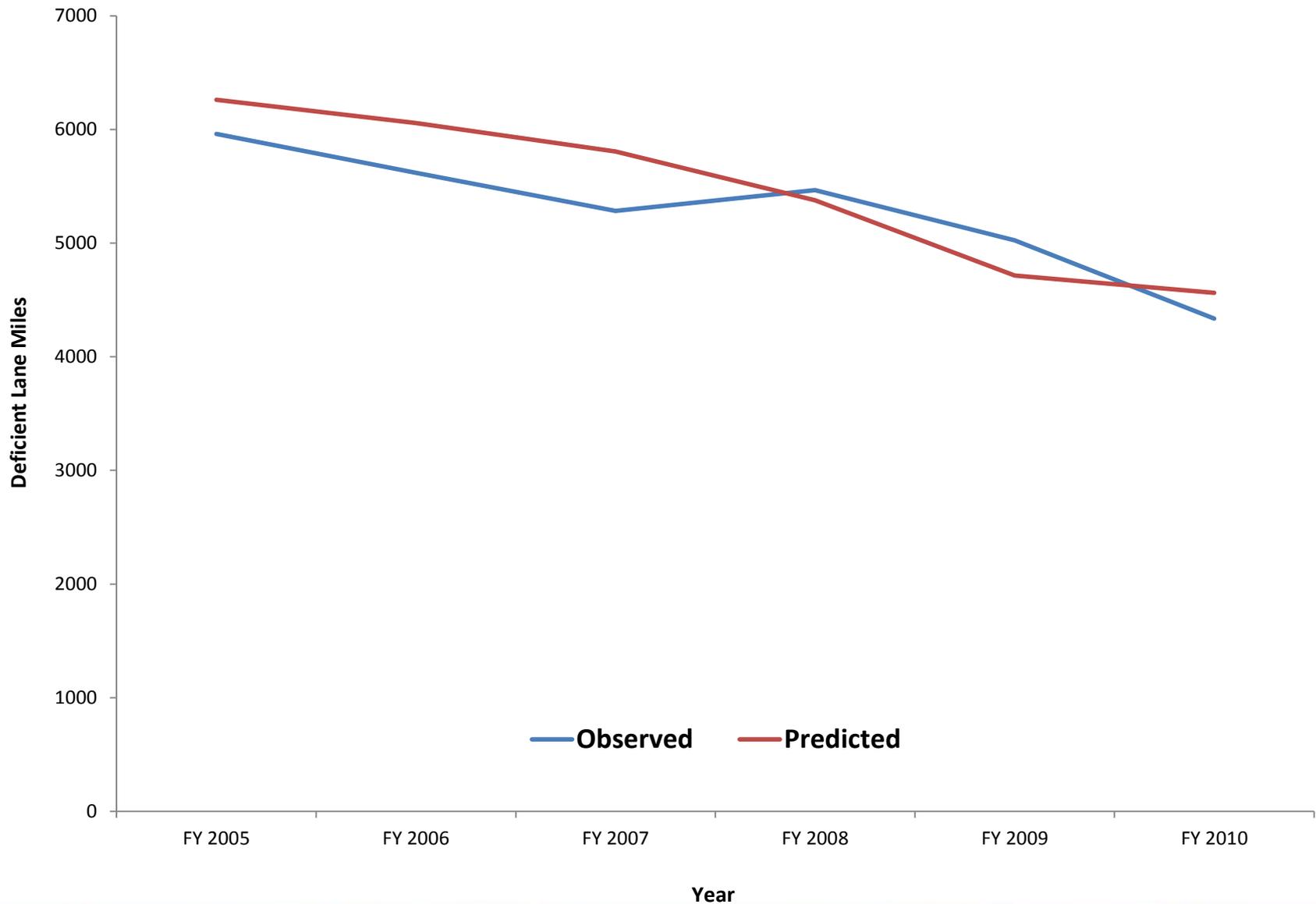
Superpave Predicted From Marshall



Forecasting From Master Curve

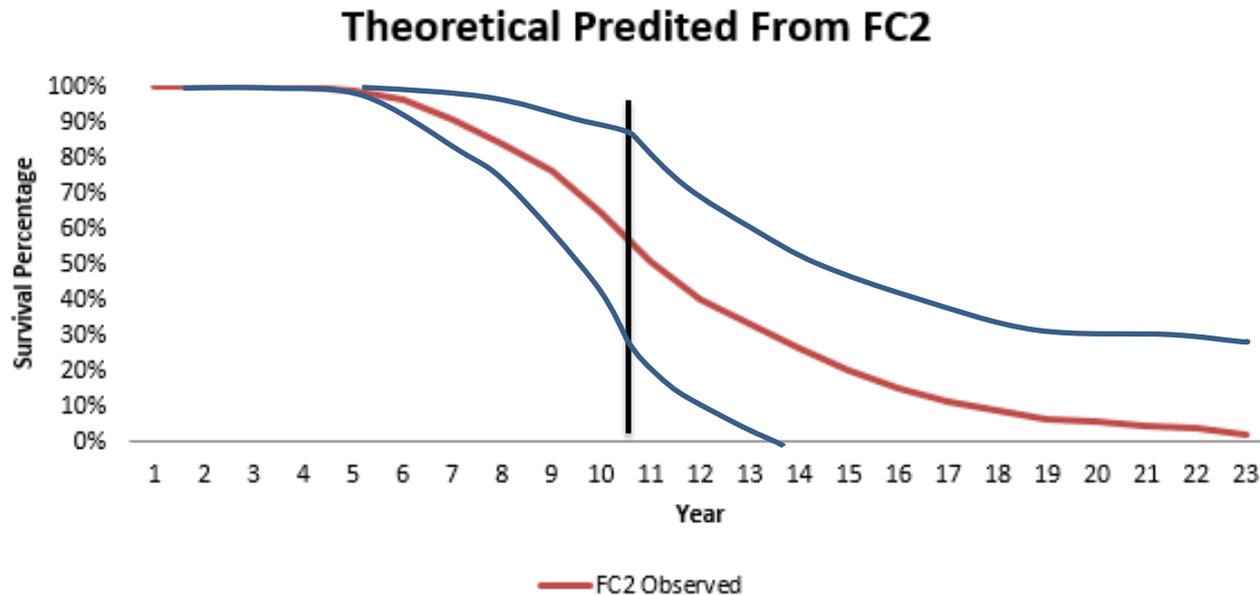


Total SHS Deficient Lane Miles (Observed vs. Predicted) FY 2005 - FY 2010



Application towards new Materials

- Using the same methods, new materials can be analyzed and predicted.

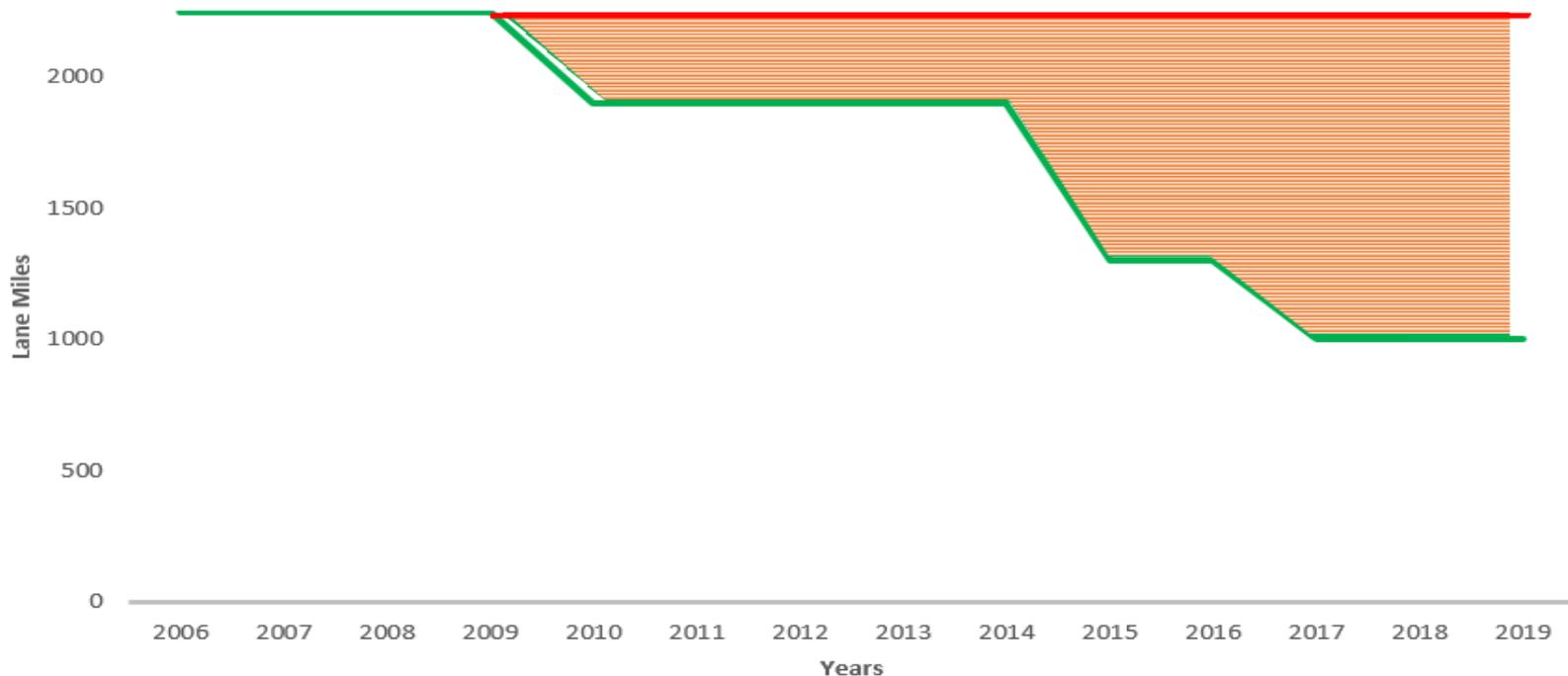


Utility of Results

- Based on these survival curves and other predictive algorithms, it is feasible to generate resurfacing targets based on forecasts of future performance.
- In order to meet the desired standards, funds may be added or removed from the resurfacing program proactively.

Overall Savings So Far

- In the past 10 year work program, Florida's Resurfacing program has reallocated roughly 7400 lane miles. (\$ 3 Billion)



Survival Analysis Impact

- Survival analysis has proven to be an effective tool in learning about the behavioral characteristics of Florida pavements.
- The survival analysis procedure has also allowed the development of predictive models that enable the effective and efficient management of the resurfacing program.

Future Impact

- Proactive analysis of decisions being made today and their affect on the whole system.
- Allow a natural deterioration of pavement preventing over-preservation of the system.
- Reallocate more funds from resurfacing to other infrastructure needs.

Questions?

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